Office of Environmental Quality Control
Office of the Governor
550 Halekauwila Street
Tani Office Building, Third Floor
Honolulu, Hawaii 96813

Hale Pōhaku

Hāmākua, Mauna Kea, Hawai'i

Mid-Elevation Facilities Master Plan
Revised Environmental Impact Statement

State of Hawaii
Department of Land and Natural Resources

February 1980

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Hale Pōhaku

Hāmākua, Mauna Kea, Hawai'i

Mid-Elevation Facilities Master Plan
Revised Environmental Impact Statement

State of Hawaii
Department of Land and Natural Resources

February 1980

REVISED

ENVIRONMENTAL IMPACT STATEMENT

FOR

HALE POHAKU

MID-ELEVATION FACILITIES MASTER PLAN

HAMAKUA, MAUNA KEA, HAWAII

Prepared for

DEPARTMENT OF LAND AND NATURAL RESOURCES

STATE OF HAWAII

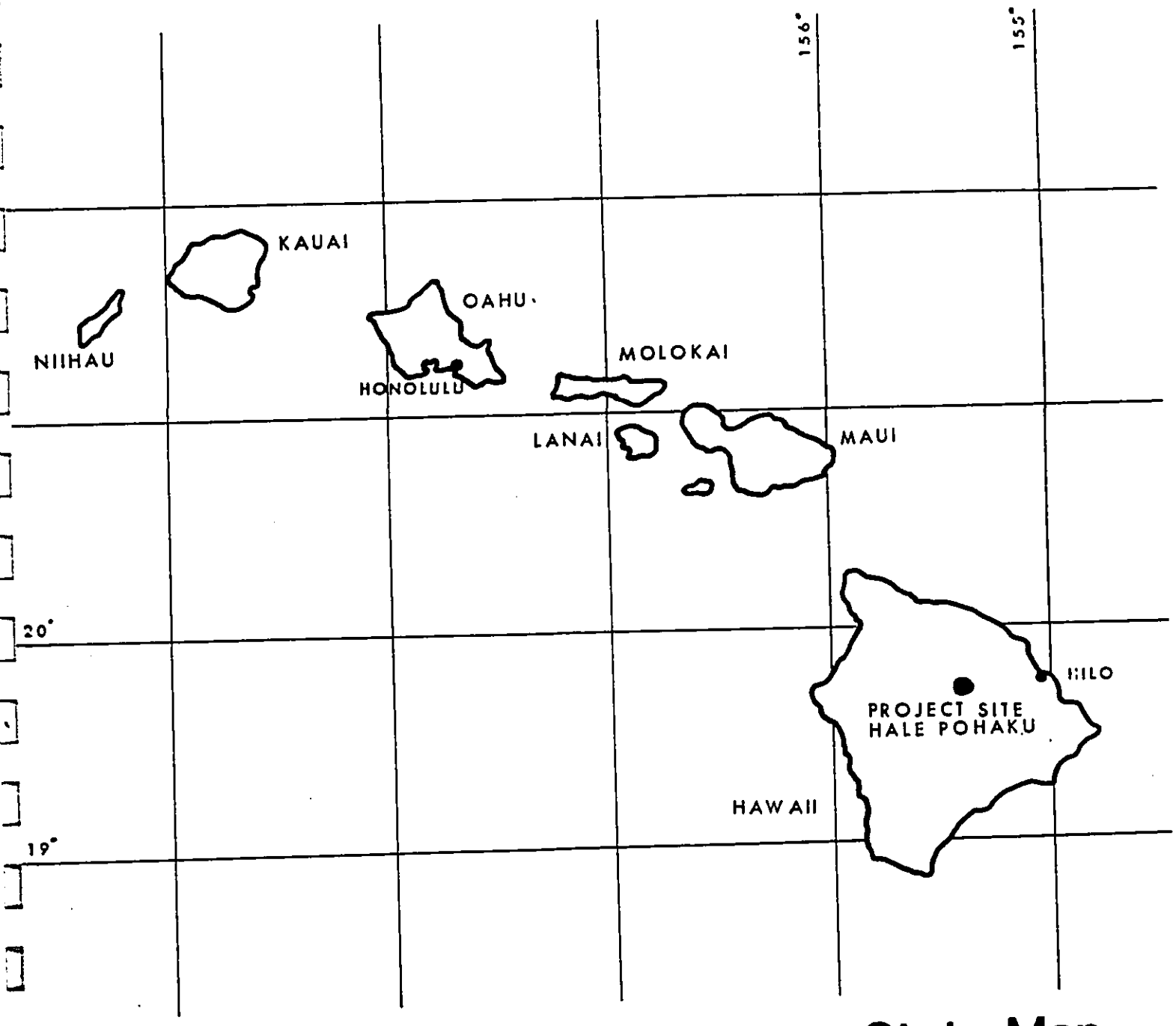
SUSUMU ONO, CHAIRMAN

February 1980
Date

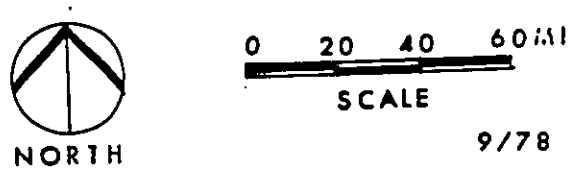
Prepared by

GROUP 70, INC.

February, 1980



State Map



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REVISED

ENVIRONMENTAL IMPACT STATEMENT

February, 1980

PROJECT:	HALE POHAKU MID-ELEVATION FACILITIES MASTER PLAN
LOCATION:	HALE POHAKU, MAUNA KEA, ISLAND OF HAWAII, STATE OF HAWAII
PROPOSING AGENCY:	DEPARTMENT OF LAND & NATURAL RESOURCES STATE OF HAWAII
ACCEPTING AUTHORITY:	GOVERNOR STATE OF HAWAII
CONTACT:	DIVISION OF WATER & LAND DEVELOPMENT DEPARTMENT OF LAND & NATURAL RESOURCES P. O. BOX 373 HONOLULU, HI 96809 TELEPHONE: 548-7496
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SUMMARY

The Hale Pohaku Master Plan was prepared to fulfill the requirements of the Mauna Kea Plan which states that "A master plan for the Hale Pohaku area shall be prepared by the Department of Land and Natural Resources. Said plan shall incorporate plans for all intended uses of Hale Pohaku . . ." (Mauna Kea Plan, 1977). The Mauna Kea Plan also describes these intended uses of Hale Pohaku by stating that ". . . the Hale Pohaku facility will consist of mid-level facilities for necessary research personnel for the summit, a central point for management of the mountain, and a day-use destination point for visitors and primitive overnight camping facilities." (Mauna Kea Plan, 1977). This Environmental Impact Statement describes the locational and physical attributes of these planned uses and discusses the potential environmental impacts that could result from implementation of various elements of the plan

The Hale Pohaku Master Plan proposes that seven acres at the 9,200 foot elevation on Mauna Kea be developed for the University of Hawaii, Institute for Astronomy, mid-elevation support facilities. Four acres of the proposed site, located adjacent to the Mauna Kea Observatory Access Road, are presently covered by structures that are serving as temporary mid-level facilities for astronomy personnel. The plan proposes to replace the existing temporary structures with new buildings which will be used for sleeping, eating, lounging, research support and minor maintenance functions directly related to telescope operations at the summit. (More extensive astronomy facilities are located in Hilo, Waimea, and Honolulu). Facilities at the mid-level are necessary so that astronomy personnel

who work in the rarefied atmosphere of the 13,800 foot summit can remain acclimatized during their on-duty periods. The elevation of Hale Pohaku, 9,200 feet, was determined to be the most suitable altitude for the purpose of acclimatization.

The plan also sets aside eight acres, located about 700 feet downslope of the proposed astronomy area, for park development. Two acres of this site are proposed to be developed initially with an Information/ Interpretive Station, parking area, and ten picnic sites. An additional six acres has been reserved for future expansion if there is a demand for this type of recreation facility.

Hale Pohaku is located in the area designated as "Mamane/Naio Forest Ecosystem Management Area" by the Mauna Kea Plan. It is also within the federally designated critical habitat of the "endangered" Palila (Psittirostra bailleui). A major consideration in preparing the Hale Pohaku Master Plan was to minimize disturbance to the mamane/naio forest and to prevent deterioration of the critical habitat.

Development within a federally recognized critical habitat of an endangered species is subject to the rules and regulations of Section 7 of the Endangered Species Act of 1973 (U.S.C. 1536) and 1978 amendments to the Act if a federal presence is involved in the project. Formal consultation between NASA, which provides some operating funds to the University of Hawaii, Institute for Astronomy, and the U.S. Department of Interior, Fish and Wildlife Service was concluded November 2nd, 1979. Correspondence related to this consultation is appended to this EIS. (Appendex E)

Although the Mauna Kea Plan specified Hale Pohaku as the appropriate location for the mid-level functions, alternative locations for this facility were assessed and evaluated. Two of the most important criteria for determining the appropriate location for the mid-level facility were: (a) convenient vehicular access to the telescopes; and (b) an elevation high enough to maintain high-altitude acclimatization for those working at the summit.

There are important medical reasons for requiring acclimatization of personnel who work at the summit. Individuals going directly from sea level to nearly 14,000 feet can suffer from mountain sickness (Seroche). One of the most serious effects of altitude sickness is pulmonary edema. Other effects, less severe but still significant, are headache; nausea; somnolence; vomiting; diarrhea; loss of mental acuity; and difficulty in concentration. These effects could result in reduction of capability to function effectively at the high elevations.

Hilo and Waimea were discussed as possible sites for the astronomy support complex but were rejected because of their low altitude. The summit itself was also considered and then rejected because the 13,800 foot elevation is too high to allow comfortable sleeping and also because the summit is limited in space and thus must be reserved for astronomical functions that cannot be conducted elsewhere.

Humu'ula Sheep Station, east of the Mauna Kea Observatory Access Road just above its junction with the Saddle Road was also assessed as an alternative location for the facility. It was judged to be suitable in

various respects with the exception that its elevation, 6,600 feet, was too low to allow for effective acclimatization

A site on Hawaiian Homes Land at the 8,000 foot elevation of Mauna Kea was considered as a location for the mid-level facility both prior to and during the preparation of this EIS. This site is presently undeveloped and it is outside of the federally designated critical habitat of the Palila. Although this site was more desirable than Hale Pohaku from an environmental point of view, it was rejected primarily because it was at the lower limit of suitability for acclimatization and therefore may not be high enough to elicit the physiological responses necessary to acclimatize the average person who would be working at the summit.

Three alternative physical plans for the Hale Pohaku area were evaluated based on criteria related to user satisfaction and environmental considerations. The plan and location chosen as a result of this evaluation was described in the Notice of Preparation for this EIS which was distributed commencing October, 8, 1978. It was selected because it was superior to all of the others from the users point of view. Comments received during the consultation period, though, revealed that development at the selected location might result in negative impacts to the environment, particularly the critical habitat of the "endangered" Palila. The compromise plan which is presented in this EIS, was agreed upon by the users, in order to minimize disturbance to the natural environment while still retaining Hale Pohaku as the location of the functions described in the Mauna Kea Plan.

The Hale Pohaku Master Plan is intended to guide and control development within the Hale Pohaku area. The proposed actions embodied in the plan, when implemented, will produce varying effects on all aspects of the area's environment. The purpose of the plan, though, is to control and mitigate potential negative impacts that might result from these actions, before they occur, so that development can proceed without causing significant deterioration to the surrounding environment.

Development at Hale Pohaku will not only affect the primary users of the area and impact the immediate project site but may also induce secondary impacts throughout the area encompassed by the Mauna Kea Plan. These primary (direct) or secondary (indirect) impacts can be either positive or negative, short-term or long-term.

The discussion of anticipated environmental impacts that is included in this EIS evaluates the impacts of development on the following items:

(1) the physical characteristics and visual appearance of the project site;

(2) the vegetation and biology of the area including rare and/or endangered flora and fauna and their related eco-systems;

(3) the historical/archaeological features, natural environment, and visual appearance of Mauna Kea;

(4) park visitors, hunters, skiers, and hikers;

(5) astronomy operations and personnel; and

(6) the island economy and population growth.

Although mitigating measures can be undertaken to minimize most of the negative environmental impacts associated with the implementation of the Hale Pohaku Master Plan, there are some that cannot be avoided. A few mamane trees will have to be removed (estimated three (3) to ten (10)) in order to construct the mid-elevation facilities. The mamane is a slow growing tree which takes decades before maturing sufficiently to provide food for native birds. Care will be taken to retain as many of the mature trees as possible and any which have to be removed will be transplanted to other areas of the site.

The visual appearance of the Hale Pohaku area will be changed as the area is opened up to more persons. The new mid elevation facilities will be more attractive than the existing structures and will improve the present appearance of the area. The currently undisturbed area downslope from the astronomy facilities will change in appearance due to the construction of the Information Station, parking area, and picnic sites.

Increased usage of Hale Pohaku could generate increased travel to the summit. Although the person on duty at the Information Station can help to control access to the upper slopes of Mauna Kea and inform visitors of the rules and regulations pertaining to the area, there is still a risk that features of the mountain will be disturbed by careless and thoughtless persons. This problem would probably occur with or without development at Hale Pohaku.

Coordination among the consultants, the University of Hawaii's Institute for Astronomy, the U.S. Fish and Wildlife Service, and the Department of Land and Natural Resources, when locating the proposed facilities in the

Hale Pohaku area is seen as a major countervailing force to potential adverse environmental effects of implementation of the Hale Pohaku Master Plan. Consultaton with experts in the fields of civil engineering, botany, and biology have also led to modifications of actions that might produce negative impacts in the area. Strict adherence to the policies and conditions set forth in the Mauna Kea Plan concerning development at Hale Pohaku also acted to curtail adverse environmental impacts to the area.

Although Hale Pohaku will no longer be a true wilderness area, at least as long as astronomy is a viable industry on the mountain, the Hale Pohaku Master Plan can be used to control land uses in the area and prevent haphazard development. The guidelines, criteria, and boundaries established within the Master Plan will also enable more informed decisions to be made concerning future actions in the Hale Pohaku area.

PURPOSE OF THIS ENVIRONMENTAL IMPACT STATEMENT

This Environmental Impact Statement has been prepared to accomplish the following:

1. to comply with Chapter 343, Hawaii Revised Statutes,

2. to inform tne public of the proposed Master Plan and development plan and to obtain response to proposed actions;

3. to assess the environmental setting of the project site and surrounding area;

4. to outline the possible environmental impacts of the proposed actions: and

5. to outline mitigating actions for the proposed actions.

Comments received during the review period were addressed and incorporated into or appended to this Revised Environmental Impact Statement.

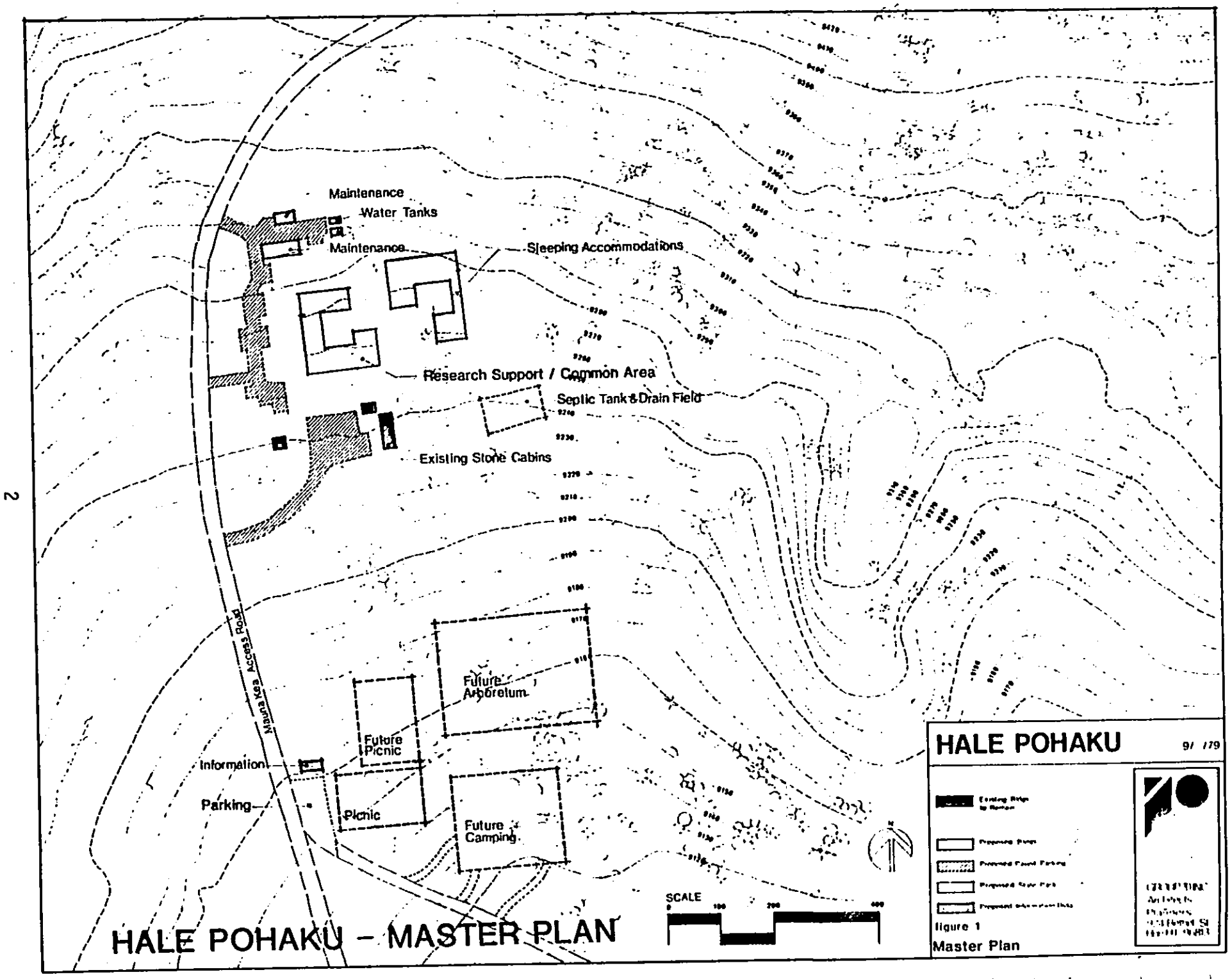
PART I: DESCRIPTION OF THE PLAN

A. Overview

The Hale Pohaku Master Plan incorporates plans for all intended uses of the area that were outlined in the Mauna Kea Plan. That is, support facilities, necessary at the mid level area, for research personnel working at the summit, and information/interpretive services and recreation amenities for the public.

The proposed University of Hawaii (UH) mid-elevation astronomy facility will be located in the vicinity of the existing temporary buildings on the site and the park will be situated about 700 feet downslope of the existing stone cabins, just off the Mauna Kea Observatory Access Road. Maximum separation between the astronomy facility and the park, within the constraints of the site, was provided so as to minimize potential conflicts between visitors to the park and astronomers who work at night and must sleep during the day.

Figure 1 shows the planned location of all programmed uses for astronomy and the park and identifies areas where park facilities could be expanded if necessary. It is a conceptual diagram that is intended merely to show the proposed location and spatial relationships of functional areas and the approximate area to be covered by buildings. For example, the research support and common area of the astronomy facility could actually consist of more than one building; however, the total site area covered by this facility and its location in relation to other

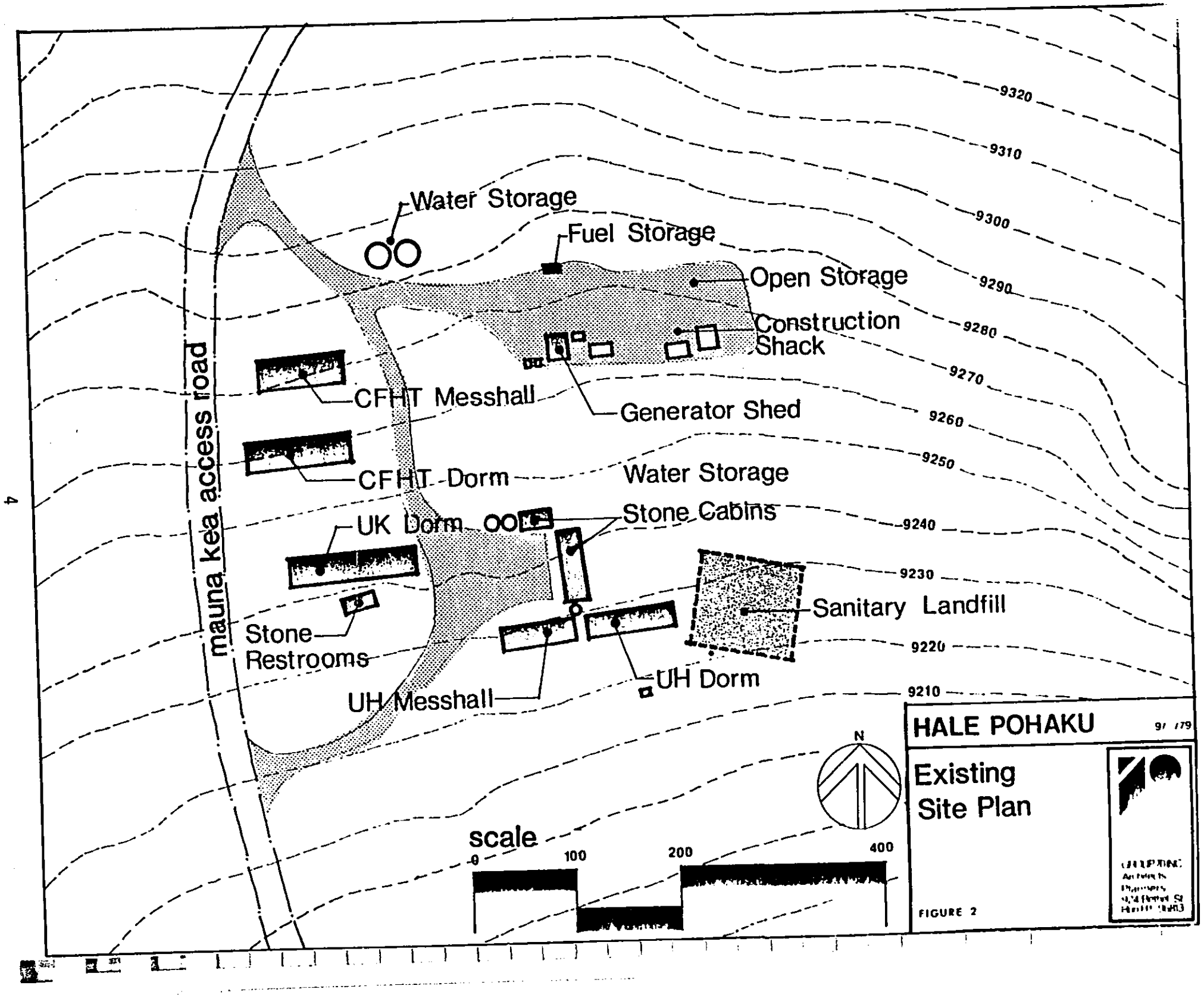

Maintenance
Water Tanks
Maintenance
Sleeping Accommodations
Research Support / Common Area
Septic Tank & Drain Field
Existing Stone Cabins
Mauna Kea Access Road
Future Arboretum
Future Picnic
Information
Parking
Picnic
Future Camping
SCALE
HALE POHAKU
9/ /79
Figure 1
Master Plan
HALE POHAKU – MASTER PLAN

buildings will be approximately the same as represented in Figure 1. Figure 2 shows the layout of the structures which currently exist on the site. Figure 3 shows the locational characteristics of the new facilities in relation to the existing development on the site.

The Mauna Kea Observatory conducts astronomical activities at the Summit, where the six telescopes which have been approved by the Board of Land and Natural Resources are in operation. The proposed mid-level facilities at Hale Pohaku will provide space for sleeping, eating, lounging, research support, and minor maintenance functions directly related to these six approved telescopes. Headquarters for each telescope facility, (where major research, administrative, and maintenance functions are performed) are located at UH Manoa, Hilo, and Waimea.

The buildings of the mid-level facility will be located so as to provide the quietest area for sleeping spaces; research support and common areas will be situated closer to the road. The maintenance area will include generators and water storage tanks, which will also service the park, as well as the necessary facilities for maintenance and upkeep of the astronomy buildings and grounds. A parking area will be provided just off the Mauna Kea Observatory Access Road. All of the buildings presently on the site, except the two stone cabins and stone restroom, will be removed when the new structures are completed.

The initial park facilities will consist of an Information/Interpretive Station, parking area, and picnic sites. The Master Plan allows for future expansion of the recreation area (Figure 1) to include additional picnic sites, primitive campsites, and an arboretum if usage warrants them. The Plan recognizes,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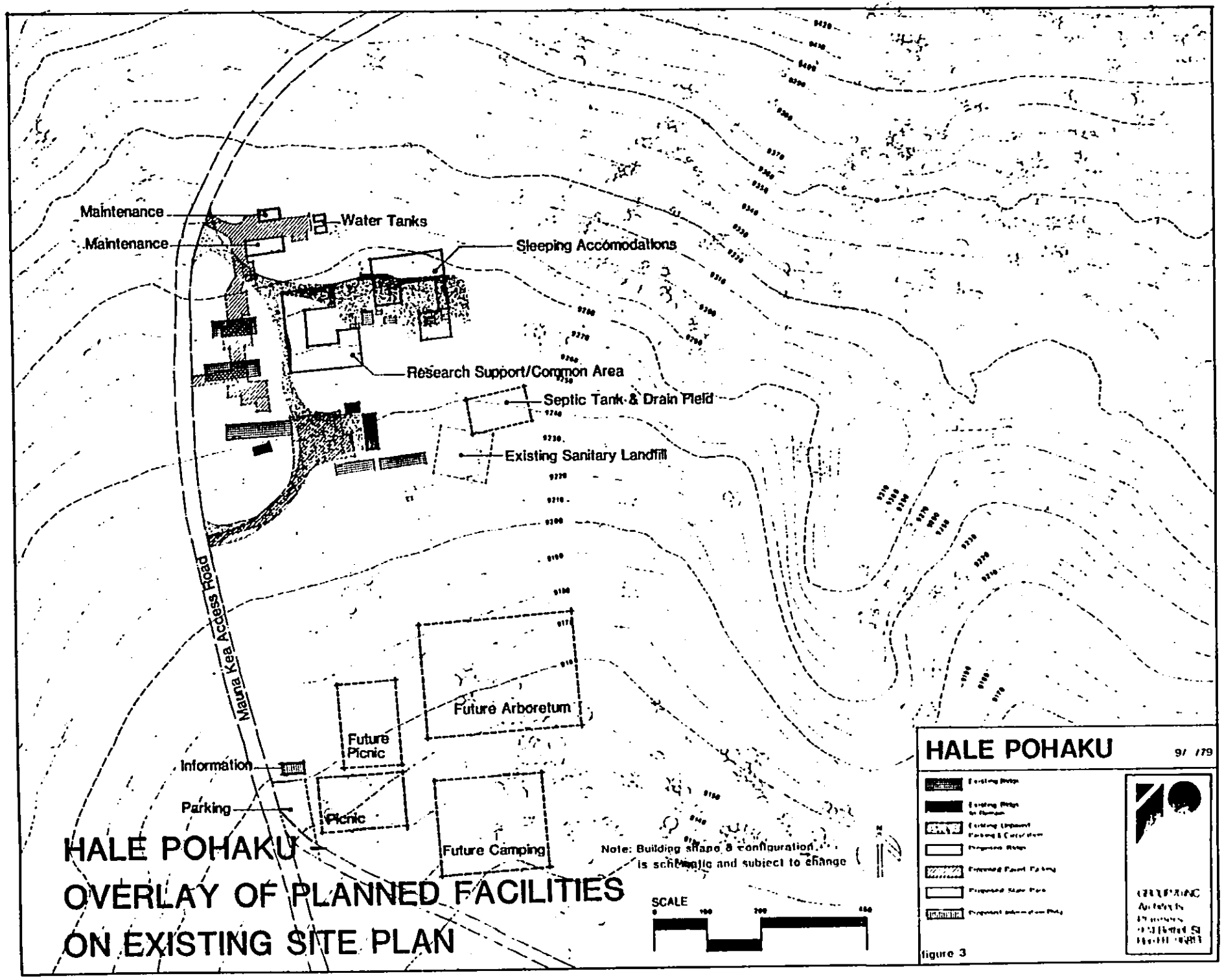
Water Storage
Fuel Storage
Open Storage
Construction Shack
Generator Shed
CFHT Messhall
CFHT Dorm
Water Storage
Stone Cabins
UK Dorm
Sanitary Landfill
Stone Restrooms
UH Dorm
UH Messhall
mauna kea access road
N
scale
0
100
200
400
HALE POHAKU
Existing Site Plan
FIGURE 2



HALE POHAKU
OVERLAY OF PLANNED FACILITIES
ON EXISTING SITE PLAN

though that the area of the site is physically limited and environmentally sensitive and that these constraints, regardless of demand, will set the outer limit on the number of recreation and scientific support facilities that can be accommodated at Hale Pohaku. The Plan has been designed to minimize removal of native vegetation in both the Astronomy and Park areas and to conserve slow-growing trees.

B. Historic Perspective

Hale Pohaku, "House of Stone", was named after the stone cabins located at the 9,200 foot elevation of Mauna Kea on the Island of Hawaii. These cabins were built in the 1930's after the road to Hale Pohaku was completed. The cabins replaced a complex of buildings near Ho'okomo, at the 7,800 foot elevation, which had been used by Forestry personnel who were building and maintaining the Forest Reserve fence and by workers constructing the road to Hale Pohaku. The cabins at Hale Pohaku were placed under the jurisdiction of the State Parks Division of the Department of Land and Natural Resources (DLNR) in 1962. Hale Pohaku was never officially designated as a State Park.

There were several reasons for building the cabins at Hale Pohaku. One reason was to have the facilities as close to the summit as possible for the convenience of those going to the summit, but another reason, equally important, was that the altitude at Hale Pohaku (9,200 feet) was more suitable than Ho'okomo (7,800 feet) for acclimatizing hunters, hikers, and snow visitors before they walked to the rarefied atmosphere of the upper elevations. Hale Pohaku became a half-way rest stop for persons traveling from sea-level to the summit.[1]

In 1968 the State of Hawaii leased the upper region of Mauna Kea to the University of Hawaii as a Science Reserve to be used for scientific research. This was based on the recognition that Mauna Kea was a truly outstanding site for ground-based astronomical observation. Since that time a total of six telescopes have been built at the Summit.

Two of the installations, the Canada-France-Hawaii telescope (CFHT) and United Kingdom infrared telescope, (UKIRT), involve international agreements with the countries involved. A third, the NASA Infrared Telescope Facility, is the subject of an agreement between the State and the National Aeronautics and Space Administration (NASA). Under the terms of these three agreements, the University is entitled to observing time on the telescopes. Three other telescopes are the property of UH and consequently are available full-time to support its research and training programs.

Because the summit of Mauna Kea is 13,800 feet high, it is physically hazardous for scientists, support staff, and construction workers to go directly from sea-level to work without acclimatizing themselves for a period of time at a higher elevation. For this reason, from the time when the University of Hawaii began construction of its first telescope, Hale Ponaku has been used as a construction camp/astronomy support facility because its altitude (9,200 feet) is ideal for acclimatization purposes.

Today there are nine structures at Hale Pohaku, the original two stone cabins and stone restroom and six temporary buildings that have been constructed on the site. All of the buildings, except the smaller of the two stone cabins and the restroom, are currently

being used for various astronomy support functions. The Ski Patrol uses the small stone cabin for storage of equipment during off-season and sleeping accommodations when there is snow.

There is very little public usage of Hale Pohaku even though the paved road has greatly improved accessibility. The lack of any park amenities and the presence of the astronomy buildings tend to discourage visitors from stopping there.

In the early 1970's it was recognized that an overall Mauna Kea plan was necessary in order to control development on the mountain and to resolve the conflicting demands of various users who desired to use the mountain for their activities. A Mauna Kea Planning Study, which addressed these problems, was completed in July, 1975; extensive citizen participation in the planning process followed. The Mauna Kea Plan, adopted by the Board of Land and Natural Resources on February 11, 1977, was a direct outgrowth of this participatory process.

The area covered by the Mauna Kea Plan includes all of the Conservation District land on the mountain from the summit down to the Saddle Road (Figure 4). This policy plan created five management areas on the mountain, each appropriate to specific uses or combination of uses. They are:

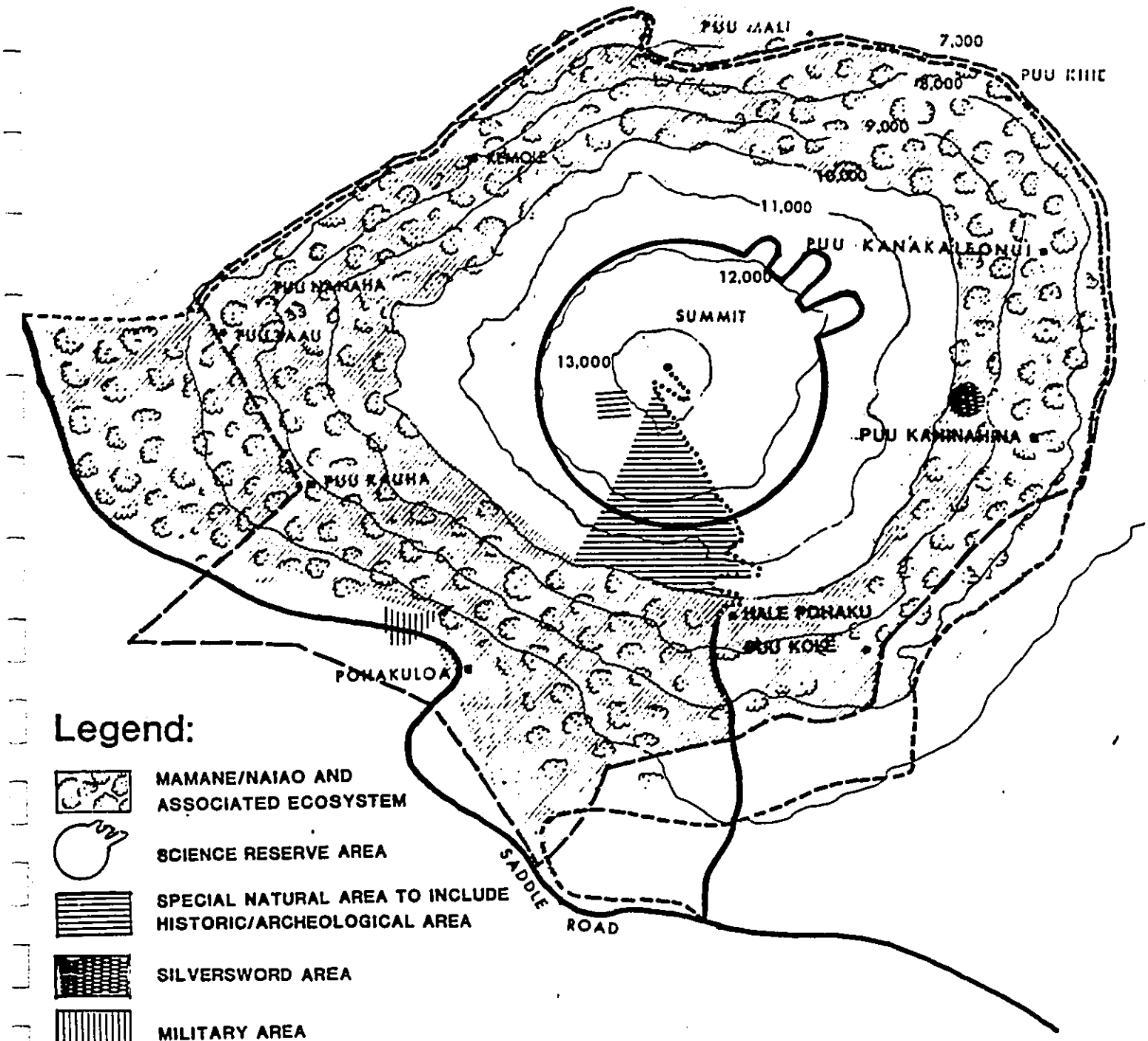
1. Mamane/Naio Forest Ecosystem Management Area;

2. Science Reserve Management Area:

3. Special Natural Area and Historic/Archaeological Management Area;

4. Silversword Management Area; and

5. Military Management Area.



Legend:

- MAMANE/NAIAO AND ASSOCIATED ECOSYSTEM
- SCIENCE RESERVE AREA
- SPECIAL NATURAL AREA TO INCLUDE HISTORIC/ARCHEOLOGICAL AREA
- SILVERSWORD AREA
- MILITARY AREA
- PALILA CRITICAL HABITAT
- CONSERVATION DISTRICT
- FOREST RESERVE BOUNDARY
- PAVED ROAD
- 4-WHEEL DRIVE ROAD

SCALE: 1:125,000

0 2 4 MILES

Mauna Kea Plan Management Areas and Critical Habitat of the Palila

FIGURE 4

NORTH

The Hale Pohaku area is within the Mamane/Naio Forest Management Area; it is also in the federally recognized critical habitat of the rare and endangered Palila bird (Federal Register, August, 1977) (Figure 4). The Mauna Kea Plan recognized the sensitivity of this location, but it was agreed that ". . . since it (Hale Pohaku) takes up a relatively small portion of the total area, mid-level facilities at Hale Pohaku, as limited . . ., will be consistent with the overall recommended use of Mauna Kea and with the management of the native Hawaiian eco-system." (Mauna Kea Plan, 1977.)[2]

The Mauna Kea Plan delineates specific uses for Hale Pohaku. It states that ". . . the Hale Pohaku facility will consist of mid-level facilities for necessary research personnel for the Summit, a central point for management of the mountain, and a day-use destination point for visitors and primitive overnight camping facilities."[3] The Plan also directs that ". . . a master plan for the Hale Pohaku area shall be prepared by the Department of Land and Natural Resources. Said plan shall be prepared in consultation with the Division of Forestry, Fish and Game, State Parks, University of Hawaii, and County of Hawaii."[4]

The Hale Pohaku Master Plan has been prepared to fulfill the requirements of the Mauna Kea Plan.

C. Objectives

The overall objectives of the Hale Pohaku Master Plan are derived from the Mauna Kea Plan. That is, to establish a physical plan for Hale Pohaku that will

incorporate "mid-level facilities for necessary research personnel for the summit, a central point for management of the mountain and a day use destination point for visitors with overnight campsites, without unacceptable damage to biotic values, scientific attributes, archaeological resources, and the visual appearance of the mountain." (Mauna Kea Plan, 1977). In addition, the goals, objectives and needs of each of the user groups, the goals and objectives of the Hawaii State Plan, the Hawaii County General Plan, and the Mauna Kea Plan were incorporated into the planning process.

D. Planning Considerations

Several considerations were an integral part of the planning process.

They were to:

1. Minimize disturbance to the mamane/naio forest eco-system and the critical habitat of the Palila;

2. Site facilities so as to minimize visual impact on the mountain;

3. Plan the recreation area so as to allow use by the general public with minimal conflict with astronomy activities;

4. Minimize the number of acres which must be restricted from hunting;

5. Utilize existing infrastructure wherever possible; and

6. Preserve and enhance existing native eco-systems.

E. Elements of the Hale Pohaku Master Plan

". . . the Hale Pohaku facility will consist of mid-level facilities for necessary research personnel for the summit, a central point for management of the mountain, and a day-use destination point for visitors and primitive overnight camping facilities". (Mauna Kea Plan, 1977)

1.0 State Park

1.1 General Description

Because of the altitude and lack of significant recreational resources on the site, Hale Pohaku is not envisioned as a major recreational area. The main purpose of the park will be to provide information about features of public interest which are located elsewhere on Mauna Kea and to serve as a point for control of access to upper elevations of the mountain. It will also serve as a wayside stopping point for those who desire to pause and reflect on the beauty of the mountain. The space provided for park activities, therefore, will initially consist of approximately two acres. An additional six acres is being reserved for future expansion if there is a demand for this type of activity. The programmed facilities in the park will include ten picnic sites, an Information/ Interpretive Station, and parking for 28 cars. There will be an office in the Interpretive Station for use by DLNR

personnel. Public restrooms for use by park visitors will also be provided in the Interpretive Station.

The park will be laid out so that the Interpretive/Information Station is easily identifiable and visible from the road. The picnic sites will be about 100 feet east of the road, behind the parking area. Existing vegetation and introduced landscaping of vegetation native to Mauna Kea will act to buffer the picnic sites from the road and provide shelter from the wind.

No roads are being provided within the park at the present time. Visitors will walk from the parking area to the picnic sites. An existing jeep trail, presently used by hunters, will terminate at the parking lot. This trail will still be accessible to those with four-wheeled drive vehicles.

Signs within and adjacent to the Park/Interpretive area will be designed to complement the natural aspects of the surroundings. Wherever possible these signs will be made of wood.

The park will be sited so as to afford views of cinder cones and large expanses of the Mauna Kea wilderness downslope. The buildings of the University of Hawaii Institute for Astronomy Mid-Elevation Facility will be upslope and therefore barely visible through the trees when looking in the direction of the summit. The area is sheltered from the wind and the picnic sites should provide a pleasant and convenient resting place for those visitors who wish to stop and admire the natural beauty of Mauna Kea.

1.2 Recreational Activities

1.21 Picnicking

There are ten picnic sites programmed for initial development in the park area. This number can be increased in the future if demand warrants it. Each picnic site will be a level area equipped with a picnic table and benches.

Even though the dryness of the area should preclude the use of fire for cooking ("No Fires" signs will be posted in the area to discourage the activity) fire caches for the disposal of hot coals and ashes will be provided in the picnic area in the anticipation that some picnickers will ignore the warning and bring hibachis anyway. In addition, fire extinguishers will be provided at the Information Station and fire flow from the water storage tanks in the astronomy area will be available for use in emergency situations.

The picnic sites will be scattered throughout the designated area so that picnickers will have some privacy. Existing native vegetation will be retained wherever possible and the landscaping will be supplemented by planting other shrubs, trees, and grasses that are native to Mauna Kea. There will be water available in the area for the park users. Covered refuse containers will be placed strategically throughout the area and emptied frequently. Restrooms with water conserving flush toilets will be located

in the Information Station nearby. Access to the picnic area will be by foot through the parking area.

The picnic sites will be available on a first-come first-served basis; there will be no requirement for advance reservations or permits. Users, however, will be expected to adhere to any rules or regulations governing Hale Pohaku. These rules and regulations will be posted at the Information Station and reminder signs, where necessary, will be placed within the picnic area.

1.22 Hunting

Hunting will not be allowed within 400 yards of the developed area at Hale Pohaku as required by the Department of Land and Natural Resources Regulation No. 23. It is expected, though, that hunters will occasionally use the picnic and restroom facilities during the hunting season.

1.23 Skiing and Snow Play

Snow activities such as skiing, sledding, and snow play are usually enjoyed at higher elevations with Hale Pohaku used as a staging area for transferring to four-wheel drive vehicles before ascending to the snow, and as a rest stop before returning home. Space will continue to be made available to the Ski Patrol in the small stone cabin for storing minor equipment. It is expected that winter sports enthusiasts will avail themselves of the picnic

facilities and the restrooms. They may also leave their conventional vehicles in the parking area and transfer to four-wheeled drive vehicles for the trip up the mountain. The Information Station will have pertinent information available for skiers and other snow visitors concerning the dangers and precautions that must be taken before venturing into the rarified atmosphere of the higher elevations.

1.24 Hiking

Hiking trails around Mauna Kea are being considered by the Forestry Division of the Department of Land and Natural Resources. These trails may originate and/or terminate at Hale Pohaku. It is anticipated that hikers will use the proposed facilities at Hale Pohaku for parking their cars and for obtaining maps and information concerning trails and destinations of interest. One of the most popular destinations will probably be the Natural Area Reserve and Adze Quarry. Hikers will be informed, both through literature and by personnel manning the Information/Interpretive Station, of the importance of not disturbing these important historical and natural features of the mountain. Hikers are also expected to make use of the picnic and restroom facilities at the park.

1.25 Camping

No camping facilities are specifically programmed for the park at the present time. The Hale Pohaku Master Plan does, however,

allocate space for future development of "primitive" campsites if there is a demand for this type of activity. If these campsites are develped, they will be oriented toward providing an alpine primitive type of experience. It is envisioned that the sites will simply be level areas suitable for pitching tents with fire-safe cooking areas and access to toilet facilities and water.

1.26 Motorcycles, Trail Bikes, and Dunebuggies

Motorcycles, trail bikes, and dunebuggies will be forbidden in the Hale Pohaku and Forest Reserve areas except for transportation purposes on established access roads. This ban will be enforced by the Department of Land and Natural Resources.

1 3 Information/Interpretive Station

1.31 General Description

An Information/Interpretive Station, of approximately 950 square feet is proposed to be constructed by the University of Hawaii. This Station will be located in the park area, adjacent to the Mauna Kea Observatory Access Road. The Station will be built of stone in keeping with the "House of Stone" identity of the park. (Stone construction will also minimize fire hazard in the water short Hale Pohaku area.) It will have space for an office for DLNR personnel when on duty, a manned information counter, bathrooms with water saving flush toilets, and fire extinguishers. The building will be heated in the winter.

The Information/Interpretive Station may also have space for permanent exhibits showing the geology, archaeology, flora and fauna, recreational activities, history , and the various scientific activities of the mountain. Interpretive exhibits, including automated slides and movies, may also be provided to illustrate the unique properties of Mauna Kea. Astronomers might also be able to set up a small telescope for daytime visitors and for local citizen and school groups during the early evening.

1.32 Management, Monitoring, and Enforcement

The Interpretive Station will be the headquarters for control of access to the upper elevations of the mountain. A large wooden sign ordering people to stop before proceeding will be prominently located just before the entrance to the parking area. It is planned that the station will be manned.

DLNR is expected to update existing regulations that apply to Hale Pohaku and surrounding environs and the person on duty will have the full authority granted him by law to enforce these rules as well as any other additional regulations that may be promulgated by DLNR. The DLNR employee manning the Information Station will also provide information to the public about the dangers of

the high altitude and cold and will discourage persons in other than approved vehicles from traveling further up the mountain. This person will also be trained in first aid so that he or she may assist visitors in an emergency. The person on duty will also be responsible for overseeing the maintenance of the park facilities. The Ski Patrol will be encouraged to assist in visitor control during the snow season.

A gate will be installed across the Summit Access Road at about the 13,300 foot elevation at the base of the summit cinder cone near the road that goes off to Puu Poliahu about a 7.5 mile 15 minute drive upslope from Hale Pohaku. The University will be responsible for locking the gate at sunset and opening it at sunrise. A sign noting the times the gate is locked will be posted near the Information Station. The purpose of the gate will be to discourage night driving up to the summit, which is not only extremely dangerous, but also causes light from headlights to be scattered into the telescopes, thus interfering with the night-time astronomical work on the summit. The gate will be opened during the day and access to the summit will not be controlled during the daylight hours. If visitor traffic to Hale Pohaku and the summit becomes increasingly heavy, the Department may re-evaluate its management, monitoring, and control programs for the area.

1.4 Arboretum

The State Forestry Division proposes to establish an arboretum in the vicinity of Hale Pohaku State Park some time in the future. This arboretum will encompass approximately one acre and will consist of examples of silversword, mamane, stenogyne, and other vegetation that is specifically native to Mauna Kea. The Interpretive/Information Station will have information on hand concerning the various plant species that can be seen in the arboretum.

2.0 University of Hawaii - Mid-Elevation Facilities

2.1 General Description

The UH Institute for Astronomy Mid-Elevation Facilities will be constructed on approximately seven acres of land adjacent to the Mauna Kea Observatory Access Road at the 9,200 foot elevation of Mauna Kea. Four acres of this site were formerly used by the University, under a revocable permit from the Department of Land and Natural Resources, as a temporary construction camp for workers constructing the Mauna Kea telescopes. Because of the delays in constructing a permanent facility, some of the temporary buildings have been refurbished and are currently being used by astronomers, technicians, and maintenance personnel who must live at Hale Pohaku while they are participating in observatory operations at the summit.

A group of buildings, containing spaces for sleeping, eating, lounging, and research, will replace the converted construction camp. The new facility (approximate gross area 35,000 sq.ft., 24,500 asf of floor area) will be used by scientists, technicians, and maintenance personnel who must remain acclimatized throughout their on-duty days or nights at the summit. Accommodations are also being provided within the facility for a small support staff who will be responsible for maintaining and operating the Hale Pohaku astronomy area. A maintenance area is also being included in the facility to provide space for minimal vehicle inspection and repair, fuel and water storage, utility housings, and other related functions.

The development will conceptually consist of a series of split-level buildings, no higher than tree-top height, that will be built along the slope. This configuration minimizes the amount of land that must be covered by structures and lessens the visual impact of the construction on the surrounding area. Structures will be placed above ground on piertype foundations so that excavation and marring of the existing landscape will be kept to a minimum thus preventing draining of subsurface run-off. The building exteriors will be woodstained in earth tones to harmonize with the surrounding area. Roofing materials will be non-reflective in colors chosen to blend into the landscape.

Entrance to the project area will be via short access roads that will terminate in a central parking area which is planned to accommodate approximately 23 vehicles. A short service road will connect the parking area to the maintenance area. Space will be provideo in the maintenance area for a truck turnaround. Access to the dormitories, research, and common areas will be by foot from the centralized parking area. All roads, parking areas, and courtyards will be paved to prevent erosion. Storm water will be directeo to catch-basins.

Tne mid-elevation buildings will be sited so as to minimize removal of native vegetation, particularly mamane, and conserve trees. The area will be landscaped with native flora, adaptable to the arid soil conditions of the site, that will be compatible with the existing native vegetation and will be from Mauna Kea stock from the DLNR Forestry Division's nursery.

All existing structures, with the exception of the two stone cabins and the stone restroom, will be removed as soon as they are no longer needed. Existing road beds which are not incorporated into the facility will be planted with vegetation native to Mauna Kea to help control further erosion.

2.2 Functional Areas

2.21 Sleeping

Sleeping accommodations for fifty-nine persons will be provided in a building of approximately 11,200 assignable square feet of floor area. This structure will be located approximately 400 feet east of the Mauna Kea Observatory Access Road, just beyond the site of the existing generator shed. Major criteria used in selecting a location for the dormitory building were to locate it as far from potential external noise sources as possible and to remain within a corridor 1/8th mile from the road in order to minimize disturbance to the mamane-naio eco-system in the area. Although not ideal, the location was determined to be the most suitable one available given the topographic, hydrological, and ecological constraints of the project site. The building design itself will incorporate features that will help to minimize the noise problem.

The dormitory building will contain fifty-five (55) bedroom/bath units and two 450 square foot studio apartments. Fifty-two (52) of the bedroom units will

be used by the UH, CFHT, UKIRT, and NASA to house astronomers, engineers, night assistants, observers, and day crew personnel who are involved in the various operations of their respective telescope facilities. The other three bedrooms will be occupied by a housekeeper/kitchen helper, an assistant cook, and a security/maintenance person who are Mauna Kea Support Services (MKSS) personnel. The two apartments will be used by the camp manager, chief cooks, and equipment maintenance personnel who are required to reside at Hale Pohaku from five to seven days a week.

The building will be terraced to blend in with the terrain and it will be landscaped with vegetation native to Mauna Kea. It will be connected to the other areas in the facility by means of slightly elevated walkways.

2.22 Research Support and Common Areas

The research support and common areas will be located approximately 150 feet east of the Mauna Kea Observatory Access Road adjacent to the parking area. These functions will encompass approximately 14,800 gross square feet (9,600 assignable sq.ft.).

The common living area will include a dining facility, kitchen and pantry, a day room, restrooms, locker room, emergency room, mechanical room, and laundry

facilities. An office for the use of the camp Manager will be located in the area.

The research support area will contain eight offices; three of the offices will be used while conducting business related to day-to-day project operations and planning, and five offices will be used by astronomers while preparing their nightly observations and analyzing preliminary findings. These eight offices will be used seven days a week.

In addition to the offices, the research support area will contain the following spaces:

(a) A common computer room which will be shared by all of the users but will contain separate terminals and printout capability for each telescope facility;

(b) A data review and observers' preparation room which will be used by the scientists, day crew, night assistants, and other technical support staff to lay out their work (e.g., charts, computer output, engineering drawings, etc.) and prepare for the upcoming night's work. It will also be used as a single repository of data for a number of people who need access to

the same information thus avoiding duplication of facilities within the research support area:

(c) Two rooms, shared by all of the telescope facilities, for electronic testing and repair. These spaces will allow expeditious tests and repairs to be made to instruments located at the summit or damaged in transit to Mauna Kea from Honolulu, Hilo, Waimea, the mainland or foreign countries;

(d) One or two infrared instrumentation preparation rooms which will be used for the final inspection and preparation of instruments and equipment prior to installation at the summit. Equipment is assembled and checked here to verify the proper functioning of components;

(e) A cryogenic transfer area which will be used for storing and transfering liquid helium and liquid nitrogen needed for testing and using infrared instruments;

(f) A darkroom for sensitizing and developing plates in preparation for observing and for developing plates taken by observers in preparation for the next night. Both processes are lengthy, requiring frequent intervention by astronomers, and must

be carried out immediately before or after observing. This cannot be done adequately either at the summit or at long distances from Mauna Kea; and

(g) A photographic storage area for storing scientific photographic plates that will be needed for observations and must be stored at temperatures below freezing. The area will also hold minimal developing materials.

The spaces described above are minimum requirements for the research needed to support observatory operations. The various functions require the presence of personnel who work at the summit and who must maintain acclimatization throughout their on-duty periods. Other more extensive and elaborate spaces for the research program are provided at UH Manoa and the base support facilities at Hilo and Waimea.

2.23 Maintenance

The third functional area at the mid-elevation facility will be the maintenance area. It will be located upslope of the other functional areas about 100 feet east of the Mauna Kea Observatory Road. Access to the area will be via a short service road which extends east from the parking

area entrance. The location close to the road was chosen in order to minimize the grading necessary for the service road. It was also necessary to locate the area downwind of the dormitory so that the prevailing winds would carry some of the noise away from the day sleepers. Because the water tanks will also be located in the maintenance area, an upslope location was necessary in order to make maximum use of gravity for water distribution.

There will be two major buildings in the area, a 2,500 square foot maintenance building and an 800 square foot generator shelter. The following facilities will be included in the maintenance area:

(a) A covered area of approximately 250 square feet to be used for emergency inspection and minor repair of vehicles;

(b) A maintenance workshop in which mechanical and electrical equipment can be maintained and minor repairs can be performed;

(c) A parts storage room in which to store fan belts, gas filters, tires, other readily changed automotive items, and small plumbing and

electrical parts. This will eliminate trips to Hilo whenever the need arises for minor repairs;

(d) A covered vehicle/equipment storage area to house road graders, snow vehicles, and other equipment when not in use.

(e) An open storage area for equipment and vehicles which do not require cover. This will be partially concealed by vegetation in order to reduce visual impact;

(f) A gasoline pumping and storage facility containing two dispensing pumps for leaded and unleaded gasoline and two 6,000 gallon capacity fuel storage tanks;

(g) An acoustically insulated generator shelter which will house two 250 KW diesel generators, transformers and panel boards. Two diesel fuel storage tanks with a total capacity of 15,000 gallons will be located adjacent to the generator shelter; and

(h) Water storage tanks with a total capacity of 70,000 - 80,000 gallons which will be partially recessed into the ground, painted earth tones, and camouflaged with vegetation to minimize visual impact.

Particular care will be taken to maintain this area so that the uncovered portions do not become cluttered with extraneous materials such as extra equipment and miscellaneous supplies.

3.0 Infrastructure and Utilities

3.1 Electrical Power[5]

Power for both the park and mid-elevation facility will be provided by a 250 KW diesel generator which will be located in the maintenance area of the astronomy complex. An additional 250 KW generator will be required for backup. The 250 KW capacity is needed because the high (9,000+ foot) elevation reduces generator efficiency by approximately 25 per cent.

The generator will consume 12 - 15 gallons of diesel fuel per hour and will be run 24 hours a day. Two fuel storage tanks, approximately 11 feet in diameter by 8 feet high each, with a total storage capacity of 15,000 gallons will be required if the supply is replenished twice a month. These tanks may be buried in the ground near the generator shed.

Diesel fuel is presently trucked up the mountain from Hilo whenever it is needed at the summit. The trucks then make a stop at Hale

Pohaku and top off the storage tanks there. It is possible that this arrangement could be continued after the mid-elevation facilities and the park are in full operation. If not, arrangements will have to be made for special fuel deliveries to Hale Pohaku.

Power will be distributed throughout the mid-elevation facility via underground direct-burial cables and concealed conduits and wire systems. Wherever possible, power lines will be concealed under walkway systems connecting buildings and other facilities. Small transformers at individual buildings may be required to step-up or step-down power as demands dictate. Standard 120/208 V power service will satisfy most of the requirements of the complex. 440 V 3-phase service may be required in various instrumentation laboratories.

Power to the park will be distributed via underground wire from the astronomy complex to the Information/Interpretive Station. A small transformer will be required at the Station to step-up or step-down power as demands dictate. A procedure will have to be developed for billing the park its share of the costs of providing electricity.

3.2 Water[6]

Water consumption at the new mid-elevation facilities is estimated to be 70 gallons per person per day. Assuming that there will be approximately sixty persons residing at the

complex, the daily water consumption could be 4,200 gallons. Because water consumption factors vary considerably with each situation and are difficult to predict, normal engineering practice applies a safety factor of 2 to 3 times predicted daily usage to obtain estimated water storage requirements. Based on a 2 x factor, water storage of 8,400 gallons per day would be necessary to service the human consumption uses of the astronomy facility. In addition to providing for human consumption uses, 40,000 to 60,000 gallons must be stored on site to provide for fire flow. Not providing for minimum fire flow requirements would result in higher insurance rates as well as exposing the occupants to the risk of losing expensive equipment, irreplaceable research data, and possibly their lives. The total on-site water storage requirements for the astronomy area are estimated at this time to be from 50,000 to 70,000 gallons based on daily replenishment.

Moderately high usage of the park is estimated to be 100 persons per day, peaking seasonally during periods of high upslope usage such as snow activities. Based on an estimated usage of 15 gallons per day per person, the moderately high daily water consumption at the park will be 1,500 gallons. Using the same safety factor as was applied to Astronomy, the daily water storage requirements for human consumption uses would be 3,000 gallons. Fire flow can be shared with Astronomy.

Water to the park will be piped from the astronomy area to the Information Station via a 4" buried water main. This direct connection to the astronomy facility water storage tanks can provide sufficient volume and fire flows to the park site.

Two 35,000 - 40,000 gallon steel water storage tanks are planned for the mid-elevation facility. These tanks, approximately 18 feet in diameter and 8 feet deep, will be located near the maintenance area. They will be partially recessed in the ground and landscaped to minimize negative visual impact on the area. Depending upon experience, approximately 8,000 gallons a day will have to be replenished for astronomy use and 3,000 for park use in order not to infringe on the fire flow requirements. This will necessitate once or twice daily truck trips from Hilo to deliver the water. Current water service is two times a week. The plan assumes daily service in order to minimize the need for larger storage tanks.

Water from the storage tanks will be distributed to the various users in the astronomy facility by a network of pipes. These pipes will be either buried in the ground or concealed under slightly elevated walkways.

The possibility of water catchment from roofs was investigated as a means to supplement the fire flow needs of the mid-elevation

facility. Fukunaga & Associates, civil engineering consultants on the project, saw limited value in roof catchment water for supplementing fire flow. The catchment water could not be mixed into the two water storage tanks since it could contaminate the potable water. Another factor discouraging the use of roof catchment water is the limited rainfall experienced in the area. When it does rain at Hale Pohaku it usually comes down in torrents and most of the water presently being caught in the existing tanks overflows on the ground. Therefore, the amount of water retained in small tanks would not supplement the fire flow capacity to any extent. Roof catchment tanks, though, will be placed near some buildings. The water collected will provide some of the water necessary for the irrigation of new or transplanted vegetation.

3.3 Alternate Energy Sources

3.31 Waste Heat Recovery

The two diesel engine driven electrical generators will be provided with engine jacket water and exhaust heat recovery systems which will reclaim sufficient, otherwise wasted, energy to supply all domestic hot water and steam needs for the mid-elevation facility. No hot water will be provided at the park.

3.32 Heat Pumps

The utilization of heat pumps, hidden in the roof planes of the facility buildings, will be investigated during the design phase of the project for space heating and air conditioning. The heat pump is a refrigeration system which extracts heat from the ambient air and supplies it to the conditioned spaces when heat is required. When cooling is required, the heat is extracted from the spaces and cool air is introduced. A humidifier will be attached to the system to supplement the moisture in the air since at the 9,200 foot elevation the air is too dry for comfortable sleeping.

3.4 Sewage System[7]

Approximately 70 per cent of the water consumed is expected to be converted to wastewater. Based on this, the estimated discharges are 3,000 gallons per day for the astronomy facilities and about 1,100 gallons for the park. Cesspools (currently in use) would be the least expensive method of sewage disposal. One is planned to be constructed in the park area. It will be located downslope of the information and picnic areas in order to allow a natural gravity flow distribution system.

Because septic tanks provide some treatment wastewater, a septic tank of approximately 3,000 gallon capacity and a large cesspool for effluent disposal is the recommended sewage disposal system for the astronomy facility. This system will require a rectangular holding tank approximately 10' by 10' by 5' deep and a cesspool approximately 6' in diameter. The tank and cesspool should be located as far downwind and down slope from the astronomy buildings and as far away from the park facilities as possible. A septic tank system should be relatively maintenance free, although it will be necessary to pump the tank periodically. Access will have to be provided for a pumping truck to service the septic tank.

It is possible that a septic tank sewage disposal system may not be practical at the mid-level due to the size of the tanks, the requirement for truck access to the septic tank, and the limited number of suitable downwind, downslope sites in the area. This will be determined in the design phase of the project. If it is not practical to install such a system, cesspools will be considered. Cesspools could clog, however, and may have to be treated or pumped. Several smaller size cesspools could be constructed near the facilities they are servicing thus minimizing the necessity for a large site for sewage disposal.

Downhill construction of the sewage disposal system will allow a natural flow distribution system thereby conserving cost and energy. The sewage distribution lines will be constructed of standard sewer pipes and buried in the ground.

3.5 Communications

The future telephone requirements of the mid-elevation facility will be satisfied through a digital radio system link to Hilo via Mauna Loa, using an 8 foot diameter microwave dish. The dish will probably be mounted on the side of a building in the maintenance area. This will eliminate the need to construct any support such as a tower. The terminal equipment will be housed in enclosed cabinets inside of the building. A similar microwave radio system has been installed at the Mauna Kea summit without any adverse consequences to the environment.

3.6 Solid Waste Disposal System

At the present time an average 25 persons per day at the temporary mid-level facility generate about 2 plastic trash bags of rubbish. These bags are hauled daily to a dumpster at the MKO office in Hilo. It can be expected that 59 or 60 persons might generate 5 - 6 bags of rubbish a day. An under-counter trash compactor located in the common area may help reduce this volume. This rubbish will continue to be hauled to Hilo periodically.

In addition, the park might generate 8 - 10 bags of trash on a busy weekend. This rubbish will also be disposed of by periodic hauling to Hilo.

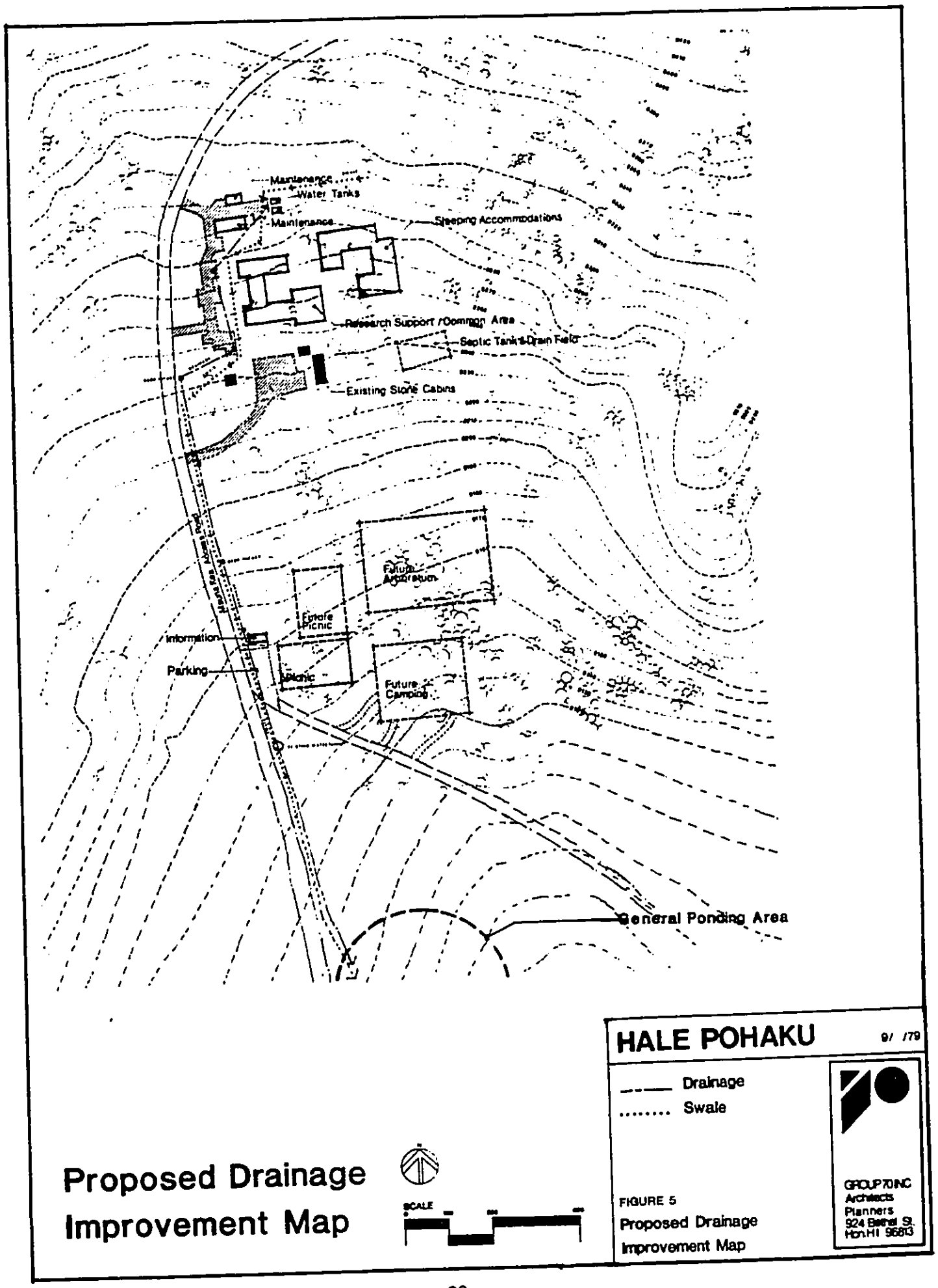
There will be designated trash collection points throughout the park and astronomy areas. Rubbish cans will be covered to discourage foraging by animals. Trash collection areas will be landscaped to be as aesthetically pleasing as possible.

4.0 Site Improvements

4.1 Drainage (Figure 5)

Cut-off swales above the maintenance area will be constructed to divert the water coming down from the upper slopes. This will prevent flooding and erosion of the buildable area. These swales will be lined with an environmentally acceptable material. Drain intakes will be provided at low points in parking lots and other strategic locations. The drainage from roofs will be piped to suitable drain intakes to minimize localized erosion. Wash areas will also be provided with sub-drains to permit more efficient drainage of the sub-surface soils.

The drainage water will be diverted to catchment areas and taken by an 18" buried pipe to a natural ponding area just below the park parking lot. An energy dissipation structure will be provided at the outlet to reduce and control flow velocities and potential soil erosion.



Proposed Drainage Improvement Map

FIGURE 5
Proposed Drainage Improvement Map

4.2 Grading

Clearing and grading at the site will be minimized. Grading will be necessary for the parking areas, the access and service road, and the area under the generator shed and maintenance building. Installation of the water tanks will require some grading and excavation in order to recess them into the ground. Excavation will be required if the fuel tanks are buried. The site for the Interpretive Station at the park will be cleared and excavated. All banks will be stabilized by plantings, retaining walls, and/or soil cement. All exposed areas will be replanted with native ground cover.

4.3 Roads and Parking

Parking areas for both the Mid-Elevation Facility and the Park will be located in close proximity to the Mauna Kea Observatory Access Road and therefore will require minimal access roads to reach them. A short service road will be necessary in the astronomy facility so that trucks can enter the maintenance area. All roadways and parking areas will be paved with asphaltic concrete to prevent erosion. Drain intakes will be provided in low areas to minimize localized erosion. All banks will be stabilized by planting, retaining walls, and/or soil cement.

4.4 Landscaping

Landscaping of buildings, infrastructure, and other facilities will be with plants native to Mauna Kea. Care will be taken not to contaminate existing gene pools. Mamane trees and U'ulei (Osteomeles) will be the primary landscaping materials. In most cases hanowatering will be the method used to irrigate the landscape material. The water will be supplied, whenever possible, from the catchment tanks, which are proposed to be located near the dormitory building of the astronomy facility.

Mamane will be replanted with stock from the Forestry division nursery on Mauna Kea. The method used for transplanting will be the one which has produced an 80% success rate in mamane regeneration for the Division. This procedure involves nearly total burial of the transplanted shoot to insure that it will take hold and survive.[8]

The U'ulei was once native to the Hale Ponaku area but has disappeared due to grazing of feral animals. This attractive shrub, a member of the rose family, will be planted primarily to provide food for the Palila and other passerines during the non-breeding season when the green pods and blossoms of the mamane are no longer available in the area.

Stands of trees and shrubs will be used to buffer noise and wind, and to help camouflage less attractive structures such as the water tanks. The trees and shrubs will be used adjacent to the generator building, recreation facilities, and maintenance area to attenuate unwanted sound. The vegetation can also help protect the buildings from excessive heat loss by buffering the windward walls of the living areas.

5.0 Other Requirements

5.1 Fire Protection

Fire hose cabinets will be placed strategically throughout the astronomy buildings and appropriate individuals will be trained in proper fire fighting procedures. A backup system of portable fire extinguishers will also be available in the area for extinguishing minor fires. A fire hose cabinet and portable fire extinguishers will also be located in the park area.

5.2 Security and Safety

The general security and safety of the park facilities and visitors will be the responsibility of the Department of Land and Natural Resources. The person on duty at the Interpretive Station will not only enforce DLNR rules and regulations but will be trained in first aid to render emergency treatment to

injured visitors. During the snowfall periods the Ski Patrol may volunteer to provide first aid and additional assistance, as required, to snowplay participants.

The University of Hawaii, Institute for Astronomy, will be responsible for the security of its area and the safety of astronomy personnel and visitors. An emergency room will be provided within the commons area to provide space for the treatment of injuries and illnesses.

5.3 Handicapped Access

The astronomy buildings will be designed to provide handicapped access. The Interpretive Station and restrooms will be accessible by wheelchairs. The picnic sites will not include special facilities for the handicapped, although the pathway to the picnic area will be wide enough for wheelchairs.

PART II: DESCRIPTION OF THE ENVIRONMENT

A. The Region

Mauna Kea has the distinction of being the tallest mountain in the world. It rises over 30,000 feet from the ocean floor to the summit and the highest of its cinder cones towers 13,796 feet above sea level. In recent years with increased accessibility. the upper slopes of the mountain have become the focus for a variety of uses, some of them conflicting and controversial

The summit of Mauna Kea is recognized as one of the finest sites in the world for astronomical research because the skies above it are very dry. free from clouds and atmospheric pollutants, and very dark. There are six telescopes on the summit at the present time. They are: (a) Canada-France-Hawaii telescope (CFHT) a 144-inch mirror, which will be in full operation early in 1980; (b) United Kingdom Infrared Telescope (UKIRT), a 150 inch mirror; (c) NASA Infrared Telescope Facility (d) the University of Hawaii's 88-inch telescope; and (e) two fully operational 24-inch telescopes owned and operated by the University of Hawaii. Temporary mid elevation facilities for astronomers, technicians. and maintenance personnel who operate and maintain these facilities area located at Hale Pohaku at the 9.200 foot elevation of the mountain.

The snow-covered slopes above the 10,000 foot elevation are used for skiing and snow play whenever the weather permits Hunting of feral goats, sheep, pigs and game birds has become a traditional use within and

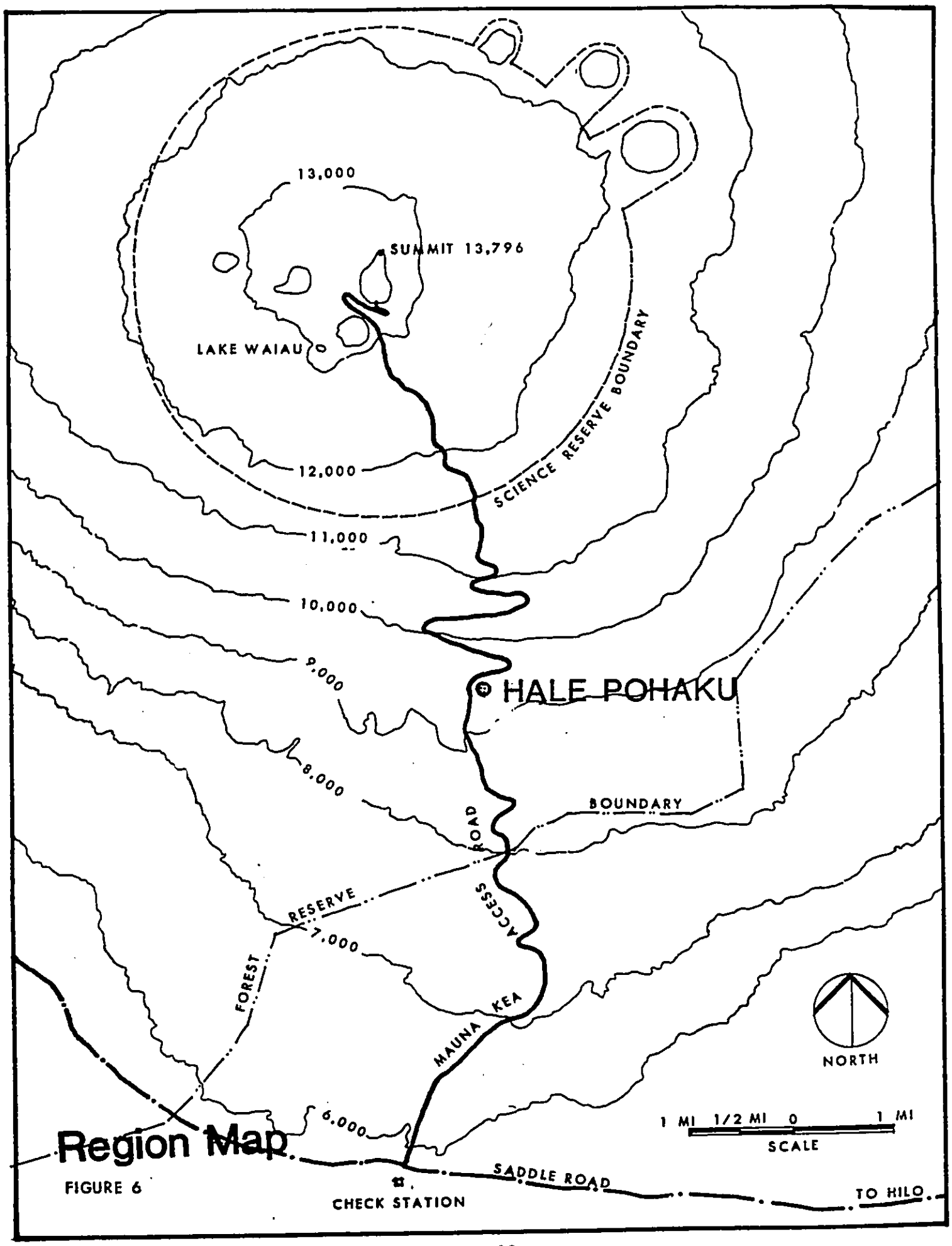
on the perimeter of the mamane/naio forest below the 10.000 foot elevation. General recreation. photography sightseeing. and scientific field research are also becoming popular uses of the mountain.

Native Hawaiian flora and fauna. including rare plants and birds, exist on the slopes of the mountain Several of these species are found nowhere else in the world. Over 30,000 acres of the mamane/naio forest area of the mountain has been designated as the critical habitat of the rare and endangered Palila, Psittirostra bailleui (Federal Register, August, 1977). This bird is found nowhere else in the world.

A policy plan for Mauna Kea was adopted by the Board of Land and Natural Resources in February, 1977. The Plan sets policies for land use on the mountain from the Summit down to about the 6,000 foot elevation. This area encompasses all of the Conservation District land from the Summit to the Saddle Road including the "Mauna Kea Forest Reserve and Game Management Area". and the "Kaohe Game Management Area". These upper Mauna Kea lands are now being managed by the State Department of Land and Natural Resources. (Figure 4). The Institute for Astronomy Mid-Level Facility and the Hale Pohaku Park, which are the subject of this EIS, are specifically included in this plan.

B. Hale Pohaku

The proposed Mid-Elevation Facility and State Park will encompass approximately nine acres of land at 9,200 foot elevation of Mauna Kea (Figure 6). The project will be located on land that is owned by the State of Hawaii and is under the jurisdiction of the parks Department of Land and Natural Resources. Four acres of



Region Map

FIGURE 6

this site are currently under revocable permit S-5537 from the DLNR Division of Land Management to the University of Hawaii for use as a construction camp and temporary living accommodations for observatory personnel.

Hale Pohaku is situated in TMK 4-4-15:01 (portion) within the Mauna Kea Forest Reserve and is designated Conservation by the State Land Use Commission. It is in a Resource subzone of the Conservation District and is subject to the conditions specified in the Department of Land and Natural Resources Regulation No. 4. A Conservation District Use Application (CDUA) is required prior to any development in the area. The Hawaii County General Plan also designates the project site for "conservation use."

Hale Pohaku is located within the critical habitat of the rare and endangered Palila bird. NASA, which provides some operating funds to the Institute for Astronomy, consulted with the U.S. Department of Interior Fish and Wildlife Service as required by Section 7 of the Endangered Species Act of 1973 (U.S.C. 1536). This consultation was concluded November 2, 1979. Correspondence concerning this consultation is appended this EIS.

C. Description of the Existing Bio-Physical and Socio-Cultural Environment

1 0 Geology

"Cinder cones and associated tephra layers along the south rift zone of Mauna Kea accumulated during explosive eruptions of

alkalic rocks during the late Quaternary Period . . . The tephra succession on Mauna Kea includes many distinct layers that were erupted over a considerable span of time from a large number of vents . . . Exposed deposits are thickest and most widely distributed along the road to the Summit between the Humuula Sheep Station and Hale Pohaku, through a broad belt east and west of Hale Pohaku, and in a large Kipuka downslope from Puu Oo. . . . Puu Hawaihine is one of the most massive cinder cones on the south flank of Mauna Kea and produced a thick and extensive blanket of tephra that is distributed mainly east of the cone (toward Hale Pohaku). It underlies much of the ground surface between Puu Haiwahine and the Hale Pohaku flow and is exposed in most roadcuts and natural outcrops within a 2-KM radius of Hale Pohaku (Porter, 1973)."[9]

2.0 Climate

2.1 Rainfall

A continuous record of rainfall data for Hale Pohaku are available from September, 1939 to December, 1966 and for the year 1971. The following table summarizes the monthly and annual mean rainfall for Hale Pohaku and is based on the 1939 to 1966 data.

Month	Rainfall (inches)
January	2.40
February	3.08
March	3.33
April	2.13
May	1.25
June	0.60
July	1.37
August	2.62
September	1.25
October	1.55
November	2.41
December	3.19
Annual	25.33[10]

The estimated 10 year one-hour rainfall has been calculated at 1.9 inches.

2.2 Ambient Air Temperature

Existing data indicate that temperatures at Hale Pohaku range from the 30's (Fahrenheit) to the mid-70's (Fahrenheit). The lower temperatures usually occur during the months of December through January whereas the higher temperatures are experienced from June through September.

2.3 Wind

The project area is located above the normal tradewind flow. Prevailing winds at the site are from the northeast and are characterized by occasional strong to heavy gusts, especially during the winter months.

2.4 Snow

The summit area of Mauna Kea experiences snowfalls from time to time, especially during the cooler half-year (October to April). Although snowfalls generally occur above the 10,000 foot elevation there are recorded incidents of snow falling as low as 6,500 feet.[11] Major snowfalls which caused blockage of the summit road have occurred in six or seven of the past ten years, the most recent being 1979.[12]

3.0 Topography

The project site varies from 9,200 to 9,300 feet in elevation. Slopes to the area west of the existing water tanks average from 10 to 15 percent while slopes to the east of the tanks are as steep as 50%. The average slope of the existing developed area is 12%.

4.0 Soils

The project area is characterized by Huikau extremely stony, loamy sand soil which is 30 to 40 inches thick resting on Aa lava. The surface layer is a very dark, loamy sand about 5 inches thick while the substratum consists of alternating layers of ash, cinders, and pumice. Stone size Aa lava fragments may occupy 30 to 60 percent (by volume) of the lower substratum (Soil Conservation Service, 1965).

The erosion hazard is high for soil in the project area as the permeability is very rapid at 20+ inches per hour and the soil is of low moisture-holding capacity. The soils are unsuited to cultivation and their severe limitations restrict their use largely to pasture or range, woodland, or wildlife habitat.[13]

5.0 Hydrology

5.1 Ground Water

Because of the very limited precipitation and high permeability of the soils, ground water resources in the project area are presumed to be non-existent.[14] Although there probably is dike-impounded water near the project area, it is assumed to be too deep beneath the surface for development.[15]

Lake Waiau, at an elevation of approximately 13,000 feet, is the only surface water in the upper regions of Mauna Kea.[16]

5.2 Drainage

Rain and melting snow water run-off in the upslope and the Hale Pohaku area are currently following existing ground contours and established drainage courses. The new culverts above the Hale Pohaku area have dissected the existing facilities into three areas. One drainage swale crosses through the major portion of the area creating a physical separation between the west dormitory structures and the stone cabins. Another drainage pattern runs on the east side of the UH Dormitory facility adjacent to the abandoned sanitary landfill area. (Figure 7).

6.0 Air Quality

The project area is located at the 9,200 foot elevation where the air is very clean because it is well above the 7,000 foot tradewind inversion. Pollutants such as smog, smoke, dust, and salt spray do not cause any particular problem at Hale Pohaku providing that they are generated below this inversion level.[17]

There has been no reported monitoring of air quality at the project site. Atmospheric pollution in the area will generally be locally generated by automobiles, trucks, power generating plants, other internal combustion engines and dust from vehicles traversing the unpaved summit access road. Because only small quantities of air pollutants are presumed to be emitted at the present time and because of the

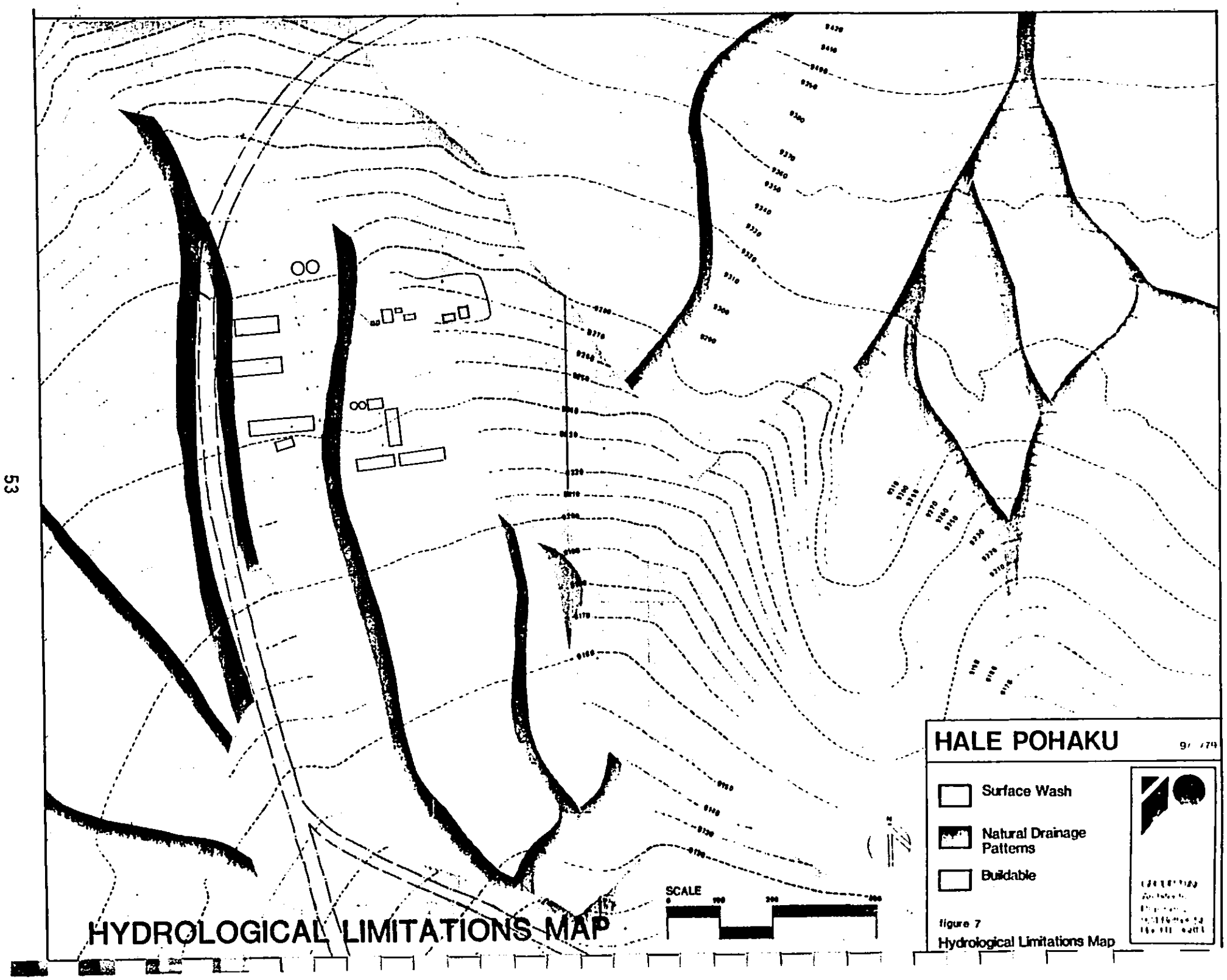


figure 7
Hydrological Limitations Map

prevailing wind patterns in the area which tend to disburse these emissions, the pollutant concentration should be very low and well within the national and state ambient air quality standards.

7.0 Vegetation

A botanical survey of the project area was conducted by Grant Gerrish, Botanist, June 14 - 15, 1979. His report appears as Appendix B in this EIS. The following information is excerpted from the survey report and other sources.

The vegetation of the currently undisturbed portion of the planned astronomy area is a parkland of mamane (Sophora chrysophylla) trees and mixed grasses. About 25% of this area is covered with mamane trees ranging from two to eight meters tall which grow in scattered clumps. The mamane trees in the proposed park area are more dense than at the astronomy site and there is less evidence of human disturbance.

Collections from several of the mamane trees found at Hale Pohaku were determined to belong to the variety Sophora chrysophylla var. circularis. This variety has been proposed for "endangered" status by the Fish and Wildlife Service (Federal Register 1976) and is listed in the IUCN red Data Book (published by Kew Gardens) which identifies rare and endangered plants and animals around the world. The taxonomy of Sophora chrysophylla is not well understood, however, and is subject to revision.

Mamane is the major food source of a number of bird species, including the rare Palila. The clumps of mamane are also important because they act as fog

interceptors to provide themselves, and other species associated with them, with the small amounts of moisture they need for survival. In addition, the Sophora clumps help prevent the ash soil under them from being carried away by winter storms.

Over a century and a half of grazing and browsing by feral mammals has resulted in the substraction of species from the "sophora parklano" community. This historical excessive disturbance to vegetation and soil has resulted in increased evapo-transpiration, causing a change in the understory conditions at Hale Pohaku from moderately moist to deficient in moisture. Increased and continued human activity at Hale Pohaku in recent years has brought about a decline in feral animal pressure and consequently the mamane in the area are rejuvenating.[18] Regeneration of mamane at Hale Pohaku could be described as "fair to good".

Two species of Stenogyne (Hawaiian mint) occur in the Hale Pohaku area. One of them, Stenogyne microphylla, has been proposed for "endangered" status by the Fish and Wildlife Service (Federal Register, 1976). Stenogyne rugosa is common at Hale Pohaku, especially in the area of the proposed park.

Several native shrubs or vines occur on the site, usually near the mamane trees. These include the silver geranium, Geranium cuneatum, and Chenopodium oahuense ('aheahea). Six individuals of Geranium cuneatum var. hololeucum were found growing in the Hale Pohaku area. This variety of geranium has been proposed for "endangered" status by the Fish and Wildlife Service (Federal Register, 1976). A map showing the location of these

individuals is included in the Gerrish report, Appendix B.

Several species of grasses are common. These include the native grasses Dechampsia australis and Trisetum glomeratum (mountain pili) and the exotic Stipa cernua. Near the mamane trees these grasses form dense stands mixed with other herbaceous plants, including weeds such as Erigeron bonariensis (hairy horseweed), Senecio vulgaris (common groundsel), and Verbascum sp. (mullein). A small grove of Eucalyptus trees is near the former site of the ranger's shack.

Table I, prepared by Grant Gerrish, lists vascular plants from Hale Pohaku by family. This table also appears as an Appendix to the botanical survey report prepared by Mr. Gerrish for this EIS (Appendix B).

8.0 Fauna

8.1 Passerine Birds

An avian survey of Hale Pohaku and alternative sites was conducted by Maile Stemmerman, Ornithologist in July, 1979. Her complete report is included as Appendix C in this EIS. The following information is excerpted from her report and other sources.

TABLE 1

VASCULAR PLANTS FROM HALE POHAKU

BOTANICAL NAME	FAMILY	COMMON NAME
	Ferns	
	Cheilanthaceae	
* N Pellaea ternifolia (Cav.)	Link	
	Gymnosperms	
	Pinceae	
** E Pinus sp.		Pine
	Angiosperms	
	Chenopodiaceae	
N Chenopodium oahuense	(meyen) Aellen	'āheahea
	Compositae	
E Cirsium vulgare (Savi)	Tenore	Bull thistle
E Erigeron bonariensis L.		Hairy horseweed
N Gnaphalium sanwicensium	Gaud	'enaena
E Hypochoeris radicata L.		gosmore
E Senecio vulgaris L.		common groumsel
E Sonchus oleraceus L.		sow thistle
	Cruciferae	
E Lepidium virginicum L.		wild peppergrass
	Epacridaceae	
N Styphelia tameiameiae	(Cham.) F. Muell	pūkiawe

*N = Native to Hawaii

**E - Exotic (brought to Hawaii by man)

TABLE I

VASCULAR PLANTS FROM HALE POHAKU

(continued)

	BOTANICAL NAME	FAMILY	COMMON NAME
		Geraniaceae	
E	Erodium circutarium (L.)	L'Her ex Ait.	filaree
N	Geranium cuneatum Hook var. hololeucum Gray		
		Gramineae	
E	Anthoxanthum odoratum L.		sweet vernal grass
E	Bromus rigidus Roth		ripgutgrass
N	Deschampsia australis	Nees ex Steud.	
E	Holcus lanatus L.		velvet grass
E	Lolium L. sp.		ryegrass
E	Poa pratensis L.	Kentucky bluegrass	
E	Stipacernua Stebbins & Love		
N	Trisetum glomeratum (Kunth) Trin. in steud		mountain pili
		Labiatae	
N	Stenogyne microphylla Benth.		
N.	Stenogyne rugosa Benth.		

TABLE I

VASCULAR PLANTS FROM HALE POHAKU

(continued)

	BOTANICAL NAME	FAMILY	COMMON NAME
		Leguminosae	
E	Cytisus palmensis (Christ)	Hutch	tagasaste
N	Sophora chrysophylla (Salisb.) cf. subsp. circularis Chock var. circularis	Seem	mamane
		Liliaceae	
E	Aloe vera L.		panini 'awa'awa, aloe
		Myrtaceae	
E	Eycalyptus L'Hér sp.		eucalyptus
		Onagraceae	
E	Epilobium cinereum A. Rich		pūkāmole
		Papaveraceae	
E	Escholtzia californica	Cham.	California poppy
		Polygonaceae	
E	Rumex acetosella L.		sheep sorrel
		Scrophulariaceae	
E	Verbascum (Tourn.) L. sp.		Mullein
		Solanaceae	
E	Solanum nigrum L.		black nightshade

Note: Nomenclature follows that of H. St. John. 1973. List and Summary of the flowering plants in the Hawaiian Islands.

Source: Grant Gerrish, "Botanical Survey of Principal Site (Hale Pohaku) and Two Alternate Sites for the Proposed Mauna Kea Observatory Mid-Elevation Facility and Hale Pohaku State Park". 1979.

Nine bird species were seen at Hale Pohaku or in the immediate vicinity during the survey, all but two were exotic. The following table is excerpted from the avian survey:

TABLE II

BIRD SPECIES PRESENT AT HALE POHAKU

Species	Number*
Francolinus erckelii (Erckel's Francolin)	3
Lophortyx californicus (California Quail)	5
Zosterops japonica (White Eye)	2
Leiothrix lutea (Red-Billed Leiothrix)	1
Loxops virens ('Amakihi)	12
Himatione sanguinea ('Apapane)	4
Carpodacus mexicanus (House Finch)	13
Passer domesticus (House sparrow)	5

*Numbers are approximate densities given in bird numbers per 10 acres.

The duration of the survey (two days) makes the above list incomplete. Several species are absent from the list in spite of their known presence in the area. Some of the explanations for this could be: (a) birds are secretive and difficult to detect during the breeding season; (b)breeding activity affects

the distributions of some species as well as their detectibility; and (c) the phenophases of their food plants, primarily those of Mamane (Sophora chrysophylla) and Naio (Mysporum sandwichense).

The most commonly observed native passerine, the Amakihi-(Loxops virens) is a generalist with regard to its food sources and is able to shift readily from one food source to another in the event of a shortage. The other three species of Drepanididae known to occur at Hale Pohaku, ('Apapane, Himatione sanguinea; 'I'iwi, Vestiaria coccinea; and Palila, Psittirostra bailleui), are more specialized than the Amakihi. The 'I'iwi and 'Apapane are nectorous and feed on nectar from Mamane and Naio flowers on Mauna Kea. The Palila is heavily dependent on the green pods of the Mamane and also takes varying amounts of brown pods as well as flowers (Berger 1972, Shallenberger 1978, van Riper 1978). The Palila has been observed feeding on U'ulei (Osteomeles) during the non-breeding season. (van Riper, personal communication) The absence of the above three species from Hale Pohaku during the survey may have been because there were no significant amounts of blooming or seeding Mamane present at the time.

The critical habitat of the Palila encompasses Hale Pohaku and extends above it to the 10,000 foot level. Because this endangered species is dependent on the green pods and flowers of the Mamane, and because the Mamane flowers sporadically on the mountain slopes, it

was necessary to include, within this habitat, forest land that encompasses most of the Palila s known historic range on Mauna Kea. Almost all of the Conservation District land on Mauna Kea, therefore, has been designated for the habitat.

While there are very few published sightings of Palila at Hale Pohaku (Mull, 1977, van Riper et al. 1978), the species has been seen with regularity there over the last five years (Conant, Woodside, and Ziegler, personal communication with Stemmerman). It can be surmised that Palila use Hale Pohaku regularly, at least for feeding.

In an interview with Group 70, Dr. Charles van Riper II, PhD., ornithologist and expert on the Palila, explained that the lack of observed breeding activity at Hale Pohaku does not necessarily mean that the Palila do not breed there. Because the bird is so rare, very few nests have ever been found anywhere within its habitat. He stated that the strong, healthy condition of the mamane at Hale Pohaku, due primarily to human habitation which discourages the browsing of feral animals, would make Hale Pohaku a potentially excellent breeding site for the bird.[19]

The Palila Recovery Team originally recommended that the Hale Pohaku Corridor (1/8 mile on either side of the road) be exempt from the critical habitat because the area was already disturbed. (van Riper, Scrowcoft, personal interviews with Group 70). The final

Palila Recovery Plan, prepared by the team, included this area in its recommendations for designation of the critical habitat. The plan's "Action Plan Narrative", in the section on General Management of Palila Essential Habitat on Mauna Kea, stated "Confine development of State Park and Observatory Facilities to the Hale Pohaku Corridor. It is recommended that utility lines to service State Park and observatory facilities be allowed within a corridor 1/8 mile on each side of the existing road leading to Hale Pohaku . . . ." (Palila Recovery Plan, August 1977) The proposed project falls within this 1/8 mile corridor.

8.2 Game Birds

Hunters and State Fish and Game officials report that the Chukar Partridge and the California Quail inhabit the general Hale Pohaku area. The California Quail was observed in the area during the avian survey, the absence of the Chuckar could be attributed to the fact that it was breeding season, a time when these birds are secretive and more difficult to detect. Erckel's Francolin (*Francolinus erckelii*) were also observed in the vicinity of Hale Pohaku during the July, 1979 survey.

The primary habitat of the Chuckar Partridge is at timberline and higher, on bare, rocky slopes. Its diet consists primarily of gosmore, Ohelo and pukiawe - all available in the project area.

The California Valley Quail feeds on seeds from vegetation such as sweet vernal grass, the common thistle, gosmore, sheep sorrel, and the Mamane tree. The Mamane and other vegetation provide food and some cover for this game bird in the Hale Pohaku area.

(Table III provides a species list of the birds of Mauna Kea.)

8.3 Mammals

The area surrounding the project site is inhabited by feral sheep (Ovis aires), mouflon (Ovis musimon), wild pigs (Sus scrofa scrofa) and wild goats (Capra hircus). Human habitation of Hale Pohaku has discouraged these mammals from frequenting the actual project site although four feral goats were sighted less than 1/4 mile downslope of the Hale Pohaku area during the avian survey of July 1979. (Appendix C.) Mice were also seen during this survey both in the vicinity of the buildings on the site and in the Mamane forest. Other small unidentifiable mammalian tracks, possibly from rats or mongooses, were also observed at that time.

The browsing of feral sheep and goats has had a destructive effect on the mamane-naio eco-system in the area. The mamane leaves, stems, seedlings and sprouts are an important food item of these animals. The animals prevent regeneration of the forest by their consumption of mamane seedlings and shoots.

TABLE III

CHECKLIST OF THE BIRDS OF MAUNA KEA, ISLAND OF HAWAII

SPECIES	COMMON NAME	HAWAIIAN NAME	STATUS*
Family PROCELLARIIDAE (Petrels & Shearwaters)			
Pterodroma phaeopygia sandwichensis	Hawaiian Petrel	'Ua'u	Bis (E)**
Family ANATIDAE (Ducks & Geese)			
Branta sandvicensis	Hawaiian Goose	Nēnē	Re (E)**
Family ACCIPITRIDAE (Hawks, Eagles)			
Buteo solitarius	Hawaiian Hawk	'Io	Rc (E)**
Family PHASIANIDAE (Quails, Pheasants & Francolins)			
Lophortyx californicus	California Quail		Fl
Alectoris chukar	Chukar		Fl
Francolinus pondicerianus	Gray Francolin		Fn
F. francolinus	Black Francolin		Fn
F. erckelii	Erckel Francolin		Fn
Coturnix coturnix	Japanese Quail		Fl
Lophura levcomelana	Kalij Pheasant		Fn
Phasianus colchicus	Ring-necked Pheasant		Fl
Family CHARADRIIDAE (Plovers)			
Pluvialis dominica	American Golden Plover	Kōlea	Vr

TABLE III

CHECKLIST OF THE BIRDS OF MAUNA KEA, ISLAND OF HAWAII
(Continued)

SPECIES	COMMON NAME	HAWAIIAN NAME	STATUS*
Family COLUMBIDAE (Doves)			
Columba livia	Feral pigeon, Rock dove		Fl
Zenaidura macroura	Mourning Dove		Fn
Streptopelia chinensis	Spotted dove		Fl
Geopelia striata	Barred dove		Fl
Family TYTONIDAE (Barn owls)			
Tyto alba	Barn owl		Fn
Family STRIGIDAE (Typical Owls)			
Asio flammeus sandwichensis	Hawaiian owl	Pueo	Ris
Family ALAUDIDAE (Larks)			
Alaudia arvensis	European Skylark		Vs, Fl
Family TIMALIIDAE (Babblers)			
Garrulax Canorus	Melodius Laughing-Thrush, Hwa-mei		Fl
Leiothrix lutea	Red-billed Leiothrix, Japanese Hill Robin		Fl
Family MUSICAPIDAE (Old World Flycatchers)			
Chasiempis sandwichensis sandwichensis	Hawaii 'Elepaio	Hawaii 'Elepaio	Re
Family ZOSTEROPIDAE (White Eyes)			
Zosterops japonica	Japanese White Eye		Fl

TABLE III

CHECKLIST OF THE BIRDS OF MAUNA KEA, ISLAND OF HAWAII
(Continued)

SPECIES	COMMON NAME	HAWAIIAN NAME	STATUS*
Family STURNIDAE (Mynas)			
Acridotheres tristis	Common Mynah		Fl
Family DREPANIDIDAE (Hawaiian Honeycreepers)			
Loxops virens virens	Hawaii 'Amakini	'Amakini	Re
Loxops maculata mana	Hawaii Creeper		Re (E)**
Loxops coccinea coccinea	Hawaii 'Akepa	'Akankane, Hawaii 'Akepa	Re (E)**
Hemingnathus wilsoni		'Akiapola'au	Re (E)**
Psittirostra bailleui	Palila	Palila	Re (E)**
Himatione sanguinea sanguinea	'Apapane	'Apapane	Re
Vestiaria coccinea	'I'iwi	'I'iwi	Re
Family PLOCEIDAE (Waxbills, Munias, Weaver Finches)			
Lonchura malabarica	Warbling Silverbill		Fn
Passer domesticus	House sparrow		Fl
Family FRINGILLIDAE (Cardinals, finches)			
Cardinalis cardinalis	Northern Cardinal		Fl
Carpodacus mexicanus	House Finch		Fl

SOURCE: Maile Stemmerman, Ornithologist

*Status symbols follow Pyle (1977), Preliminary List of the Birds of Hawaii, 'Elepaio 37(10):110-121,as below:

Re = Resident; endemic at species level
Fl = Foreign; long established & breeding for more than 25 years
Fn = Foreign, new introduction; apparently established, but for less than 25 years
Ris = Resident; indigenous species - Hawaiian subspecies is endemic
Vr= Visitor, regular migrant to Hawaii
Vs= Visitor, accidental straggles to Hawaii

**[illegible] = d[illegible]nat[illegible] [illegible]s [illegible]ubs[illegible]ies [illegible]ent[illegible] on the Federal list of endangered species.

Because of the animals' tendency to bed down above the tree line at night and to feed in flocks to about tne 8,000 foot level during the day, the sheep and goats have denuded entire areas of mamane seedlings, shoots and other vegetation causing the tree line to recede down the slopes of Mauna Kea. As the tree line moves down the mountain so do the sheep and goats

The sheep and goats browse within the critical habitat of the Palila on Mauna Kea. Because of this destructive effect on the major food supply of this endangered bird, a civil action was instituted by the Palila, the Sierra Club, the National Audubon Society, the Hawaii Audubon Society, and Alan C. Ziegler (Plaintiffs) against the Hawaii Department of Land and Natural Resources and Susumu Ono, Chairman of the Board of Land and Natural Resources (defendents) to protect the Palila from the harm caused by feral sheep and goats.

In a decision rendered June 6, 1979 (United States District Court for the District of Hawaii, Civil No. 78-0030) by United States District Judge Samuel P. King, the defendents were found in violation of the Endangered Species Act by maintaining feral sheep and goats in the Palila's critical habitat on the slopes of Mauna Kea. He found that Susumu Ono, in his capacity as Chairman of the Board of Land and Natural Resources and the Department of Land and Natural Resources may be ordered to adopt a program at state expense designed to eradicate the feral sheep and goats from the

Palila s critical habitat and may be enjoined from taking any action which has the effect of increasing or maintaining the existing population of feral sheep and goats in the Palila's critical habitat.

(Table IV gives a checklist of the mammals of Mauna Kea).

9.0 Hazards

Mauna Kea is located in Earthquake Zone 3 (on a scale of 0 - 3 in the zone of highest seismic occurrence and danger). All construction work is subject to provisions of the "Uniform Building Code" which requires that all structures be designed and constructed to resist stresses.

10.0 Historical/Archaeological

Mauna Kea Ice Age Natural Area Reserve

There are no historical/archaeological sights within the project area (Appendix A). The Mauna Kea Ice Age Natural Area Reserve, though, is located upslope and to the west of Hale Pohaku between the elevations of 10,400 and 13,200 feet (Figure 8). It extends into a portion of the summit area that is leased to the University of Hawaii as the Mauna Kea Science Reserve. The west boundary of this reserve is the western ridge of Pohakuloa gulch and the east boundary is along the summit road from a 100 foot distance. Pu'u Pohaku, located about a mile to the northwest, is a satellite

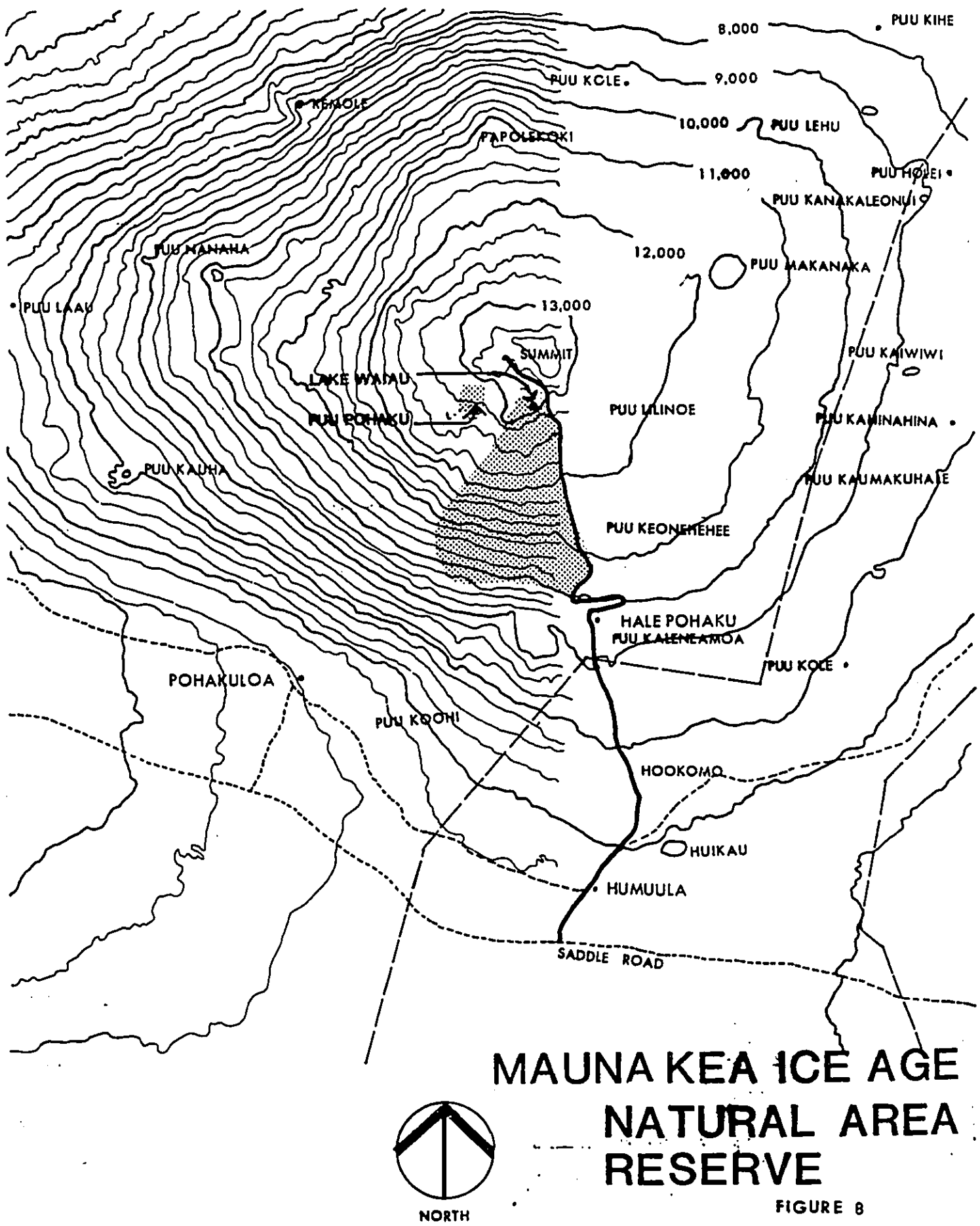
TABLE IV

CHECKLIST OF THE MAMMALS OF MAUNA KEA ISLAND OF HAWAII

SCIENTIFIC NAME	COMMON NAME	HAWAIIAN NAME
Family VESPERTILIONIDAE		
Lasiurus cinereus semotus	Hawaiian bat	O Pe'a Pea **
Family MURIDAE		
Rattus rattus	Black rat	Iole
Mus Musculus	House mouse	Iole li'ili'i
Family CANIDAE		
Canis familiaris	Feral dog	Ilio
Family VIVERRIDAE		
Herpeste auropunctatus	Mongoose	Iloe manakule
Family SUIDAE		
Sus scrofa	Feral pig	Pua'a *
Family BOVIDAE		
Capra hircus	Feral goat	Koa, kunana *
Ovis musimon	Mouflon	
Ovis aries	Feral sheep	Hipa *
Family FELIDAE		
Felis catus	Feral cat	Popoki

Source: Department of Land and Nautral Resources. Division of Fish and Game

* Open to public hunting
** Native, endangered
(All others, introduced)



MAUNA KEA ICE AGE NATURAL AREA RESERVE

FIGURE 8

section of this reserve. The Natural Area Reserve designated for the area described was approved by the Board of Land and Natural Resources November 9, 1978.

The main ice age features located in the reserve are Pohakuloa Gulch (formed by glacial meltwater) glacial moraine and meltwater deposits of fine sediments (present down to the 10,500 foot elevation), and the glacially sculptured features of cinder cones and lava flows. Lake Waiau, one of the highest lakes in the United States, is another significant geological feature of the area.

The Keanakakoi Adze Quarry is located within the Natural Area Reserve at the 12,400 foot elevation. The quarry site is listed on the National Register of Historic Places.[20] There are a variety of ancient Hawaiian culture remains, dating back to about 1,000 A.D., that are scattered througnout this quarry. These include religious shrines and rock shelters of different types, which were established in conjunction with a series of adz (tool) quarries and workshops.

The site was a very important and extensive center of Hawaiian adz manufacturing. Scientists at the Bishop Museum have been collecting information about the process of obtaining raw material and of the manufacture of this important class of stone tools. During their survey, excavations, and analysis of the Quarry they found the first evidence of Hawaiian rock art on the upper

slopes of the volcano. There was also evidence of intermittent, short-term habitation in the numerous rockshelters including artifacts and well preserved food remains.[21]

"The Mauna Kea Adz Quarry is probably one of the nation's least known but most important National Historic Landmarks, from both a research and interpretive point of view. It is the only landmark of its kind in the United States Moreover, it is probably one of the largest and most complex stone tool quarries in the world." (McCoy 1976)[22]

D. Existing Uses of the Site

1.0 Astronomy Support Facilities

The University of Hawaii Institute for Astronomy occupies a 1,300 square foot messhall/ lounge which is currently being used as a library and data preparation facility and an 1,800 square foot dormitory situated on a portion of the project site approximately 250 to 330 feet east of the main Mauna Kea Access Road. The UH also has constructed a 500 square foot corrugated metal generator shed which is located approximately 340 feet east of the main road.

The Institute for Astronomy has permission from DLNR to use the 1200 square foot large stone cabin, which is under the jurisdiction of the State Parks Division, as a temporary sleeping area. This building is located approximately 320 feet east of the Mauna Kea Access Road.

The Canada-France-Hawaii Telescope Corporation (CFHT) and the United Kingdom (UKIRT) both constructed temporary buildings to provide living accommodations for the crews who were constructing their respective telescopes. The buildings are now being used as living quarters for technicians, assistants, maintenance and staff personnel. These buildings, two dormitories of 2,000 square feet and 3,100 square feet respectively and a 1,900 square foot messhall/lounge, are now owned, operated and managed by the University of Hawaii. Observatory personnel who use these facilities are charged a daily rate by the University. (Figure 2 shows the location of these buildings on the project site.)

2.0 Recreation Facilities

There are two stone cabins and one stone restroom located at Hale Pohaku. The large stone cabin is now being used by the University of Hawaii Institute for Astronomy. The park is rarely used by the general public except on snow days when the Ski Patrol makes use of the small stone cabin for overnight accommodations. The small cabin is also used by the Ski Patrol in the off season for storage. The stone restroom is for use by the general public.

No winter activities actually take place at Hale Pohaku. The facilities are used primarily to support snow recreation at the upper elevations. No hunting is allowed within 400 yards of the developed portion of the project site. This buffer zone was established by the State Division of Fish and Game

to insure the safety of Hale Pohaku residents and visitors.[23] Hunters use the Mauna Kea Access Road to reach designated hunting areas and some hunting currently takes place adjacent to the site.

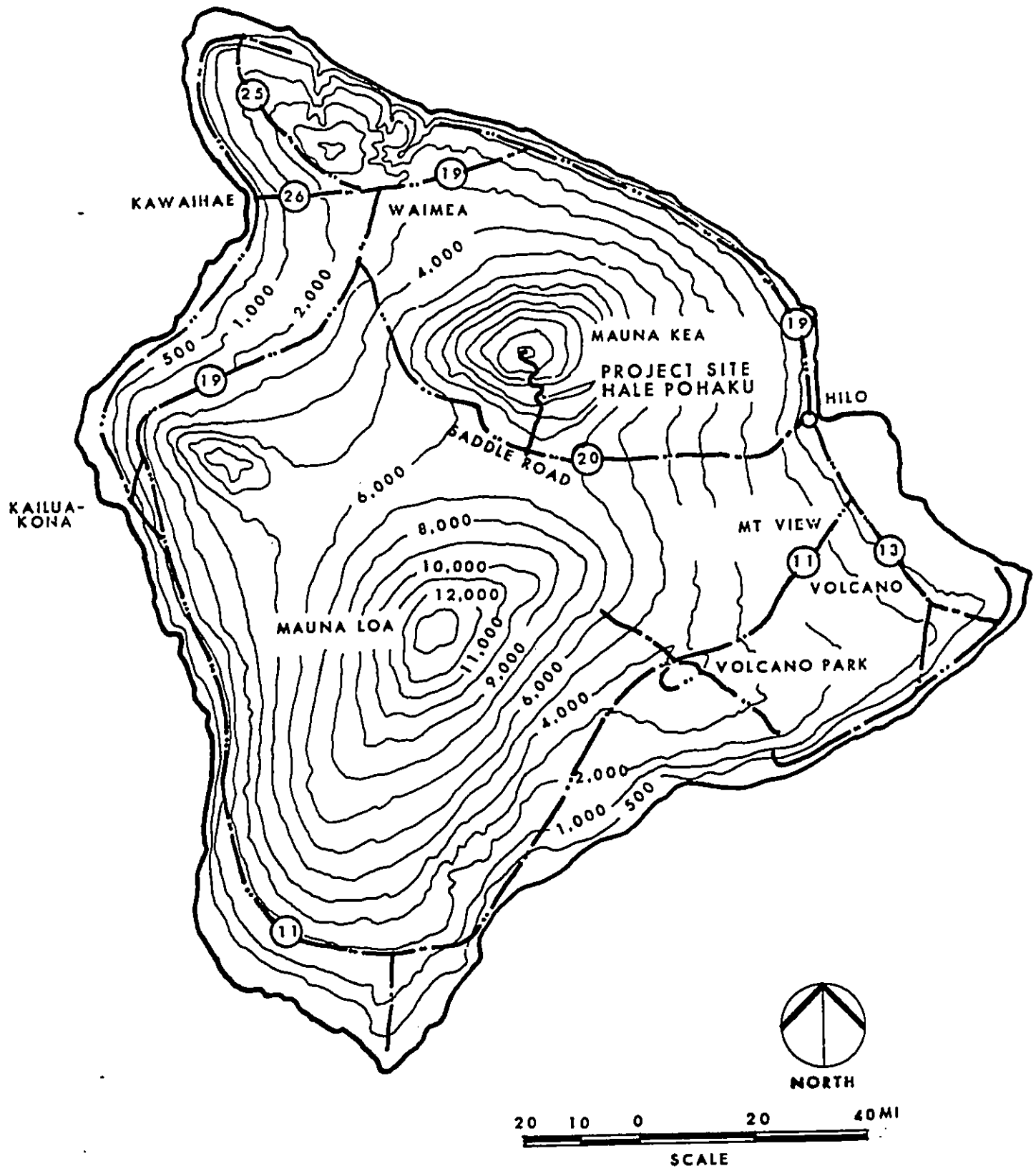
Hikers, motorcyclists, sightseers and others pass by the project site on their way to visit the Summit, Lake Waiau or other natural features. Use of the area for recreation purposes, with the exception of hunting, is subject to obtaining a "Mauna Kea Entry Permit". This permit authorizes an individual or group to use the road between Hale Pohaku and the Summit and to enter upon State lands within the Mauna Kea Forest Reserve.[24] In recent years permits have not been issued.

3.0 Other Uses of the Site

The State Division of Fish and Game's Management and Enforcement Center is currently located at Pohakuloa. Except for occasional camping by enforcement staff members, they do not actually use the project site. The Division does, however, have management and enforcement responsibilities within the area. These responsibilities are shared with the newly created Enforcement Division and State Parks.

4.0 Access

Access to Hale Pohaku from the airports at either Hilo, Kona or Kamuela is via the Saddle Road, State Route 200, to Pu'u Huluhulu and from there via a newly completed 20 foot wide paved road (Figure 9). The distance from Hilo to Hale Pohaku is 34 miles and takes about 50 minutes by automobile.



Location Map

FIGURE 9

The existing 6.5 mile, one lane stabilized cinder road from Hale Pohaku to the summit is narrow, steep, winding and dangerous. At least one death and several injuries have occurred on that road since January, 1976.[25] A four-wheel drive vehicle is required for safe driving on the road.

5.0 Grading

Visual inspection of the site indicates that minimal grading was performed to erect the existing structures at Hale Pohaku. The majority of the newer buildings are built on elevated post and beam construction systems. The most extensive excavation and backfill operations appear to have occurred during the construction of the stone cabins and restroom structures, since these facilities have slabs on grade and rock retaining walls.

6.0 Infrastructure and Utilities

6.1 Roads

The main access into the project site is via a partially paved two-lane road which connects the temporary mid-elevation buildings with the Mauna Kea Access Road. Entry into the site can also be made through a secondary access road approximately 560 feet mauka from the main entry along the Mauna Kea Access Road. This unpaved road provides access to the swimming-pool type water storage tanks, generator and open storage areas. Direct vehicular access to the major astronomy facilities from the secondary entry area is not possible since the interior road connecting the

upper and lower portions of the site has been blocked off due to severe erosion problems.

6.2 Parking

An area of approximately 2,400 square feet has been assigned as the parking zone at Hale Pohaku. This stabilized area, which services all of the major buildings and structures at Hale Pohaku, can accommodate approximately ten standard-sized passenger vehicles. Another small unpaved parking area of 500 square feet is located at the upper side of the complex and accommodates users of the messhall and the dormitories on the west side, as well as those who must go to the generator and construction sheds.

6.3 Water Distribution and Storage

Water requirements for the Institute for Astronomy temporary facilities at Hale Pohaku, approximately 7,500 - 10,000 gallons per week, are currently being satisfied by trucking water from Hilo about two times a week.[26] Three wood stave tanks, with a total capacity of 14,000 gallons, are being used by the University Institute for Astronomy for water storage. Two of these tanks are located in the immediate vicinity of the kitchen-messhall-dormitory area and one tank is located between the messhall and dormitory buildings. Water to service the facilities used by the CFHT, IRT, and UK telescope personnel is stored in two

large 8,000 gallon capacity swimming pool storage containers located above the structures near the generator facilities.

Water is distributed through exposed as well as concealed piping. Tanks are generally located adjacent to those structures requiring service thereby minimizing distribution lines.

6.4 Power

The current electrical power demands at Hale Pohaku are being met by three diesel generators of 150 KW, 105 KW, and 60 KW respectively. The 150 KW and the 105 KW generators are operated in rotation for 500 hours each. The 60 KW generator is only operated in the summer, when heaters are not being used, as it does not have sufficient capacity to satisfy user needs during winter months.

Each generator, when in use, runs 24 hours a day and uses 6 gallons of diesel fuel per hour. No special trips are made to Hale Pohaku from Hilo to deliver diesel fuel. Whenever the fuel truck goes to the summit it stops off at Hale Pohaku and tops off the tanks.[27]

Power from the generators is distributed through an underground network of cables to the various facilities at Hale Pohaku. The maximum length of power distribution cable is approximately 400 feet.

Propane gas, which is trucked to the area, is used both for cooking and for heating water. There are two large 100 cu. ft. metal tanks on the site for storage of this gas. One tank is located south of the old UH building while the other is below the CFHT messhall/lounge facility.

6.5 Sewage

Three large cesspools are located at the "CFHT" building, the "UH" building, and stone restroom respectively. Two smaller cesspools, no longer in use, are located adjacent to the site of the former ranger shack. Underground discharge lines are provided wherever cesspools are not located directly beneath the facilities.

6.6 Communications

Communication with the Summit and other areas on the Island of Hawaii is accomplished by means of a VHF mobile two-way radio system with two assigned frequencies. Television and VHF radio reception is poor at Hale Pohaku.

7.0 Services

7.1 Solid Waste Disposal

In the past, solid waste was buried in a sanitary landfill area located east of the

major astronomy complex. At the present time, all solid waste material is being trucked daily to a dumpster located at the Mauna Kea Observatory headquarters in Hilo.

7.2 Health and Safety

The nearest police, fire, and medical facilities are located in Hilo, approximately thirty-four miles from Hale Pohaku. Because of this distance the response time for these services can be one hour or longer. Observatory personnel are currently rendering emergency service to both visitors and staff to the best of their ability. The Ski Patrol provides volunteer aid to snow-play visitors in distress on winter weekends.

7.3 Fire Protection

At the present time Hale Pohaku does not have any fire fighting capability except for a few large portable fire extinguishers placed strategically among the major buildings. These extinguishers are being maintained by personnel from Hilo.

7.4 Security

Observatory personnel take responsibility for security of their area. DLNR personnel are present from time to time to enforce Department of Land and Natural Resources regulations.

PART III: THE RELATIONSHIP OF THE PROPOSED ACTION TO LAND USE PLANS, POLICIES & CONTROLS FOR THE AFFECTED AREA

The Mauna Kea Plan (adopted by the Board of Land and Natural Resources on February 11,1977) is the policy guide for all of the Conservation District land on Mauna Kea from the summit down to the Saddle Road (Figure 4). Five management areas, each appropriate to specific uses or a combination of uses. were created in the plan. Hale Pohaku is within the Mamane/Naio Forest Ecosystem Management Area.

The Mauna Kea Plan states that ". . . since it (Hale Pohaku) takes up a relatively small portion of the total area, mid-level facilities at Hale Pohaku, as limited. . ., will be consistent with the overall recommended use of Mauna Kea and with the management of the native Hawaiian eco-system." (Mauna Kea Plan, 1977). The proposed Hale Pohaku Master Plan follows the directives of the Mauna Kea Plan by providing for "mid-level facilities for necessary research personnel for the summit", and a "day-use destination point for visitors". The master plan also allows for expansion of the park facilities in the future to include additional picnic sites and primitive overnight camping facilities. The last activity was also specified in the Mauna Kea plan as being a suitable use for Hale Pohaku.

Hale Pohaku is also in an area designated in the Federal Register of August 11, 1977, as the critical habitat for the endangered Palila. The Federal Endangered Species Act of 1973, as amended 1978, mandates that if any federal funds are involved in proposed developments within an officially designated critical habitat formal consultation proceedings must be

instituted between the affected agency and the Secretary of the Interior. The National Aeronautics and Space Adminitration (NASA) which provides some operating funds to the Institute for Astronomy concluded their consultation with the U.S. Fish and Wildlife Service, November 2, 1979.

The Palila is also on the State "Endangered Species" list. Therefore, any activity which could potentially disturb the bird or modify its habitat would be subject to the regulations and requirements of the State Endangered Species Act of 1975.

Hale Pohaku is located in a Resource subzone of the Conservation District and any development is subject to the conditions specified in the Department of Land and Natural Resources Regulation #4. A conservation district use permit is required prior to any development in this area.

The Mauna Kea Plan takes cognizance of the sensitivity of the Hale Pohaku area and its relationship to the mamane/naio forest eco-system and the critical habitat of the Palila. Minimal disturbance to the area was therefore required as a condition to developing the area. The Hale Pohaku Master Plan, the subject of this EIS, was developed with this factor as the overriding criterion in the location and magnitude of all facilities and activity areas.

PART IV: ANTICIPATED ENVIRONMENTAL IMPACTS AND PROPOSED MITIGATION MEASURES

A. Introduction

The Hale Pohaku Master Plan, when adopted, will guide and control the development of the Hale Pohaku area. The proposed actions embodied in the plan, when implemented, will produce varying effects on all aspects of tne area s environment. The purpose of preparing a Master Plan, though, was to set controls and propose mitigation means for potential negative impacts tnat might result from these actions, before they occur, so that the area could be developed and used without causing significant deterioration to the surrounding environment

Development at Hale Ponaku will not only affect the primary users of the area and impact the immediate project site but may also induce secondary impacts throughout the area encompassed by the Mauna Kea Plan. These primary (direct) or secondary (indirect) impacts can be either positive or negative, short-term or long-term.

Direct impacts are those resulting from implementation of the various elements of the Master Plan while indirect impacts are those which may occur in other areas of the mountain as a result of developing a park and mid elevation facility at Hale Pohaku. Short-term impacts are generally construction related and limited to the duration of the construction period. Long-term impacts are those generated by the continued presence and use of the mid elevation facility and park in the Hale Pohaku area.

The discussion of anticipated environmental impacts which follows will assess the effects and potential impacts associated with the overall planned development of Hale Pohaku and various elements of the Master Plan on specific users and areas of concern. It will consist of evaluations of the impacts of development on the following items:

(1) the physical characteristics and visual appearance of the project site;

(2) the vegetation and biology of the area including rare and/or endangered flora and fauna and their related eco-systems;

(3) the historical/archaeological features, natural environment, and visual appearance of Mauna Kea;

(4) park visitors, hunters, skiers;

(5) astronomy operations and personnel, and

(6) the island economy and population growth.

The following sections will summarize the probable effects of various actions together with their anticipated environmental consequences, under each of the above classifications. Proposed mitigating measures that will be undertaken to minimize significant negative impacts will also be included in the discussions.

B. The Physical Characteristics and Visual Appearance of the Project Site

1 Astronomy Facilities

a. Description of the Action

Specific actions to be taken in the development of the astronomy facilities which may disturb the localized environment and/or modify or change the physical characteristics and visual appearance of the project site are:

(1) construction of a group of buildings, which will be used for sleeping, common living activities, research support functions, and facility and equipment maintenance, in the vicinity of the existing temporary structures;

(2) construction of a parking lot, service road, water tanks and a septic tank to service the astronomy facility;

(3) installation of diesel generators fuel storage tanks, a micro-wave dish for the telephone communication, and electrical, water, and sewage distribution systems;

(4) clearing, grading, excavation and drainage improvements on the site;

(5) landscaping;

(6) removal of temporary buildings which are presently occupying the site; and

(7) an increase in the number of persons residing at Hale Pohaku.

Only direct impacts related to the above actions will be described in this section. Secondary impacts will be discussed under separate headings in this chapter.

b. Positive Impacts

All of the positive impacts associated with the proposed actions can be considered long-term in duration. The project site is presently being used as a temporary mid-level facility for astronomy personnel. These persons occupy a group of temporary structures which were originally built to house workers who were constructing the telescopes at the summit. The temporary buildings are unattractive and inadequate and project a negative visual image to the visitor to Mauna Kea. The new group of buildings which will replace the existing

temporary structures will be designed to blend into the surroundings, thus improving the existing visual image of the area.

The roadways and parking areas at Hale Pohaku are unpaved, dusty, and eroded. The proposed new parking areas and service roads will be paved and low points in the parking areas will be provided with drain intakes to divert runoff and minimize erosion.

Serious erosion problems in the area are being caused by the new culverts above Hale Pohaku which were constructed as part of the summit access road improvements. These culverts have caused rain and melting snow water run-off from the upslope to dissect the existing development into three areas. (One drainage swale crosses through the major portion of the area creating a physical separation between the facilities.) This drainage pattern is causing serious erosion at an accelerated pace affecting not only Hale Pohaku but also areas directly downslope from it. Drainage improvements proposed for the new facility will divert the water coming down from the upper slopes to catchment areas where it will be piped to a natural ponding area just below the planned park parking lot. These improvements will prevent further

flooding and erosion of the Hale Pohaku area and allow the re-establishment of native vegetation in formerly barren areas.

The proposed landscaping of the site will result in a long-term positive benefit to the area. A vigorous mamane replanting program will be undertaken to upgrade the forest to a level superior to its existing condition. U'ulei (Osteomeles) will also be planted. This shrub, a member of the rose family, is native to Mauna Kea. It will be planted not only for ornamental purposes but to provide food for the Palila and other passerines during the non-breeding season when the green pods and blossoms of the mamane are not available in the area. Native grasses will be re-established to further control erosion.

c. Negative Impacts

Short-term negative impacts on the physical characteristics and visual appearance of the project site will occur during site preparation and construction of the facilities. Impacts such as noise from construction equipment, dust, and run-offs from exposed soils can be mitigated by incorporation of specific measures in the construction contract and by strict adherance to County regulations concerning grading, excavation, etc. Short-term negative impacts can also result from increased truck traffic during

the construction period and visual pollution caused by the presence of construction materials and equipment at the site. These impacts will exist only for the duration of the construction period.

Some actions related to the modification of the topography in the area could result in long-term negative impacts if proper precautions are not taken during the construction period to avoid them. Although the proposed buildings and other structures will be "site-adapted" to the existing ground contours, some clearing, grubbing, excavating, and grading will be required in the site preparation and construction phases of the project. The following actions may cause some environmental disturbance of this nature:

(1) Clearing and grading of the parking areas the access and service road, and the area under the generator shed and maintenance building; and, excavation and grading of the site for the proposed water tanks:

(2) Excavation for concrete footings, (necessary as foundations for the building piers), the septic tank, cesspool, and the fuel tanks, and

(3) Excavation of utility line trenching for providing 410 linear feet of underground electrical conduit from

the generator to buildings in the astronomy facility and to the Park area; 400 linear feet of sewer line to the proposed septic tank; 1,300 linear feet of drainage pipe; and 1200 linear feet of water line from the proposed water tanks to the functional areas of the astronomy facility and to the park Information Station.

The soils in the area may be lacking in sufficient amounts of organic and inorganic soil binders which would contribute to its highly erodable qualities and low compactibility. Removal of the already sparse vegetation and large surface rocks could result in displacement of the fine materials with resultant erosion and dust problems. To minimize the problem the following measures will be taken:

(1) minimal site clearing and grading will be undertaken and all exposed areas will be replanted with endemic ground cover;

(2) cutting "benches" for roadways and building areas will be carefully accomplished and all banks will be stabilized by plantings, retaining walls, soil cement or other suitable means;

(3) roof gutters and drains will be designed so that they will not discharge onto the ground and other drainage improvements will be undertaken.

(4) sightly elevated walkways will be provided between buildings to discourage walking on cleared paths; and

(5) drainage swales will be lined with an environmentally suitable material.

Other long-term negative impacts may be caused because of the increased number of people who will be using the facility. With increased generator size (from 150 KW at present to 250 KW) additional pollutant loads may be discharged into the air. Pollution control devices will be installed on the generator in order to mitigate this impact so that air and safety standards can be met. Use of alternate energy sources as described earlier in this EIS may result in a reduction of generator size.

Water consumption will increase and correspondingly water tanker trips from Hilo may be increased from two per week to once or twice daily depending upon experience. More diesel fuel will be required to run the larger generator and therefore the number of trips the fuel truck makes to Hale Pohaku may also have

to be increased. Use of water conserving devices in the complex and employing alternate energy sources may reduce these requirements.

The amount of sewage discharged will also increase with the growth in numbers of persons using Hale Pohaku. It may be difficult to find an environmentally acceptable site for a septic tank which will allow access of a truck for annual pumping without scarring the mountain. The location of the septic tank must be downwind of occupied areas to prevent possible odors from disturbing persons in the area. If an appropriate location for a septic tank system cannot be found, cesspools will be the alternative means of sewage disposal. The cesspools may clog, though, and may require chemical treatment periodically.

An increase in the number of persons using the facility will probably result in an increase in the volume of auto traffic to and from the site. Most of this increase will probably be on the access road from Hale Pohaku to the summit because the need to remain acclimatized will discourage discretionary travel to Hilo or Waimea. Because four-wheeled drive vehicles are necessary for the drive from Hale Pohaku to the summit, it is probable that car-pooling will be used extensively for the to and from work commute. It should be noted here that the unpaved condition of the road to the summit appears to be a major cause of locally generated pollution in the area.

Astronomers appreciate the fact that clean air is important for the viability of the Mauna Kea eco-system, because it is also a vital attribute for successful scientific research at the summit. Therefore, they will do everything possible to minimize locally generated air pollution.

An increase in the number of people using the facility will result in more solid waste being created. Because open rubbish and garbage bins can attract predators, such as rats and mongoose, who may also prey on the birds in the area, all rubbish containers will have tight fitting lids and will be emptied daily and driven to Hilo for disposal.

2.0 Park Facilities

a. Description of the Action

Specific actions to be taken in the development of the Park which may disturb the local environment and/or modify or change the physical characteristics and visual appearance of the project site are:

(1) Excavation of the foundation and construction of an Information/ Interpretive Station of approximately 950 square feet of floor area;

(2) Clearing and leveling of ten picnic sites of approximately 150 square feet each within an area of approximately 1/3 acre;

(3) Clearing and grading of an area of approximately 8,000 square feet as a parking area for 28 automobiles;

(4) Construction of a cesspool;

(5) Erection of a large warning sign adjacent to the road and smaller signs within the park area and

(6) an increased number of persons using the area.

b. Positive Benefits

Positive impacts of park development at Hale Pohaku on the physical characteristics and visual appearance of the area are difficult to evaluate at the present time. Any judgment as to whether the Park will enhance or despoil the appearance of the area will of necessity be subjective. To some persons, a stone cabin type Interpretive Station will be an attractive supplement to the natural scenery at Hale Pohaku, while to others, structures of any type only serve to detract from its natural quality. The reviewer of this EIS must use his or her own judgment in categorizing the park development as positive or negative in relation to the visual appearance of the site.

Other positive benefits of park development will accrue to the users and tq users of other areas on the mountain. These

positive impacts will be discussed fully under the separate categories which appear in later sections.

c. Negative Impacts

Short-term negative impacts on the physical characteristics and visual appearance of the park area will occur during site preparation and construction. Impacts such as noise from construction equipment, dust, and run-offs from exposed soils can be mitigated by incorporation of specific measures in the construction contract and by strict adherance to County regulations concerning grading, excavation, etc. These impacts will exist only for the duration of the construction period.

Some actions related to the modification of the topography in the area could result in negative impacts if proper precautions are not taken to avoid them. The following actions may cause some environmental disturbance of this nature:

(1) clearing and excavation of: (a) the foundation for the proposed Information Station. (b) the cesspool; (c) 25 linear feet of sewer line to the proposed cesspool; and (d) 800 linear feet of water line from the astronomy facility to the Information/Interpretive Station and the picnic area;

2) clearing, grading, and paving of the parking area; and

(3) clearing and leveling of the picnic sites and excavation (slight) of small fire caches in the picnic area.

Appropriate mitigating measures, described in paragraph 1.c. of this section, will be undertaken to minimize any adverse impacts that might result from these actions.

In order to minimize visual impact, all signs placed or erected in the area will utilize natural or local materials except those parts of signs that require metal to withstand the elements. Any metal that must be used will be of a non-glaring type.

As the number of visitors to the Park increases, more pressure will be placed on the limited resources of Hale Pohaku. Therefore, only a minimal number of recreation facilities will be provided in order to minimize potential environmental impacts.

Visitors intrude on the natural environment not only by their physical presence but by the rubbish they create. Rules and regulations of the Park concerning litter will be posted. Closed cover rubbish cans will be located

in the picnic area; near the Information Station; and in the restrooms. This rubbish will be collected daily and trucked to Hilo for disposal. The DLNR employee on duty at the Information/Interpretive Station will have the authority to enforce anti-litter regulations.

The Park will generate increased traffic to the area and consequently an increase in localized pollutants resulting from vehicle emissions. It is expected, though, that vehicles will arrive at random during the day with the only heavy concentration of arrivals being on snow and ski weekends. The prevailing winds will facilitate the dispersal of these pollutants before the levels of concentration exceed clean air standards. In addition, tour buses will be discouraged from making the trip up the mountain. There will be no space provided for parking them or turning them around.

Water will be sufficient for average to moderately heavy usage of the Park. Water conserving fixtures in the restroom and signs discouraging wasteful water use will facilitate the conservation of the water supply.

C. The Vegetation and Biology of the Area (Including Rare and/or Endangered Flora and Fauna and Their Related Eco-Systems)

Complete consultants' reports of vegetation and avian surveys that were undertaken for the purpose of this EIS appear as Appendices B and C in this report. The reader is referred to these appendices for the consultants' assessments of the positive and negative impacts of the proposed project on their particular areas of expertise. Portions of these reports will be excerpted in the following sections.

1.0 Description of the Action

Hale Pohaku falls within the boundaries of the Mamane/Naio Forest Eco-System Management Area which was established by the Mauna Kea Plan (1977). It is also within the critical habitat of the rare and endangered Palila (*Psittirostra bailleui*). (Federal Register, August, 1977.) According to the Mauna Kea Plan, the Mamane/Naio Forest Eco-System Management Area is to be managed primarily "to maintain and improve the native Hawaiian eco-system and the threatened and endangered species found therein."

If a federal presence is involved in a project, development within a federally recognized critical habitat of an endangered species is subject to the rules and regulations of Section 7 of the Endangered Species Act of 1973 (U.S.C. 1536) and 1978 amendments to the Act. As required by the Act, NASA, which provides some operating funds to the University of Hawaii Institute for Astronomy, consulted with the U.S. Fish and Wildlife Service

concerning the development of Hale Pohaku. This consultation was concluded November 2, 1979.

The recreation uses proposed for the Hale Pohaku area are specifically permitted by the Mauna Kea Plan The mid-elevation facilities are also allowed if certain precautions are taken to minimize disturbance of the eco-system. Some positive actions that will be taken to minimize disturbance of the existing flora and fauna and improve the avian habitat are:

(a) development will be planned so as to use the land as efficiently as possible, construction of the mid-elevation facilities will be confined within a corridor 1/8th mile from the Mauna Kea Observatory Access Road, an area which is presently over 50% developed;

(b) care will be taken to not disturb existing vegetation, rare plants located on the site will be fenced so that they will not be disturbed in the construction phases of the project and, after construction is completed, a mamane planting program will be undertaken for the purpose of upgrading the forest to a level superior to its existing condition;

(c) U'ulei (Osteomeles) will be planted to provide food for the Palila when the greenpods and blossoms of the mamane are not in season; the grove of Eucalyptus trees in the area may be removed and replanted with mamane to improve the food supply of native birds

(d) measures will be taken to control undergrowth in order to prevent natural fires from destroying the existing mamane and any inhabiting species, such as the Palila;

(e) traps may be set throughout the Astronomy and Park areas to capture predators such as rats, mongoose, and feral cats that might prey on native birds; and

(f) if at all possible, heavy construction activity will begin mid-June or later so that any inhabiting Palila can possibly have one brood that season before being disturbed by construction noise and activity.

Development of the area and the corresponding increase in the number of users of and visitors to Hale Pohaku will generate environmental impacts though, and these impacts will be both positive and negative. These impacts will affect not only the mamane/naio forest and the Palila but other birds, mammals, and other species of native vegetation that are found at the site.

2.0 Positive Impacts

Long-term positive benefits will accrue as the direct result of some of the actions taken to improve the existing forest and avian habitat such as the replanting program, planting of U'ulei, and undergrowth control. Actions taken to improve the drainage patterns of the area and to minimize soil erosion will also benefit the mamane/naio forest by providing a more stable environment in which the mamane can grow. Setting traps for predators will help insure the safety of breeding birds and allow them to raise their young successfully. In addition, human habitation of the area will continue to discourage the foraging of feral animals, thus allowing the existing mamane to regenerate and grow.

3.0 Negative Impacts

Development of the area will involve removing some mamane trees (preliminary estimate, 3 - 10). If possible, only younger trees will be removed leaving the mature mamane, the food source for the Palila, intact. An attempt will be made to transplant any mature trees that must be removed. A planting program for mamane in the Hale Pohaku area will begin as soon as construction is completed.

There are other rare plants, besides mamane, at the site. These include Geranium cuneatum var. hololecum and two species of Stenogyne. These plants will either be fenced during construction so that they will not be disturbed or transplanted to other locations on the project site. Any of these species found growing in the park area will be fenced and identified with signs. The

Information/Interpretive Station will have information available concerning the native plants in the area.

The primary negative effects on both the native flora and the native fauna of the area result from an increase in the use of the Hale Pohaku area by both astronomers and park users. Increased foot traffic in the surrounding vegetation will have negative impacts. Some additional vegetation may be trampled and otherwise disturbed; therefore, slightly elevated board walkways will be provided in the astronomy area to discourage walking on the vegetated areas. Personnel on duty at the Information/Interpretive Station can also inform visitors of the significance of protecting the environment and remind them of the regulations concerning disturbing the vegetation. Increased traffic to and within the area also increases the chance of new exotic species being introduced into the area. This is already happening in the area.

An increased number of persons using Hale Pohaku, particularly the park area, could have harmful effects on the biology of the Palila and other native birds. In spite of the fact that Palila seem to be fairly tame while feeding (Stemmerman, personal observation), breeding birds are likely to be far more susceptible to disturbance. Although Palila have never been observed breeding in the area the potential is considerable. Palila are only able to raise one set of young per season (van Riper, 1978); thus disturbance of breeding birds would have a far more serious effect on the Palila than in other multiple brooded species such as the 'Amakihi. (Stemmerman,

1979). It has been suggested that construction be started in mid-June or later (van Riper, interview 1979) to allow the birds to possibly have one brood that season before being disturbed by construction noise and activity. A continued increase in human activity, though, could also increase the possibility of decreasing productivity of the Palila through disturbance and nest desertion. (Stemmerman, van Riper 1979)

Increased usage of the area will also increase the probability that predators such as rats, mongoose, and feral cats will be attracted to the area. Mammalian predation is one of the most significant limiting factors to Palila breeding success (van Riper 1978). Traps for small mammals such as these will be placed in both the Park and the astronomy areas to reduce the negative effects of these species on nesting birds, both native and exotic. Careful containment of rubbish and frequent (daily) disposal of this refuse will also reduce the attractiveness of the area to predators as well as making the area more aesthetically pleasing for humans.

One of the most serious negative effects of increased usage of the area, particularly the Park, is the increased probability of "human-caused" fires which could destroy the forest in the area. The Hale Pohaku area is very dry and the fire potential is considerable. It was first intended that cooking fires in the area should be banned entirely. Discussions with knowledgeable persons during the consultation period, though, have convinced us that people will bring their hibachis and cook out whether they were forbidden to do so or not.

Remnants from cooking fires already exist in the area. Therefore, small fire caches are being provided in the picnic area to minimize this danger. Warnings of potential dangers of fire will be prominently displayed in the Information Station and portable fire extinguishers will be available for emergencies. Fire flow is being provided at the astronomy complex and can be used by the Park in an emergency.

D. The Historical/Archaeological and Natural Features of the Mountain

1.0 Description of the Action

Opening of the Park at Hale Pohaku, and the corresponding increase in visitors to the mountain, could generate impacts on the fragile environment upslope of these facilities. The adze quarry and Lake Waiau are particularly vulnerable to desecration by thoughtless visitors. Some actions being taken to minimize these secondary impacts are:

(a) Construction of an Information/ Interpretive Station to act as headquarters for control of access to the upper elevations of the mountain;

(b) Placement of a large wooden sign near the station ordering people to stop before proceeding to the upper slopes;

(c) Updating of the rules and regulations concerning Mauna Kea by the Department of Land and Natural Resources;

(d) Manning of the Information/Interpretive Station by DLNR personnel who will have the full authority granted by law to enforce rules as well as any other regulations promulgated by DLNR;

(e) Installation of a gate across the Summit Access Road at about the 13,300 foot elevation which will be locked at sunset and opened at sunrise; and,

(f) Education of the public through exhibits, located in the Information Center, that illustrate the unique properties of Mauna Kea and the significance of conserving and preserving these features.

2.0 Positive Benefits

It is reasonable to assume that most persons, if properly informed, will want to conserve the unique features of the environment. The Information/Interpretive Station can provide them with this knowledge through interpretive exhibits, including automated slides and movies, pamphlets and posted notices. For example, the exhibits can explain the archaeology, geology, flora and fauna, history of the mountain, and the scientific activities taking place on the mountain. DLNR employees manning the Station can answer questions and provide interested persons with copies of rules and regulations pertaining to the area. It is anticipated that many people will be

satisfied with the information provided at the Station and will not want to travel further up the mountain.

Positive benefits of tne Information/ Interpretive Station will accrue to the safety and well-being of visitors to the mountain. These benefits will be described in later sections of this chapter.

Persons traveling up the mountain will be required to stop and register at the Information Station. The person on-duty at the Station will ensure that visitors traveling beyond Hale Pohaku are in approved vehicles and are aware of the dangers inherent in traveling up the mountain and regulations that pertain to his safety. The person manning the information station will have the authority to stop persons in unapproved vehicles from venturing further up the mountain. This action should help to reduce some of the negative impacts of increased number of persons traveling to the summit.

3.0 Negative Impacts

At the present time the Information/ Interpretive Station is planned to be manned by one person. It will not be manned continuously for 24-hours a day, seven days a week. The person on duty could possibly have other responsibilities in the area from time to time so that he cannot always personally insure that everyone stops and registers

at Hale Pohaku before proceeding up the mountain. There will still be a risk that features of the mountain upslope will be disturbed by careless and thoughtless visitors.

The gate at the summit cinder cone will only be locked at night and access will not be controlled during the day. If visitor traffic to Hale Pohaku and the summit becomes heavy and problems in preserving the unique features of the upper slopes of Mauna Kea become intensified, DLNR may have to reevaluate its management, monitoring, and control programs for the area and exercise options such as restricting access to the adze quarry to guided tours and placing a manned gate at Hale Pohaku.

The problem of "off-the-road" vehicles defacing the fragile landscape may continue with or without the provision of park amenities at Hale Pohaku. These vehicles will be forbidden in the Hale Pohaku and Forest Reserve areas except for transportation purposes on established access roads. This ban will be enforced by DLNR.

Visitors to the upper regions of Mauna Kea will increase in number even if the park is not developed. Paving of the road to Hale Pohaku has greatly increased accessibility to the area. The amenities provided by the Park may encourage some persons, who might not otherwise be interested, to travel to Hale Pohaku and from there to the summit area. The number of visitors to Hale Pohaku must be monitored carefully so that when they increase beyond a certain point additional control measures can be instituted by DLNR before irreparable damage is done to the mountain.

E. Park Visitors, Hunters and Skiers

1.0 Description of the Action

Opening of the park facilities at Hale Pohaku could attract more visitors to the area, possibly affecting the quality of the visitors' experience on the mountain. In order to preserve the natural character of the area, facilities will be limited to ten simple picnic sites, a parking area, and an Interpretive/Information Station. Large tour groups in buses who create a commercial atmosphere will be discouraged from visiting the area, possibly by bans against bus parking at Hale Pohaku.

Most of the responsibility for the visitor's safety and comfort will lie with the visitor himself, as there will be a lack of modern conveniences. Information pertinent to the health, safety and well-being of the visitor will be available at the Information/Interpretive Station. The employee who is manning the station can provide information to the public of the dangers of the high altitude and cold and discourage persons with two-wheel drive vehicles from traveling further up the mountain. He will be trained in first aid so that he may assist visitors in an emergency. The Ski Patrol will be asked to assist in visitor control during the snow season.

The boundaries of the "no-hunting" zone will have to be extended approximately 50 yards in the astronomy area and 100 yards in the park zone in order to insure that a four hundred yard safety zone surrounds the Mid-Elevation Facilities and State

Park. Alignment of the Hale Pohaku facilities in a mauka-makai linear fashion has minimized the amount of additional land that will be posted for no hunting. Hazard warnings and safety precautions will be available to hunters at the Information Station. It is anticipated that hunters may avail themselves of the picnic, parking, and restroom facilities from time to time.

It is anticipated that the park facilities may attract an increasingly large number of winter visitors who will use Hale Pohaku as a staging area before continuing to the upper slopes for skiing and snow play. Snow information, hazard warnings, and safety precautions will be available at the Information Station. It is possible that a member of the Ski Patrol or Ski Association will volunteer to be present during heavy snow weekends to assist the winter visitors. It is expected that these visitors will avail themselves of the picnic, parking and restroom facilities while at Hale Pohaku.

2.0 Positive Impacts

A State Park at Hale Pohaku can produce long range positive benefits for the visitor. The information and interpretive exhibits at the Information Station can increase his knowledge of the fragile mountain ecology and make him more aware of the need for conservation of this precious resource. It can educate him in many aspects of Hawaiian heritage and geographical features of the Island. The exhibits at the Station can also facilitate the teaching of proper use of the mountain so that its unique features can be enjoyed while at the same time being preserved for future

generations. The picnic facilities can allow visitors a pleasant place to relax and enjoy the magnificent scenery in the Hale Pohaku area. Skiers and hunters will be provided with a convenient rest stop area and a place to park their cars. Hikers can park their vehicles at Hale Pohaku, pick up trail information from the Information Station, and proceed to their chosen destinations.

The most important benefit of the park facility to the visitor will be in improved safety. Even though DLNR requires that 4-wheel drive vehicles be used above Hale Pohaku, many people attempt the journey to the 14,000 foot summit in standard automobiles unprepared for the hazardous road, the wind and cold, the thin air that causes physical and mental exhaustion, and the potential altitude sickness, which could also hamper proper driving responses. The casual visitor can be endangered unknowingly. The employee on duty at the Information/Interpretive Station can help insure that visitors proceeding up the mountain are in approved vehicles, are aware of the dangers and regulations, and are appropriately dressed. Other information and hazard warnings will also be available at the station for the protection of the visitor. The gate at the base of the summit cinder cone will prevent visitors from making the hazardous drive to the summit area at night when it is exceptionally dangerous.

As more persons go to the summit for skiing and snowplay, many of them inexperienced and not in the proper physical condition, the potential for accidents and illnesses increases. The DLNR employee on duty, with the volunteer assistance of

the Ski Patrol, can utilize the Information/ Interpretive Station as a control point where newcomers are warned of the hazards involved in high altitude skiing and snow play. The Station will have printed material available that will inform winter visitors of the potential risks involved. The parking area of the Station would be a convenient place to control the access of winter visitors to the upper elevations on heavy snow weekends if it becomes necessary to limit the number of persons on the mountain at any one time for health or safety reasons.

3 0 Negative Impacts

The mix of hunters and recreationists in the Hale Pohaku area may cause some problems to the participants. Hikers may traverse the hunting areas thus endangering themselves and interfering with the hunters' activities. One possible mitigating measure would be to ban hiking in the area during hunting season. Hikers could also be required to wear clothing that would be highly visible to hunters if they are hiking in a hunting area.

The presence of the mid-elevation facilities in close proximity to the park area could reduce the alpine experience of the park visitor. Both park and astronomy areas are located so that the densest existing stands of trees and shrubs in the area lie between the facilities.

An increased visitor load at any one time may deplete the available water supply below a level adequate to meet both user needs and fire flow requirements. If this should occur, stringent water conservation measures may have to be initiated.

F. Observatory Operations and Personnel

1.0 Description of the Action

The proposed action will involve the construction of a new, permanent mid-elevation facility in the approximate location of the existing temporary structures. Space will be provided in the complex for sleeping, eating and lounging, research support and maintenance. The facility will accommodate 59 persons who will reside there during their on-duty periods at the Summit.

The proposed Park and Information Station will be located approximately 700 feet downslope of the astronomy area. It was necessary to plan the area in a mauka-makai alignment so as to minimize disturbance to the mamane/naio eco-system and the critical habitat of the rare Palila.

2.0 Positive Impacts

One immediate and long-term positive impact resulting from the proposed action will be the improvement of working and sleeping conditions at the mid-elevation site. This will be beneficial to the health, safety, and welfare of the personnel who must work in the less than ideal conditions at the summit.

Indirect long-term benefits that may accrue from the new facilities will be: a) the increased efficiency of observatory operations at the summit; b) the favorable image that Hawaii will reflect to the international scientific community. and c) the recognition that Mauna Kea will gain as a major observatory site.

Upon completion of the new facilities, the University will have fulfilled its contractual obligations to Canada, France, the United Kingdom, and NASA to provide such accommodations at a mid-level site.

3.0 Negative Impacts

Short-term negative impacts will be basically construction related. Although some of these adverse effects can be mitigated by incorporation of specific measures in the construction contracts, noise due to construction may seriously interfere with the ability of personnel to sleep during the day. Construction phasing will also be a problem, because the astronomers will continue to reside in the area during the construction of the facilities. This may involve moving certain functions to various temporary locations at various times while permanent structures are being built.

The facility is planned to be located near the Mauna Kea Observatory Access Road in order to minimize disturbance to the natural vegetation of the area. (Figure 1) This location will be noisier than the site that was originally chosen for the facility (Part VI, Sect. C-2). This may necessitate closing

of all windows in the dormitory at more frequent intervals than would be required at the original site in order to allow astronomers to sleep during the day. This could result in increased energy consumption as a mechanical means of ventilation will have to be provided in the dormitory building.

Day use of the Park could also conflict with day sleeping of the Astronomy personnel. Separation of the Astronomy and Park facilities as far as possible away from each other within the constraints of the site was one means used to reduce this potential impact. The closeness of the Park and the visibility of the Astronomy complex from the Park and road could also increase the need for stringent security measures in order to prevent vandalism and theft of expensive equipment and supplies. At the present time there are no plans to fence off the Astronomy complex from the rest of the Hale Pohaku area. A clear-cut deliniation of management and operating responsibilities for each of the facilities (Park and Astronomy) will have to be agreed upon by DLNR and the University in order to reduce the incidence of dual or overlapping responsibilities.

G. Economic Impact and Population Growth

Short-term economic effects will be the employment of individuals in the construction phases of the project. Each construction job is estimated to generate one indirect job in the economy. Long-term employment due to operating of the mid-elevation facility will increase minimally, .5 indirect jobs for each operating job. The long-range benefit to the economy of Hawaii

will be in the income generated by the presence of a multi-national scientific community operating on Mauna Kea and the prestige and reputation that will be garnered by the State as a superior location for scientific endeavors.

It is not anticipated that development of the State Park will affect long-term population growth patterns in the region although it is possible that some inmigration to the Big Island might be generated by the astronomy activities. This impact is considered positive rather than negative because it is State policy to encourage population growth and economic diversification on the neighbor islands.

PART V: PROBABLE ADVERSE ENVIRONMENTAL EFFECTS WHICH CANNOT BE AVOIDED

A. Primary Short-Term Impacts

Construction related effects include dust and erosion impacts which can be mitigated by immediate replanting of exposed areas, immediate refilling of all trenches and other measures described in previous sections of this EIS. Water sprinkling for dust control will only be undertaken on extreme cases of exceptionally high winds due to the limited supply of water in the area.

The removal of vegetation will be necessary for the development of the facilities. Wherever possible native trees, shrubs, and vines will be transplanted and incorporated into the landscape plan.

Noise related impacts will be minimized by having the contractor use equipment with proper noise muffling devices. Noise intrusion on sleeping Astronomy personnel cannot be completely avoided during the construction period.

B. Primary Long-Term Impacts

A few mamane trees will have to be removed (estimate 3 to 10) in order to construct the mid-elevation facilities. The mamane is a slow growing tree which takes decades before maturing sufficiently to provide food for native birds. Care will be taken to retain as many of the mature trees as possible and any which have to be removed will be transplanted.

The expanded Mid-Elevation Facilities, the Park, and the Information Station will generate additional automobile traffic to the Hale Pohaku area. More truck trips to the area are also anticipated because of the need for more frequent deliveries of water and fuel. This may increase the amount of locally generated pollutants resulting from vehicle emissions. This effect will probably be more pronounced during periods of heavy activity at the Park, such as snow weekends. The prevailing winds are expected to dissipate most of this increased pollutant load before it exceeds air quality standards. An increase in traffic on the road to Hale Pohaku could also result in an increase in accidents in the area.

Increased usage of the area will increase the potential of humans being accidental agents in exotic weed transmission to the area. Elevated walkways will be provided to minimize disturbance of the vegetated areas. The potential for human caused fires, which may harm the mamane forest in the area, will also increase with heavier usage of the Hale Pohaku area. In order to minimize this danger, a 40,000 to 60,000 gallon reserve for fire flow will be available to both the astronomy and park areas from the water storage tanks located in the maintenance area of the astronomy facilities. The picnic area will also have fire caches for the disposal of hot coals. The employee on duty at the Information Station can also inform the public about regulations concerning the use of fire in the picnic area.

Some littering of the visitors' area cannot be avoided. Covered receptacles for disposing of trash, frequent emptying of trash bins and frequent trips to Hilo to dispose of rubbish will help to minimize this problem. The employee on duty at the Information

Station can also help to maintain the area free from extraneous litter. It is expected that some litter problems cannot be entirely avoided, particularly on days of heavy park usage.

An increased number of persons using the Park could have harmful effects on the biology of the Palila. Humans can scare the birds and disturb their nests, this can result in decreasing productivity of the Palila through nest desertion. The Information/Interpretive Station will dispense information and warnings to the visitors concerning precautions to be taken so that the birds in the area will not be disturbed.

The visual appearance of the Hale Pohaku area will be changed as the area is opened up to more persons. The new Mid-Elevation Facility will be more attractive than the existing camp and will improve the present appearance of the area. The undisturbed area downslope from the astronomy facilities will change in appearance due to the construction of the Information Station, parking area, and picnic sites. The judgment of whether or not this change in appearance of the mountain will be a positive or negative impact will be left to the reviewer.

C. Secondary Impacts

Increased usage of Hale Pohaku could generate increased travel to the Summit. Although the person on duty at the Information Station can help to control access to the upper slopes and inform visitors of the rules and regulations pertaining to the area, there is still a risk that features of the mountain such as the adze quarry and Lake Waiau will be disturbed by careless and thoughtless persons. This problem occurs without

the park at Hale Pohaku but it could be intensified as more persons become aware of the park facilities available on Mauna Kea. If visitor traffic to Hale Pohaku and the summit becomes heavy and problems in preserving the unique features of the upper slopes of Mauna Kea become intensified, DLNR may have to re-evaluate its management, monitoring and control programs for the area and institute additional controls such as restricting access to the adze quarry to guided tours and placing a manned gate at Hale Pohaku.

PART VI: ALTERNATIVES TO THE PROPOSED ACTION

A No Action

The no action alternative means no further development. The existing temporary structures at Hale Pohaku will not be adequate to provide support facilities for anticipated personnel and visiting scientists when all six telescopes are in full operation. As part of a Tripartite Agreement which established the Canada France-Hawaii Telescope Corporation, the University of Hawaii agreed to construct a mid-level station on Mauna Kea which would include living accommodations, offices, and laboratories (Appendix D). The University has similar agreements with the United Kingdom and with NASA. If a mid-level facility is not constructed on Mauna Kea the University will not be able to fulfill these national and international obligations.

The Mauna Kea Plan (1977) recognized the need for planned expansion of the mid-elevation facility and recommended Hale Pohaku as the location. The Mauna Kea Plan also directed that a portion of the Hale Pohaku area be designed for public use as a park and as a central point for management of the mountain. Because of the policies established in the Mauna Kea Plan and because the University of Hawaii would have to break international agreements if the mid-level facilities are not constructed, the alternative of no further development was rejected.

B Alternative Locations for Mid-Level Facilities

1.0 Selection Criteria

Two of the most important criteria for determining the appropriate location for the mid level facility were. (a) convenient vehicular access to the telescopes; and (b) an elevation high enough to maintain high-altitude acclimatization for those working at the summit. Astronomers typically work 12 hours at 13 800 feet in the cold; sleep, eat and go back up the mountain. Long commuting distances would be an unreasonable burden on personnel working under these conditions and not remaining acclimated during their on duty period could possibly be dangerous to their health.

The main purpose of a mid-elevation facility is altitude acclimatization for observatory personnel. Existing policy requires that astronomers remain at the temporary mid-level facility at Hale Pohaku for at least 24 hours so that they can physically adjust to higher elevations before proceeding up the mountain to the rarefied atmosphere of the 13,800 foot summit. The unions representing the United Kingdom technical and maintenance personnel at the UKIRT telescope have the same requirements included in their contracts.

There are important medical reasons for requiring acclimatization of personnel who work at the summit. Individuals going directly from sea level to nearly 14,000 feet can suffer from mountain sickness (Seroche). One of the most serious effects of altitude sickness is pulmonary edema. Even if

summit workers are not affected by edema they may suffer a number of symptoms such as headache, nausea, somnolence, vomiting diarrhea, loss of mental acuity, and difficulty in concentration, which could reduce their capability to function for several days.[28] In a 1970 study of High Altitude Sites and IR Astronomy, Gerard P. Kuiper states that "operation (of observatories) around 14,000 - 18,000 feet is possible under strictly controlled conditions. . . astronomers should be adapted a few days beforehand to 8,000 to 10,000 foot elevation at the base-laboratory, and only persons admitted to high altitude who have passed a heart examination and stood up well at the 9,000 foot level." The following table, from H. G. Armstrong, Principles and Practice of Aviation Medicine, 1943, which was reproduced in the above cited Kuiper report, presents data on loss of human efficiency vs. duration of high altitude exposure at various elevations:

Exposure (hours)	Loss of Efficiency 0%	20%	40%	60%%	80%	100%
1	9*	12	14	16	18	20
6	9	12	14	15	16	18
18	9	11	13	14	15	16

* Elevations in 1,000 feet; 100% = unconscious

The work schedule of astronomers and support staff is such that within a day of arrival at the mid-level, they are expected to shift their sleeping schedule 12 hours (night to day); work typically 12 hours at 13,800 feet in the dark and cold; sleep, eat and go back up the mountain. Mid level facilities are necessary so that acclimatization can

be maintained throughout their observation programs. Astronomers and technicians must be alert and in good health in order to make the most efficient use of their time and to warrant the investment in their specific research operations.

2.0 Hilo and Waimea

Hilo and Waimea were discussed as possible sites for the astronomy support facility when the need for such accommodations was first determined. These two locations were not investigated in detail during the preparation of the EIS because they not only were too low (Hilo is at sea-level, Waimea at 2,500 feet) for the purpose of acclimatization, but the long driving time to the summit from each of these towns would not allow for efficient and safe utilization of manpower. These sites were rejected for those reasons.

3.0 The Summit

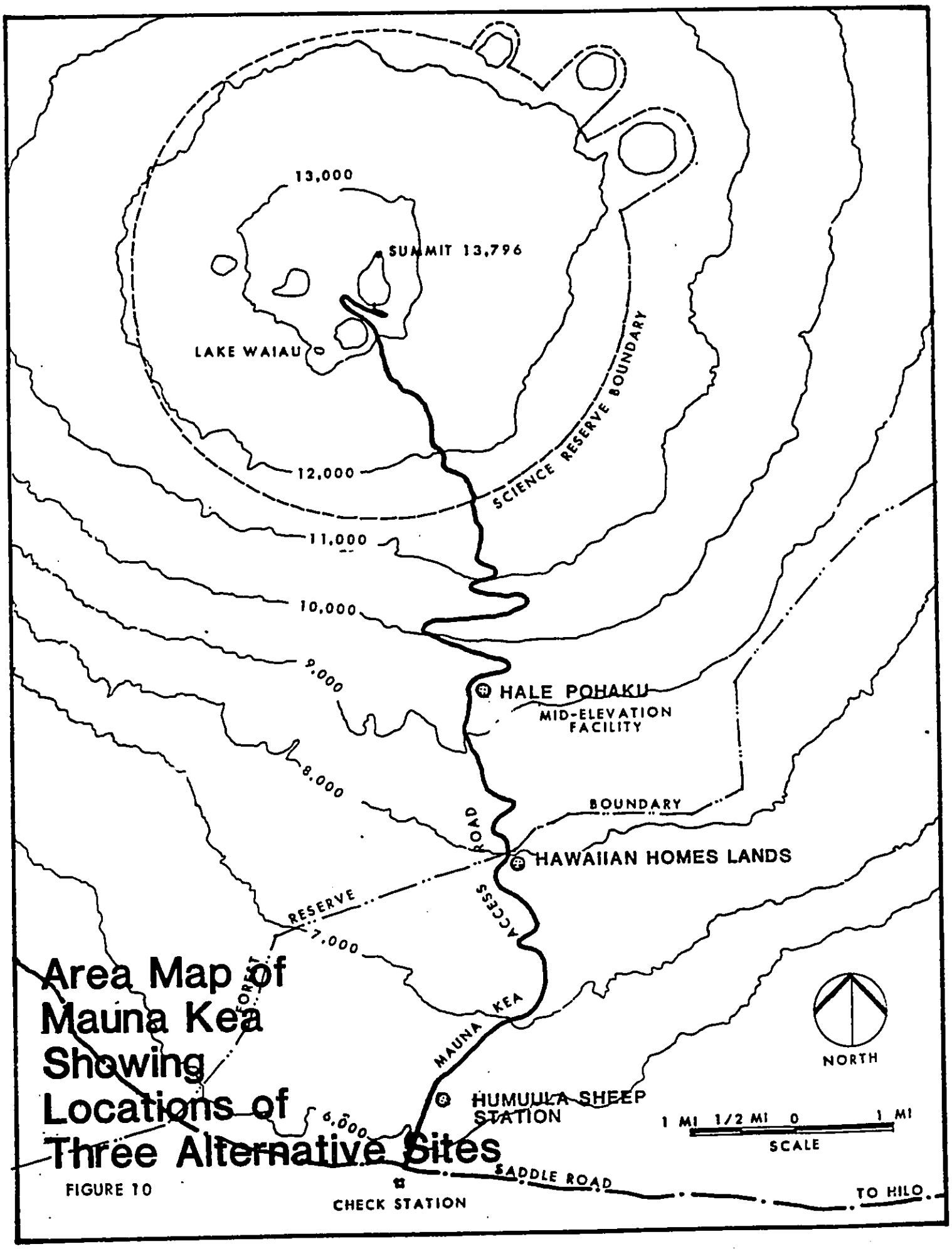
It is normal practice in the astronomy community to provide accommodations for observing astronomers and for maintenance and support personnel in the immediate vicinity of the telescopes. The Mauna Kea Science Reserve, where the telescopes are located, is not suitable for this purpose because the 13,800 foot summit is too high to allow comfortable sleeping. The Summit is also limited in space and thus must be reserved for astronomical functions that cannot be conducted elsewhere. For these reasons, the Summit was rejected as a location for observatory support facilities.

4.0 Humu'ula Sheep Station (Figure 10)

A site in the vicinity of the Humu'ula Sheep Station, east of the Mauna Kea Observatory Access Road just above its junction with the Saddle Road, was evaluated as a possible location for the Mid-Level Facility. There were many advantages to this site: (a) the topography is generally flat; (b) the soils appear stable; (c) there are no signs of erosion; (d) there are electric power lines to the site; (e) mamane trees cover less than 1% of the area and there were no rare plants observed during a recent vegetation survey; (f) it is a marginal bird habitat; and, (g) there is adequate access to the summit. The site is also outside of the Forest Reserve and Game Management Area and is not part of the critical habitat of the Palila.

Although the site is highly visible from the Saddle Road, there are already buildings in the area and Hilo Electric has a microwave station nearby. Impact on the visual features of the mountain would be minimal. There would also be no unacceptable impact on local biota or native bird communities and development would not infringe on the hunting area.

The major negative impact would be on observatory personnel. Humu'ula Sheep Station is at an elevation of approximately 6,600 feet. All of the experts consulted on the subject of acclimatization agreed that this altitude was not sufficient to achieve and maintain high altitude acclimatization for personnel who would be working at or near the 13,800 foot elevation of the summit.[29] Altitude acclimatization is one of the main purposes of a mid-level facility.



Area Map of Mauna Kea Showing Locations of Three Alternative Sites

FIGURE 10

The impacts and thus costs to the environment would be considerably less at Humuula than at Hale Pohaku. The costs to develop the site would probably also be less in terms of dollars and cents. Operating and maintaining separate interpretive/information and access control facilities would result in greater costs and increased manpower requirements and if a park/interpretive/access control area is developed in another area such as Hale Pohaku, the economies of sharing of infrastructure would be lost.

The Mauna Kea Plan specified that Hale Pohaku be developed as a wilderness park. A park at Humu'ula, in close proximity to Pohakuloa, would not provide the alpine experience envisioned in the plan. In addition, if an Information/Interpretive Station were to be placed at Humu'ula, the casual visitor might be inclined to stop, but would undoubtedly want to go further up the mountain, since Humu'ula gives little impression of the varied nature of Mauna Kea.

The disadvantages described above, particularly the altitude as related to acclimatization and the potential danger to summit workers, outweighed the advantages of locating the complex at Humu'ula. The site was therefore rejected as a possible location for astronomy mid-level facilities.

5.0 Hawaiian Homes Land - East of Mauna Kea Observatory Access Road - 8,000 Foot-Elevation (Figure 11)

5.1 Description of the Site

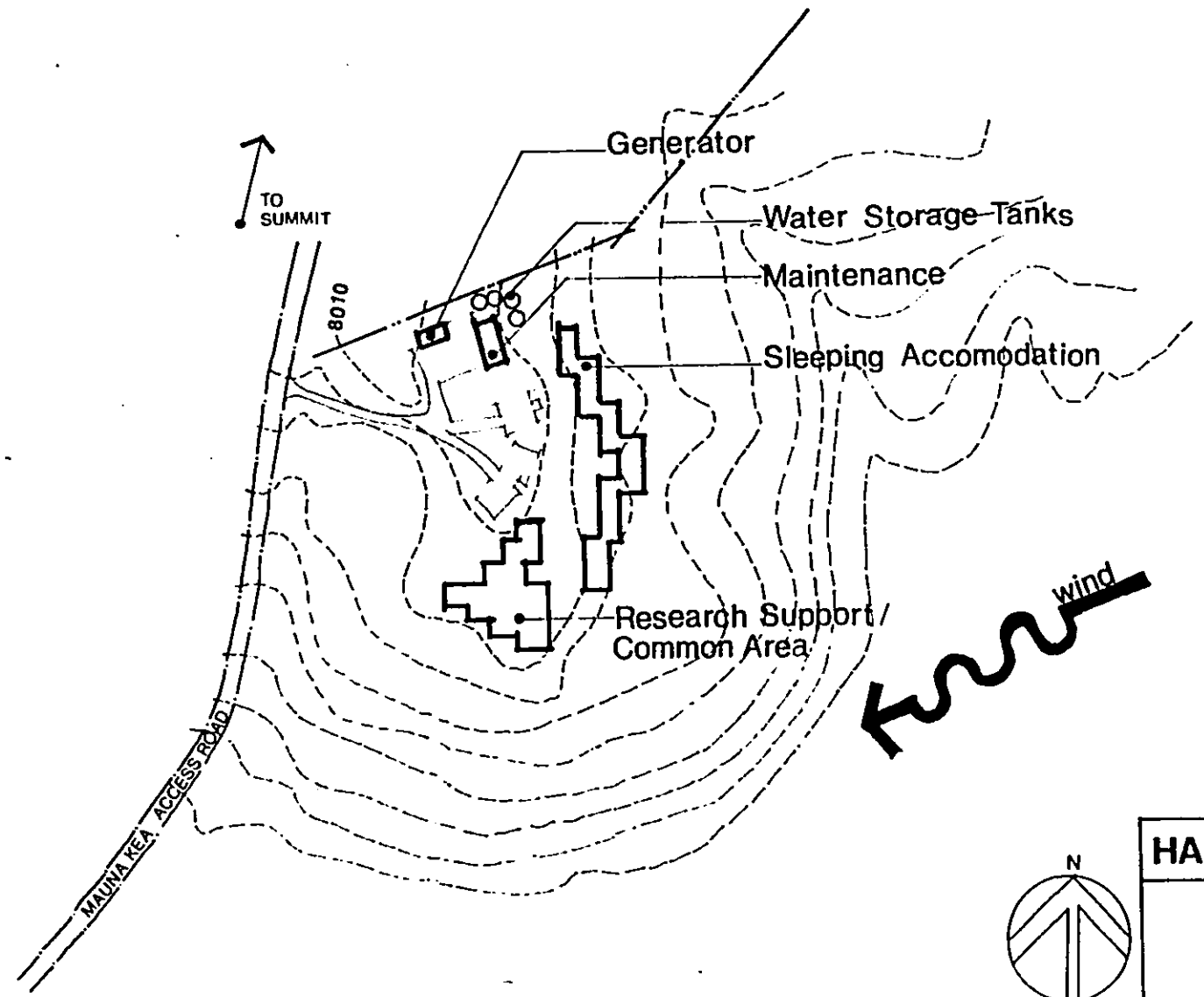
a. Location: The site is located east of the Mauna Kea Observatory Access Road just below the Forest Reserve and Game Management Fence.

b. Vegetation: A savanna of mixed grasses, scattered mamane trees, and a few pukiawe shrubs. Mamane trees cover approximately 10% of the area. No rare plants occur on the site.

c. Fauna Habitat provides marginal game bird range and appears to be suitable for several passerines. The disturbed nature of the forest would not provide adequate resources for Palila populations. The site is outside of the critical habitat of the Palila.

d. Historical/Archaeological. There are no historical or archaeological sites in the area.

e. Soils: Soils in the area are classified as Kilohana loamy fine sands 12% to 20% slopes. The soil appears to be lacking in sufficient amounts of organic and inorganic soil



HAWAIIAN HOMES LANDS
CONCEPTUAL SITE PLAN

N

scale
0 100 200 400

HALE POHAKU 9/ /79

GROUP 70 INC
Architects
Planners
924 Bethel St
Hon HI 96813

FIGURE 11

binders which contributes to its highly erodable qualities and low compactibility. Soils tests would have to be made to verify this observation.

f. Topography: The terrain has a slope of 6 to 20%. There is a grade differential from the road and the higher parts of the site. There is a fairly flat area right off the road.

g. Views There are distant views of Mauna Kea.

h. Access. There is no existing access to the site from the Mauna Kea Observatory Access Road. An internal road system would have to be constructed. The length of access roads and internal roads and consequently the amount of grading required for these facilities would depend upon site layout. Access to the observatories is good (about 12 miles).

i. Utilities: None. Electrical power and water distribution systems would have to be constructed. Cesspools or septic tanks and water storage tanks would also be required.

j. Drainage: Appears to be good with some signs of soil erosion. When the area is developed there will be

erosion due to the soil qualities and the slope. Drainage improvements would have to be made.

k. Availability: The site is under the jurisdiction of the Department of Hawaiian Homes Lands. A lease would have to be negotiated in order to use the property. In order to obtain such a lease a determination will have to be made as to whether a new lease to the University will be considered a "general" lease, that is, a lease for commercial use or use by the general public. Issuance of such leases is currently in limbo pending the development of new rules based on requirements established in a recent Constitutional amendment. This amendment calls for the offering of land to Hawaiians before general leases are given to non Hawaiians. If it determined that a lease to the University does not fall into the "general" lease category, then the Hawaiian Homes Commission will pass on the issue. In addition, if the parcel is currently leased, the lessee must be willing to relinquish his lease voluntarily.

l. Zoning: This site is in the State Conservation District, General Use Subzone. A conservation district use permit will have to be obtained in order to develop the facility.

Government facilities, where the public benefit outweighs any impact on the Conservation District, are allowed in a General Use subzone. The site is also classified Conservation in the Hawaii County General Plan and is designated A-40a Agriculture in the County Comprehensive Zoning Ordinance. The area is marginal for agriculture use and has been used for grazing of cattle in the past.

5.2 Impact Analysis

The area is relatively barren and currently is unimproved. With the exception of fences, there are no structures which are visible from the site. Any development in a remote area, no matter how well planned, will intrude upon the natural wilderness quality of the area. The siting and design of structures to blend with the natural terrain and appropriate landscaping would help to mitigate this impact, although some structures and the access road would be visible from the Mauna Kea Observatory access road (Figure 11). If the Park and Interpretive Station are located at Hale Pohaku, it would mean that two areas on the mountain would be developed, thus increasing the visual impact and intrusion on the natural features of Mauna Kea.

Approximately 30 mamane trees on the site cover about 10% of the area. It is undetermined at this time how many mamane

trees, if any, would have to be removed in order to construct the mid-level facilities. The impact of construction on the mamane/naio eco-system at this site would probably be minimal. A mamane replanting program could be undertaken to improve the quality of the forest in this area. No rare plants or other native plants of special interest occur on the site. The site is outside of the Forest Reserve and is not included in the critical habitat of the Palila.

Erosion will be a problem at the site if it is developed. If left unchecked, gullies or bank erosion can undermine the vegetation and building foundations. This problem also occurs at Hale Pohaku and is probably more severe there than at the Hawaiian Homes Lands site. Remedial soil stabilization measures, drainage improvements, and restrictions on the amount of grading would be required at both sites in order to minimize this impact.

"Due to the already highly disturbed nature of this site, construction of mid-elevation facilities would have no effect on Palila populations, and would certainly have little appreciable impact on other bird species. The greatly reduced potential impact on both populations of Palila and other native birds posed by construction at this site constitutes a major advantage for use of this as a . . . site from an ornithological point of view." (Stemmerman, 1979) The site is outside the federally designated critical habitat of the Palila and thus construction there would

not involve consultation with the U.S. Fish and Wildlife Service. The area is also out of the game management area and thus the impact of development of the site on hunters would be minimal.

The impact of locating the mid-elevation facilities at this site could be significant and negative to observatory operations and personnel. The elevation of 8,000 feet is at the lower limit of the suitability range for acclimatization and it may not be high enough to elicit the physiological responses necessary to acclimatize the average person who would be working at the summit. Although documentation on this subject is limited, those knowledgeable in the field who responded to queries from the Institute of Astronomy felt that about 9,300 feet was a more appropriate elevation if such a site was available.[30] (Appendix F)

The Hale Pohaku site has been a developed area since the construction of the stone cabins. Before these cabins were built Forestry had a cabin and auxiliary buildings in the vicinity of the Hawaiian Homes Lands site at Ho'okomo. This complex was used by Forestry personnel who were building and maintaining the fence and by workers constructing the road to Hale Pohaku. After completion of the road, and when help became available from the CCC, the cabins were built at Hale Pohaku to replace the Ho'okomo complex. There were several reasons for building the complex at Hale Pohaku. One reason was to be as high as possible to the summit, but a second reason was that the

altitude at Hale Ponaku was more suitable than Ho'okomo for acclimatization. There was a need for facilities at Hale Pohaku so that hunters, hikers and snowplay visitors could acclimatize themselves before proceeding up the mountain. At that time, people walked the distance from Hale Pohaku to the snow or summit.[31]

Construction of a mid-level facility on the Hawaiian Homes Lands site rather than at Hale Pohaku would probably reduce the negative impacts on the mamane-naio eco-system and the Palila. It may also be a less costly site to develop even though a 200-foot access road across the contour would be required. The visual impact of the facility as one travels the Mauna Kea Observatory Access Road would be more severe than at Hale Pohaku. If this site were selected, it would entail development at two sites on the mountain - the park at Hale Pohaku and the mid-level facilities downslope below the fence.

The risk of developing a multi-million dollar support facility which may not be of sufficient altitude to accomplish the primary purpose of the facility (to achieve and maintain acclimatization of all personnel who work on the summit), outweighed the impacts of additional disturbance to the Hale Pohaku area. In addition, the potential visual impact of construction on a previously undeveloped site and the fact that there is some uncertainty of being able to obtain the Hawaiian Homes Lands parcel for this purpose also augered against its selection as the site

for the mid-level facilities. Therefore, after careful consideration, Hale Pohaku, in the area described in this EIS, was recommended as the location for the mid-level support buildings.

C. Alternate Sites at Hale Pohaku

1.0 Evaluation

Three alternative physical plans, including the selected one which is the subject of this EIS, were evaluated. Each plan was judged on its relative effectiveness in fulfilling the following objectives:

a. To assure user satisfaction with the physical environment while minimizing existing and potential conflicts among the following user groups:

   1) picnickers. sightseers. hikers. skiers; etc. (criteria: privacy; wilderness experience; comfort, view);

   2) astronomy personnel (criteria: privacy, day use activities vs. day sleepers; noise; traffic; service; view); and

   3) hunters (criteria: land taken from hunting)

b. To provide a facility which is efficient, economical, and environmentally sound in regard to the following elements:

1) infrastructure (criteria: degree of consolidation; utilization of existing infrastructure; externalities): and

2) natural constraints of the site (criteria: topography; drainage; climatic conditions).

c. To enhance the existing bio-physical environment and minimize adverse impacts on the following elements:

1) mamane-naio eco-system (criteria: number of trees removed; disturbance of Palila habitat); and

2) visual appearance of the mountain (criteria: distance from Mauna Kea Access Road; amount of grading necessary; visibility from below).

d. To provide a physical plan which will facilitate management and operation of the area with regard to:

1) operational efficiency (criteria: minimizing staffing requirement; minimizing operational conflicts), and

2) safety and security (criteria: for visitors; for astsonomy personnel; otners).

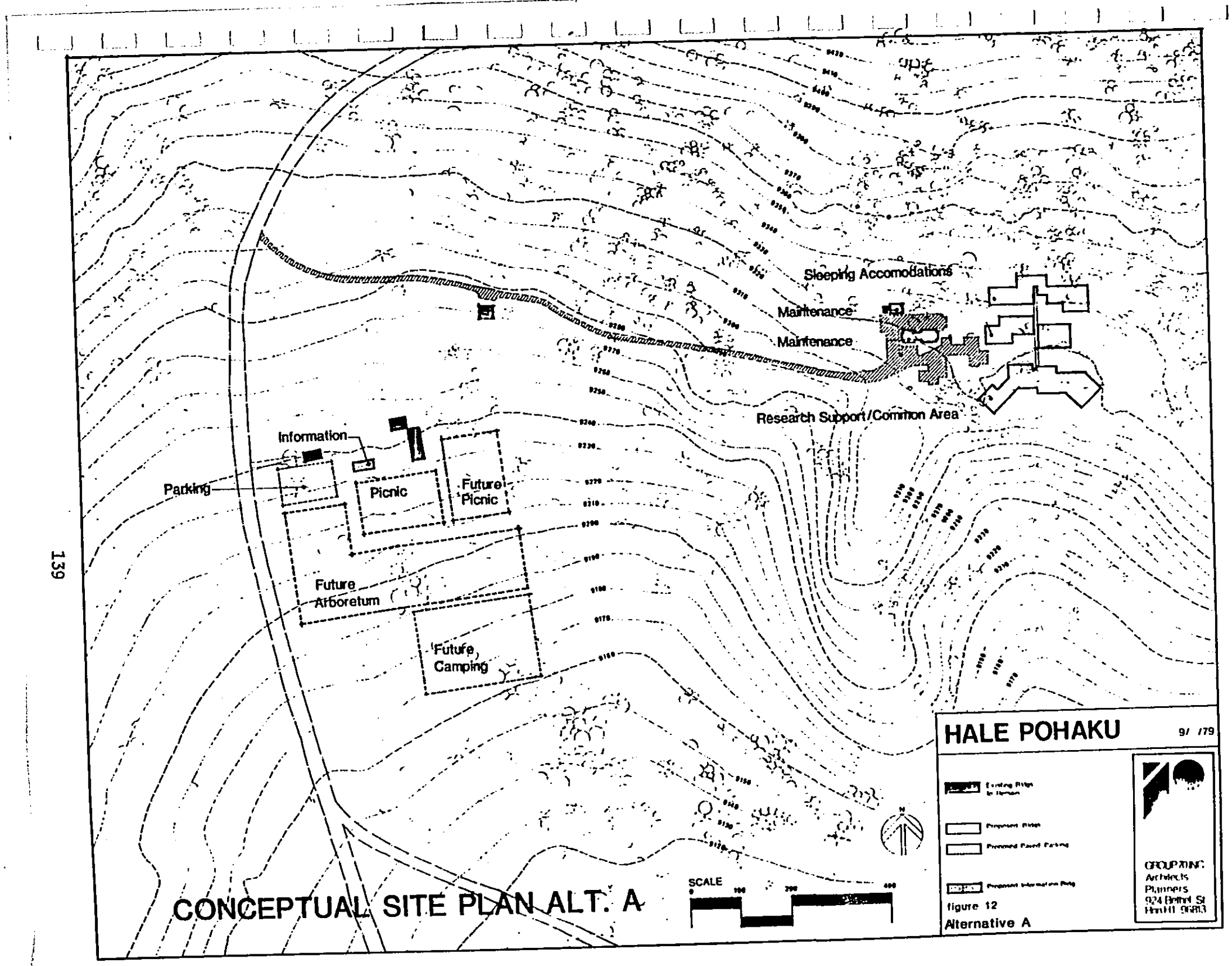
The users and managers were given an opportunity to evaluate each alternative plan. The layout which was originally selected (Alternate A - Figure 12) was chosen by concensus of those who participated in the rating.

The plan finally chosen (Alternative B) was a compromise agreed upon by the users following publication of the Notice of Preparation of EIS for this project (October 8, 1978). Evaluation of comments received during the consultation period revealed that development at Site A could possibly result in potentially significant negative impacts to the environment, particularly the critical habitat of the rare and endangered Palila. A description of the three alternative physical layouts and the advantages and disadvantages of each follows.

2.0 Alternative A (Figure 12)

2.1 Advantages

a. The separation between astronomy and the park should insure privacy for both parks and astronomy personnel and tend to minimize conflicts among users of Hale Pohaku;


Sleeping Accomodations
Maintenance
Maintenance
Research Support/Common Area
Information
Parking
Picnic
Future Picnic
Future Arboretum
Future Camping
CONCEPTUAL SITE PLAN ALT. A
SCALE
HALE POHAKU
9/ /79
figure 12
Alternative A
GROUP 70 INC.
Architects
Planners
924 Bethel St
Honolulu 96813

b. The visual impact of the astronomy buildings on the mountain would be minimized because the facilities would not be visible from the Mauna Kea Observatory Access Road below Hale Pohaku;

c. The existing stone cabins can be incorporated into the park;

d. The definite separation between the two areas should minimize jurisdictional conflicts in operations between parks and astronomy;

e. The physical layout could afford good views to both park users and astronomy personnel; and

f. It is possible to separate visitor traffic from astronomy traffic.

2.2 Disadvantages

a. It is a previously undeveloped site. The proposed astronomy site has an above average number of mamane trees growing on it and construction of the facility would necessitate the removal of 30 or more clumps;

b. The scheme would result in additional acreage being posted for no hunting;

c. There is a probability of scarring the mountain if the access road to the proposed astronomy facility were built along the contour;

d. Because of the separation between the astronomy buildings and the park, either an extensive utility distribution system would have to be built or duplicate systems would have to be provided;

e. More drainage improvements will be required at this site than at the others in order to prevent extensive soil erosion.

2.3 Evaluation

This plan was originally chosen for the mid-elevation facilities and the park because it was superior to all of the others from the point of view of the users. Both Astronomy representatives and State Park planners felt that such a layout would satisfy both of their needs. It would afford astronomy the necessary privacy and quiet required for sleeping during the day, while the park visitors could enjoy the wilderness without the astronomy buildings intruding on the experience. This scheme would result in the least visual impact on the natural features of the mountain because the astronomy complex would be secluded and hidden from view.

There are serious deficiencies in this scheme from an environmental point of view. The most serious is the potential disturbance to the mamane-naio eco-system in the astronomy area. Although there are measures that could be taken to minimize negative environmental impacts, the long-term negative effects of building in this undisturbed site could probably not be satisfactorily mitigated, the University of Hawaii therefore agreed to compromise their requirements and accept an alternative scheme which would impact the environment less severely. (An environmental specialist representing the British interests in the consortium was called upon to verify these findings before the British agreed to a move from Site A.)

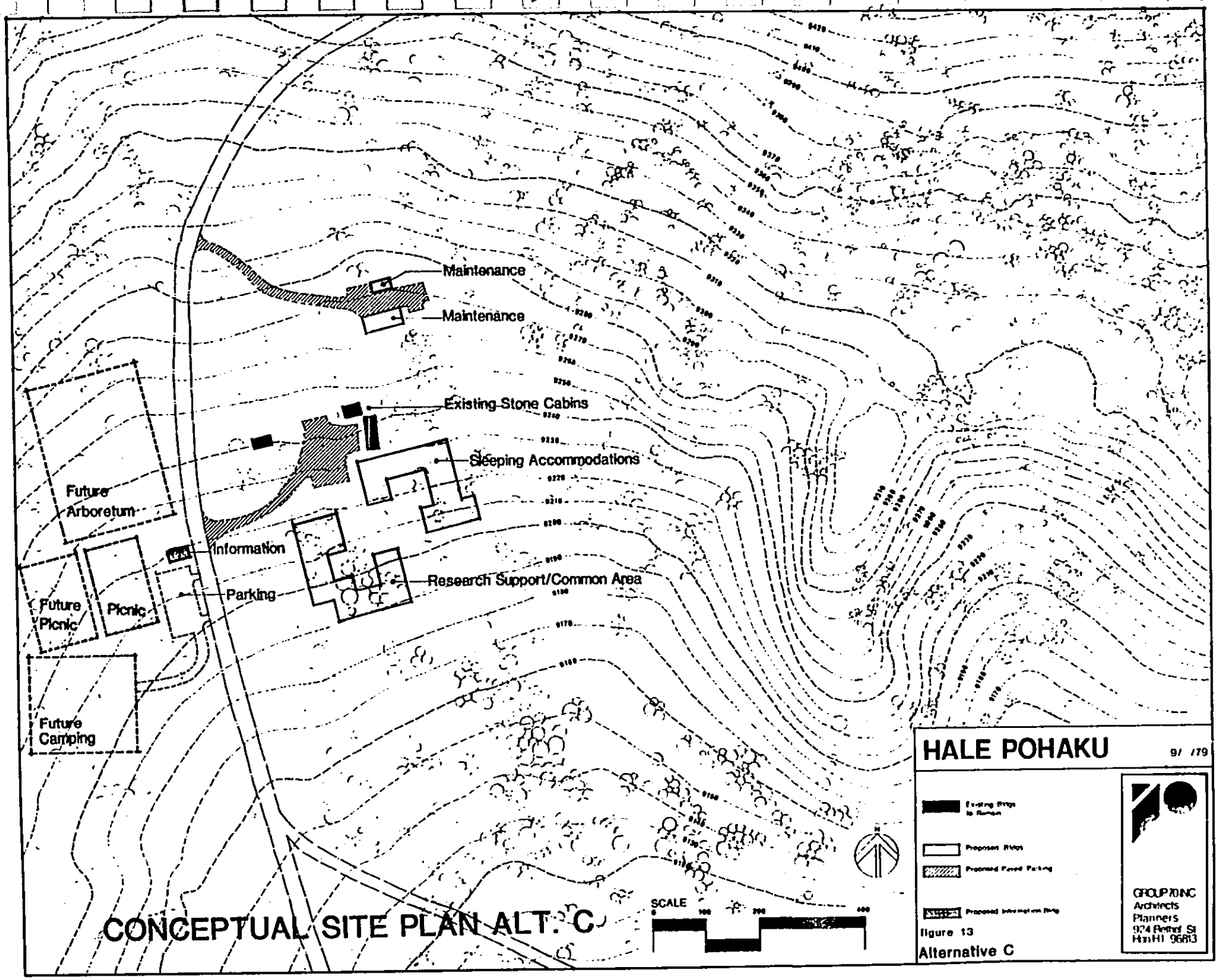
3.0 Alternative C (Figure 13)

3.1 Advantages

a. There is privacy for the astronomy buildings because they are separated from the park area by the road.

b. The layout does not require much additional land to be taken from hunting;

c. There are good views from the astronomy area;


Maintenance
Maintenance
Existing Stone Cabins
Sleeping Accommodations
Future Arboretum
Information
Parking
Research Support/Common Area
Future Picnic
Picnic
Future Camping
CONCEPTUAL SITE PLAN ALT. C
SCALE
HALE POHAKU
9/ /79
Figure 13
Alternative C
GROUP 70 INC
Architects
Planners
974 Bethel St
Hon HI 96813

d. The astronomy facility is close enough to assist visitors in emergencies;

e. The close proximity of the two areas could facilitate coordination of water and fuel delivery and solid waste disposal;

f. Some of the existing roads to the astronomy buildings could be used; and

g. A minimum amount of grading would be required.

3.2 Disadvantages

a. There would be development on both sides of the Mauna Kea Observatory Access Road;

b. There could be significant disturbance to the vegetation;

c. The astronomy buildings would be highly visible from the park;

d. Utility lines would have to cross the road if water and power storage and distribution systems were shared; and,

e. The wind angle could result in discomfort for park users.

3.3 Evaluation

This scheme was rejected primarily because development on both sides of the road would produce a significant negative visual impact on the area. The characteristics of the site would also make it difficult to site the park area so as to allow some sense of privacy and protection from the elements for park visitors. Developing the mid-level facility in this layout would also require disturbing an area in which the mamane are relatively dense.

4.0 Alternate B - The Plan (Figure 1)

4.1 Advantages

a. The site is already developed and thus disturbed;

b. Development at this site would only entail the removal of between three and ten mamane trees;

c. The major portion of the development is planned for the existing no hunting zone;

d. Some of the existing infrastructure and roads could be used;

e. Utility systems and storage systems could be shared;

f. Water and fuel delivery and solid waste disposal could be consolidated; and,

g. Minimum grading should be required.

4.2 Disadvantages

a. Extensive drainage improvements will have to be made to the site before development to prevent erosion;

b. Limited views;

c. There would not be enough separation between the park and astronomy areas to avoid some conflict between day use activities of the park and day sleeping of astronomy;

d. Astronomy facilities would be visible, as they are now, from the Mauna Kea Observatory Access Road below Hale Pohaku;

e. Traffic noise might be a problem to astronomers because of proximity of dormitories to the road; and

f. Construction of facility buildings in close proximity to the existing dormitories could make it difficult for personnel to sleep during the day for the duration of the construction period.

4.3 Evaluation

The potential user conflicts generated by the close proximity of the park to the astronomy buildings and the negative visual impact of having the astronomy buildings so close to the road were the major criteria for rejecting this scheme in the initial selection process. Correspondence and discussion with various concerned individuals during the consultation period following publication of the Notice of Preparation of EIS for this project (October 1978) led to a re-evaluation of this scheme as a potential plan for Hale Pohaku. This scheme would result in the least disturbance to the mamane-naio eco-system of the three that were prepared for Hale Pohaku. The area is presently developed and expansion of the mid-elevation facilities would not result in extensive additional disturbance of the area. The positive and negative environmental impacts of this plan are discussed in detail in the Environmental Impacts section of this EIS.

5.0 Summary

Hale Pohaku was chosen as the general location for the Mid-Elevation Facility and State Park because: (a) it is the most superior of all available locations for the purpose of acclimatization of observatory personnel: (b) the area is already developed, and some of the existing infrastructure can be incorporated into the new facilities; and (c) the site was specified in

the guidelines of the Mauna Kea Plan which stated that the mid-level facilities should be located at Hale Pohaku and should be in proximity to the park so that development on the mountain can be consolidated for the reasons of aesthetics and efficiency.

The physical plan that is described in this EIS was selected as a compromise between need for protection of the environment and the requirements of park and astronomy users. The plan minimizes disturbance to the mamane-naio eco-system while still providing a pleasant view from the park (astronomy facilities will be separated by dense stands of vegetation). The area is presently developed and construction of the permanent mid-elevation facilities will not result in extensive additional disturbance to the mountain. The resulting facility should improve the appearance of the area as it is today and efforts will be made to revitalize the mamane forest in the area.

PART VII: THE RELATIONSHIP BETWEEN LOCAL SHORT-TERM USES OF MAN'S ENVIRONMENT AND THE MAINTENANCE AND ENHANCEMENT OF LONG-TERM PRODUCTIVITY

The proposed actions for Hale Pohaku have considered the environmental attributes of the area, the conditions for use of the area set forth in the Mauna Kea Plan, the Federal requirements for proposed developments in a critical habitat, the needs of the University of Hawaii, Institute for Astronomy, and the needs of the various divisions of the Department of Land and Natural Resources. ". . . the ancient Hawaiians recognized the high value of Mauna Kea resources and, because of this recognition, Mauna Kea was a regional resource probably exploited for the benefit of all and as long as this attitude is maintained so will be the Hawaiian tradition." (Olson, UH Department of Anthropology, 1979)[32] The proposed Master Plan, when implemented, will allow controlled use of the area for educational, recreational, and scientific activities in a manner that will allow opening the area to more people, while still minimizing disturbance to the natural environment.

The permanent mid-elevation facilities will foreclose future recreation options in the immediate area of the astronomy facility. The recreation resources at Hale Pohaku, per se, though, are limited and the area is generally used as a staging area for recreation activities elsewhere on the mountain. A new park and picnic area, will be provided about 700 feet downslope from the astronomy buildings the existing stone cabins will be returned to the jurisdiction of DLNR for possible use by recreationists.

Hale Pohaku, and an area extending to 400 yards from the farthest facility, will be closed to hunting. This hunting restriction currently is in effect for all but 100 yards of the proposed area. Alternative recreation uses will be provided at the Park and other areas of Mauna Kea will continue to be open to hunting.

Mid-elevation facilities are necessary to support the astronomical activity at the summit. They are also necessary for the health of astronomy personnel who may possibly suffer altitude sickness and would definitely lose efficiency at the summit if they are not properly acclimatized. Hale Pohaku was the only suitable area available for these facilities. The trade-off of not constructing the astronomy facility would either be continued occupancy of temporary, unattractive buildings; risking the health of astronomy personnel by requiring them to go directly from sea level to the summit; or drastic curtailment of scientific activities at the summit. The importance of the astronomy work on Mauna Kea was felt to justify the taking of three additional acres of land at Hale Pohaku for this purpose.

PART VIII: IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

State funds, human labor, construction and building materials, and fuels will be commited to the project. Maintenance and operation manpower and funds will be required. Water will be needed for occupants of the mid-elevation facilities, park users, and landscape irrigation. Fuel will be consumed to provide the electrical needs of the mid-elevation facilities and the park. Fuel will also be consumed by trucks making trips to replenish the water supply. Hale Pohaku will be a developed area, rather than wilderness, for as long as astronomy is a viable industry on Hawaii.

PART IX: AN INDICATION OF WHAT OTHER INTERESTS AND CONSIDERATIONS OF GOVERNMENT POLICIES ARE THOUGHT TO OFFSET THE ADVERSE ENVIRONMENTAL EFFECTS OF THE PROPOSED ACTION

Coordination among the consultants, the University of Hawaii s Institute for Astronomy the U.S. Fish and Wildlife Service, and the Department of Land and Natural Resources Division of Forestry, when locating the proposed facilities in the Hale Pohaku area, is seen as a major countervailing force to potential adverse effects of development in the critical habitat of the endangered Palila. Consultation with experts in the fields of botany and biology have also led to modification of actions that might produce negative impacts in the area.

Inclusion of a manned Information Station as a means of educating the public to environmental concerns and disseminating information concerning the rules and regulations of the Department of Land and Natural Resources will also be a force in minimizing adverse impacts on the ecology and natural features of the area. DLNR personnel will assist in control of the mountain and enforcement of DLNR regulations.

Strict adherence to the policies and conditions set forth in the Mauna Kea Plan concerning development at Hale Pohaku also acted to curtail adverse environmental impacts to the area. The Conservation District Use Permit which is required before the facilities are constructed will also insure that all of the most important environmental aspects have been considered in the design of the facility and that all restrictions placed on the permit as a condition of approval will be strictly adhered to.

The Hale Pohaku Master Plan wil be used to control land uses and prevent haphazard development. The guidelines, criteria, and boundaries established within the Master Plan will also enable more informed decisions to be made concerning future actions in the area.

PART X. LIST OF NECESSARY APPROVALS

1. Conservation District Use Permit - Department of Land and Natural Resources

2. State of Hawaii - Department of Health

3. County of Hawaii - Building Department - Building Permit

   a. Engineering

   b. Structural

   c. Mechanical

   d. Civil

   e. Sewers

   f. Land Use

   g. Fire

   h. Architectural

PART XI: AGENCIES, ORGANIZATIONS, AND PERSONS CONSULTED IN THE PREPARATION OF THIS EIS

The following persons and firms were contacted for professional services and/or specialized advice on various aspects of this EIS:

Patrick C. McCoy, Archaeologist	Historical/ Archaeological Reconnaissance Survey
Grant Gerrish, Botanist	Vegetation Survey
Maile Stemmerman, Ornithologist	Avian Survey
Charles van Riper, III, Ph.D. University of Hawaii CPSU Hawaii Field Research Center Hawaii Volcanoes National Park	Palila expert
Paul Scrowcroft U.S. Forest Service Institute of Pacific Islands Forestry	Mamane expert
Stanley Young, C.E. Fukunaga & Associates Inc.	Civil Engineering
Forrest Bennett	Electrical Engineering
Donald Manuel	Mechanical Engineering
Eugene Kridler Ernest Kosaka U.S. Fish & Wildlife Service	Critical Habitat of the Palila
Rodney Kawamura Hilo Engineering, Inc.	Topographic Studies
Jake Manegdeg Land Division Department of Hawaiian Homes Lands	Hawaiian Homes Lands Leases

The following agencies, organizations, and individuals received copies of the EIS Notice of Preparation. Starred (*) agencies, organizations, and individuals responded to the notice and double starred (**) respondents made substantive comments which are included in this section of the EIS.

Federal

* Department of Agriculture, Soil Conservation Service
** Department of Energy
Department of the Interior (Water Resources Division)
** Fish and Wildlife Service
** National Park Service
U.S. Forestry Service (Institute of Pacific Island Forestry)

State

* Department of Accounting and General Services
* Department of Agriculture
** Department of Health
* Department of Planning and Economic Development
** Department of Transportation
University of Hawaii
* Director of Administration
Environmental Center
* Institute for Astronomy
** Lyon Arboretum
* Water Resources Research Center

State Legislature

Representatives for the Hawaii District (5)

Senators from the Hawaii District (3)

House Committee on Ecology

House Committee on Water and Land

Senate Committee on Environment, Recreation and Ecology

<u>County of Hawaii</u>

Mayor s Office

* Hawaii County Council

Fire Department

* Parks and Recreation

** Planning Department

** Police Department

Public Works Department

** Research and Development

* Water Supply Department

<u>Organization and Individuals</u>

Animal Species Advisory Committee

** Bishop Museum

Board of Realtors, Hawaii Island

Chamber of Commerce, Hawaii Island

Conservation Council, Hawaii Island

Construction Industry Legislative Organization (CILO)

Hamakua District Development Council

** Hawaii Audubon Society, Island of Hawaii Representative

Hawaii Botanical Society

Hawaii Society of Professional Engineers, Big Island Center

Hawaii Trails and Mountain Club

Hawaiian Electric Company

** Hawaiian Telephone Company

Hilo Contractors Association

* Hilo Electric Company

Hunters Association

* Mr. Lawrence Katahira

* Life of the Land

Mauna Kea Ski Patrol, Hawaii

Sierra Club

Sigma Xi Club, University of Hawaii at Hilo

Ski Association of Hawaii

Mark Smith, Gamman & Associates

Sierra Club, Moku Loa Group, Hawaii Chapter

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P. O. BOX 50167
HONOLULU, HAWAII 96850

November 27, 1978

Mr. W. Y. Thompson, Chairman
Board of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Re: Hale Pohaku Mid-Elevation Facilities Master Plan, EIS
EIS Preparation Notice

Dear Sir:

We have reviewed the referenced Environmental Impact Statement Preparation Notice and offer the following comments:

General Comments:

No mention was made of the project area and access road being located within federally recognized critical habitat for the endangered palila. If federal funds such as a grant from the National Aeronautic and Space Administration are to be used in conjunction with project development, formal consultation with the U.S. Fish and Wildlife Service will be required as mandated by guidelines for implementation of Section 7 of the Endangered Species Act of 1973. Please contact Mr. Eugene Kridler, Pacific Area Office Endangered Species Coordinator, at the following address for additional information concerning consultation requirements:

Office of Endangered Species
U.S. Fish and Wildlife Service
300 Ala Moana Blvd. Room 5302
P. O. Box 50167
Honolulu, Hawaii 96850

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

Should the existing facilities need to be expanded, consideration should be given to their location at a lower elevation. This relocation should be presented as an alternative in the Environmental Impact Statement. This was recommended some years ago before the present site was developed. If existing facilities must be relocated, they should be relocated out of the game management and mamane-naio forested areas.

Specific Comments:

Page 11. The camp, picnic and housing facilities should be designed in such a manner as to minimize removal of native vegetation. In particular, slow growing trees should be conserved. Should replanting be necessary, seeds must be obtained from sources near the proposed project area to avoid gene pool contamination. No closely related plants should be introduced from the other parts of the state or island.

Page 16, Section 1.4. The same precaution mentioned above regarding local plantings should be taken for the arboretum.

Page 17. If new University of Hawaii mid-level facilities are to be constructed, their relocation to Humuula or another area where impact would be minimal should be considered.

Page 29, Section 7.1. Be more specific as to which, if any, endangered plants are in the project site. The improved road site should be surveyed also.

Page 33, Section 7.21. Although Berger mentioned that the palila feeds on dry seed pods, this type of food is rarely taken. The green seed pods are the preferred food.

The statement concerning palila nesting at Kaohe G.M.A. is misleading. This area is on Mauna Kea also. Palila nest elsewhere on Mauna Kea, and have been recorded close to Hale Pohaku during palila surveys. They are extending their present known range to the paved road leading from Saddle Road to Hale Pohaku. The palila are probably reoccupying former range now recovering from damage by feral goats and sheep.

Page 54, Section 3.3. The Endangered Species Act of 1973 prohibits any federal action which would contribute to the further endangerment of federally recognized endangered species. Therefore, at this time there is no mitigation for loss of, or damage to, species so designated for federally sponsored or funded projects. However, the precautions included in this discussion are appropriate.

This portion of the discussion should include the potential impact of the human as an accidental agent in exotic weed transmission.

We appreciate this opportunity to comment.

I also would like to take this opportunity to request a copy of the Mauna Kea master plan referenced in this document.

Sincerely yours,

Maurice H. Taylor
Field Supervisor
Division of Ecological Services

cc: HA
HDF&G

December 18, 1978

Mr. Maurice H. Taylor, Field Supervisor
Division of Ecological Services
U.S. Department of Interior
Fish and Wildlife Service
P. O. Box 50167
Honolulu, Hawaii 96850

Dear Mr. Taylor:

Mauna Kea Hale Pohaku Mid-Elevation
Master Plan

Thank you for reviewing and commenting on the EIS Preparation Notice for the Hale Pohaku Mid-Elevation Facilities Master Plan. We appreciate your interest in this project.

Our consultant, Group 70, Inc., has been in contact with Mr. Eugene Kridler to obtain information concerning the critical habitat designation for the endangered Palila bird. They have also discussed consultation procedures with him in the event that federal funds are actually involved in the project.

The additional information that you have supplied us with concerning the feeding and nesting habits of the Palila bird will be incorporated in the draft EIS. The draft EIS will also be more specific as to endangered plants on the project site and appropriate mitigation measures to insure their survival.

Your other comments concerning the arboretum and alternate sites are currently under discussion among the various divisions of the department. We will respond to these comments at a later date.

Very truly yours,

W. Y. Thompson

W. Y. THOMPSON
Chairman of the Board

RTC:JYY:jes
bcc: Div. of Fish & Game
Division of Forestry
cc: Group 70, Inc.

9757

United States Department of the Interior

NATIONAL PARK SERVICE

HAWAII STATE OFFICE
300 ALA MOANA BLVD., SUITE 6305
BOX 50165
HONOLULU, HAWAII 96850

IN REPLY REFER TO:
L7621

November 30, 1978

Mr. William Y. Thompson
Chairman of the Board
State Dept. of Land & Natural Resources
P. O. Box 621
Honolulu, HI 96809

Dear Bill:

As requested in your October 19 letter, we have reviewed the Hale Pohaku Environmental Impact Statement, Notice of Preparation and offer the following comments.

The document is very comprehensive and in keeping with the guidelines set forth in the Mauna Kea Plan. The Anticipated Environmental Impacts and Mitigating Measures section is well done; the analysis appears complete and objectively written.

We strongly concur with the requirement that all buildings and structures harmonize with the landscape. We suggest, however, that the plan also include some guidelines for storage of equipment and miscellaneous supplies in the scientific complex. Regardless of how architecturally pleasing and environmentally compatible the complex is designed, ugly bone piles and sundry clutter eventually accumulate unless some control is exercised.

The frequently specified intent to use only plants native to Mauna Kea for landscaping purposes is highly commendable. We also fully endorse an arboretum concept for silverswords and other interesting but rare Mauna Kea plants.

We note on page 13 that fire control procedures have not been finalized. Our only suggestion would be that a small fire cache be placed in the immediate visitor area so fires that might start could be quickly extinguished.

We believe the plan is well done at this stage and when implemented should provide suitable conditions for both visitor use and astronomical research support while at the same time maintaining the natural integrity of the mountain.

You deserve congratulations for a fine, sensitive job! Thanks for letting us review it.

Sincerely yours,

Robert L. Barrel
State Director

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

December 13, 1978

Mr. Robert L. Barrel
State Director
U.S. National Park Service
Department of Interior
P. O. Box 50165
Honolulu, Hawaii 96850

Dear Mr. Barrel:

Thank you for reviewing and commenting on the EIS Preparation Notice for the Hale Pohaku Master Plan. We appreciate your interest in this project and thank you for your complimentary remarks.

Your point concerning clutter in the Astronomy Complex is well taken. We will try to incorporate some guidelines to mitigate this problem in the Master Plan and draft EIS. Your suggestion concerning a fire cache will also be considered, although at the present time we feel that fires should be banned completely from the picnic area.

We hope you will consider reviewing the draft EIS.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Group 70, Inc.

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9748

Fwd

RECEIVED

Department of Energy
Pacific Area Support Office
P.O. Box 29939
Honolulu, Hawaii 96820

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DEPT. OF LAND
... RESOURCES
STATE OF HAWAII

Mr. W. Y. Thompson
Chairman of the Board
Department of Land & Natural Resources
State of Hawaii
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Thompson:

HALE POHAKU MID-ELEVATION FACILITIES MASTER PLAN, EIS PREPARATION NOTICE

We would like to thank you for your letter of October 19, 1978 advising us of the plans for Mauna Kea and providing us the opportunity to review and comment on the EIS Preparation Notice. Although we often have projects at various locations within the State, we know of no programs at this time that would be influenced by or would influence the Mid-Elevation facilities being planned at Hale Pohaku.

We are pleased to see that the use of motorcycles, dunebuggies, etc., within the area will be forbidden. For the protection of the area and the pleasure of the general public we recommend a strong emphasis be placed on this ban. We would also recommend that the section on the Information/Interpretive Center be developed more thoroughly. Visitors generally have more appreciation for and enjoy an area if they can join a knowledge of the geology and history, and have an understanding of the natural features. Dr. Steven C. Porter of the Department of Geology at the University of Washington at Seattle could be of assistance in this area as he has done considerable geological mapping on Mauna Kea. In 1973 he issued a technical paper in the Geological Society of America Bulletin titled "Stratigraphy and Chronology of Late Quaternary Tephrite On the South Rift Zone of Mauna Kea Volcano".

Sincerely,

W. J. Stanley
Director

OP-940
JWM:idh

GEORGE R ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

December 13, 1978

Mr. W. J. Stanley, Director
Department of Energy
Pacific Area Support Office
P. O. Box 29939
Honolulu, Hawaii 96820

Dear Mr. Stanley:

Hale Pohaku Mid-Elevation Facilities
Master Plan, EIS Preparation Notice

Thank you very much for reviewing and commenting on the Hale Pohaku Mid-Elevation Facilities Master Plan, EIS Preparation Notice. We appreciate your interest in the project.

As per your suggestion, we have written Dr. Steven C. Porter of the University of Washington and have sent him a copy of the EIS Preparation Notice. We have also requested a copy of the paper that you mentioned in your comments of the subject Preparation Notice.

We hope that you will review the draft EIS when it is published.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Group 70, Inc.

HAND TO CLEAN OUR LAND · STATE OF HAWAII

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

December 6, 1978

Dr. Steven C. Porter
Department of Geology
University of Washington
Seattle, Washington 98105

Dear Dr. Porter:

Hale Pohaku Mid-Elevation Facilities
Master Plan, Mauna Kea, Hawaii

Our department is in the process of preparing a master plan and an environmental impact statement on mid-elevation facilities for astronomy personnel and recreational facilities for the general public at Hale Pohaku on the slopes of Mauna Kea. Enclosed for your information is a copy of an EIS Preparation Notice for the subject project which more fully describes the proposed activities and facilities planned.

Part of our planned recreational facility at Hale Pohaku is an Information/Interpretive Center. Mr. W. J. Stanley, Director of the Department of Energy, Pacific Area Support Office, in his review of the EIS Preparation Notice, has informed us of your work on Mauna Kea and of your technical paper "Stratigraphy and Chronology of Late Quaternary Tephrite On the South Rift Zone of Mauna Kea Volcano". He suggests that joining the geology and history of the area would give the visitors a greater understanding and appreciation for the natural features. He further suggests that your technical paper and your knowledge of the geology of Mauna Kea may be of help to us in making such information available to the visiting public.

We would appreciate receiving from you a copy of your paper and any other information which may be of help.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

LAY A HAND TO CLEAN OUR LAND · STATE OF HAWAII

Mr. W. J. Stanley, U. S. Dept. of Energy
Group 70 Inc.

9664

RECEIVED 22 A8:21

University of Hawaii at Manoa

Harold L. Lyon Arboretum
3860 Manoa Road • Honolulu, Hawaii 96822

22 November 1978

RECEIVED DEC 4 1978 GROUP 70 LAB, INC.

Mr. W.Y. Thompson, Chairman of the Board
Dept. of Land and Natural Resources
State of Hawaii
P.O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Thompson,

Thank you very much for transmitting to us the EIS preparation notice of Hale Pohaku Mid-Elevation Facilities. I hereby wish to send you the comments on the statement by our staff.

--The increase of visitors to Hale Pohaku will create problems of fire potential, litter, crime and eventual atmospheric problems. These aspects were briefly addressed in Sec. 3.3 (pg. 54) and Sec. 6.3 (pg. 60) in Part III but more detailed studies should be made into management of the increased visitor load. The scars will be indelible in this fragile environment.

--Establishment of an arboretum is to be commended. There is a great need for one at such elevations.

--Several errors are noted in the Flora and Fauna section. When the genus is used as a common name as in "sophora parkland" it need not be capitalized nor underlined. However, if it is intended to be used as the generic epithet then it should be capitalized and underlined e.g. "Sophora parkland". This error is noted throughout the report.

--One taxon in Table 1 is listed as Stenogyne gugona var. mollio f. mollioolma Skottab. This is probably an error.

--A detailed biological survey should be conducted by qualified personnel from DLNR, the University of Hawaii and the Fish and Wildlife Service (Office of Endangered Species).

--The project lies within the established critical habitat for the palila and if federal funds are being used in any way for this project, consultation with the Office of Endangered Species is required as per the rules and regulations of the Endangered Species Act.

AN EQUAL OPPORTUNITY EMPLOYER

--Statement is well written. It seems that both the negative (increased visitors and activities) and the position (planting of native stuff, decrease grazing, increased plantings leading to better habitat for palila) should balance each other.

Sincerely yours,

Yoneo Sagawa, Director
Lyon Arboretum

YS:ms

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

January 8, 1979

Mr. Yoneo Sagawa, Director
Lyon Arboretum
University of Hawaii
3860 Manoa Road
Honolulu, Hawaii 96822

Dear Mr. Sagawa:

Thank you for reviewing and commenting on the EIS Preparation Notice for the Hale Pohaku Master Plan. We appreciate your interest in this project.

In response to your specific comments:

1. We share your concern for the impact the increased number of visitors will have on the environment. The draft EIS will address, in more detail, the management and control of this potential problem.

2. Thank you for pointing out errors in the text. They will be corrected in the draft EIS.

3. At the present time, we are evaluating alternate physical plans for Hale Pohaku. We are looking into the possibility of doing a survey of vegetation at the site before the final decision is made.

4. Our consultant, Group 70, Inc., has contacted the Office of Endangered Species in regards to the project.

We hope you will consider reviewing the draft EIS when it is completed.

Very truly yours,

Susumu Ono

SUSUMU ONO
Chairman of the Board

HAND TO CLEAN OUR LAND · STATE OF HAWAII

cc: Group 70, Inc.

9568

STATE OF HAWAII

November 20, 1978

STP 8.5181

Mr. W. Y. Thompson
Chairman of the Board
Department of Land and
Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Thompson:

Subject: Hale Pohaku Mid-Elevation Facilities Master Plan, EIS Preparation Notice

Thank you very much for giving us the opportunity to review and comment on the above-captioned document. We have the following comments to make which could improve the Draft EIS:

1. Include a drawing of the Master Plan of the Mid-Elevation Facilities;

2. Include a discussion of the pros and cons of the power and utilities facilities; and

3. Include a discussion on the traffic impact to the highway system, including an estimate of the increase in the vehicular traffic.

Very truly yours,

R. Higashionna

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
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STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

December 7, 1978

Honorable Ryokichi Higashionna
Director, Dept. of Transportation
State of Hawaii

Dear Mr. Higashionna:

Hale Pohaku Mid-Elevation Facilities
Master Plan

Thank you for reviewing and commenting on the EIS Preparation Notice for the Hale Pohaku Master Plan. We appreciate your interest in this project.

In response to your specific comments:

1. A map of the Master Plan and appropriate illustrations will be included in the draft EIS.

2. Discussion of power supply in the draft EIS will be limited to on-site generators. Positive and negative impacts of all utilities will be discussed fully in that document.

3. Traffic generation and impact will be discussed in the draft EIS under the assumption that the road from Hale Pohaku to the summit will not be paved. If this condition changes, and if visitor access to the summit becomes easier, then our traffic estimates may be too low.

We hope you will consider reviewing the draft EIS for this project.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

Group 70 Inc.

9287

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF HEALTH
P O Box 3378
HONOLULU HAWAII 96801

GEORGE A. L. YUEN
DIRECTOR OF HEALTH

Audrey W. Mertz, M.D., M.P.H.
Deputy Director of Health

Henry N. Thompson, M.A.
Deputy Director of Health

James S. Kumagai, Ph.D., P.E.
Deputy Director of Health

In reply, please refer to
File EPHS — SS

November 9, 1978

Mr. William Y. Thompson
Chairman of the Board
Department of Land & Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Thompson:

Subject: Request for Comments on Proposed Environmental Statement (EIS) for Hale Pohaku Mid-Elevation Facilities Master Plan

Thank you for allowing us to review and comment on the subject proposed EIS.

Public toilet facilities should be provided at the mid-elevation and summit sites. At this time, public toilet facilities are not available at the summit and the old stone privy at Hale Pohaku is aesthetically unpleasant.

We realize that the statements are general in nature due to preliminary plans being the sole source of discussion. We, therefore, reserve the right to impose future environmental restrictions on the project at the time final plans are submitted to this office for review.

Sincerely,

Brian J. J. Choy

for JAMES S. KUMAGAI, Ph.D.
Deputy Director for
Environmental Health

cc: DHO, Hawaii

GEORGE R ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
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LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

December 13, 1978

Dr. James S. Kumagai, Deputy
Director for Environmental Health
Department of Health
P. O. Box 3378
Honolulu, Hawaii 96801

Dear Dr. Kumagai:

Thank you for your comments on the Hale Pohaku Master Plan EIS Preparation Notice. We will address the problem of toilet facilities at Hale Pohaku in the draft EIS. We are not, however, considering summit facilities within the context of this project although we agree that your concern is valid.

Be advised that our consultant, Group 70, Inc., will contact you personally in regards to specific environmental restrictions that may affect the proposed project.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Group 70, Inc.

HAND TO CLEAN OUR LAND
STATE OF HAWAII

9222

PLANNING DEPARTMENT

25 AUPUNI STREET • HILO, HAWAII 96720

COUNTY OF HAWAII

HERBERT T. MATAYOSHI
Mayor

SIDNEY M. FUKE
Director

DUANE KANUHA
Deputy Director

November 3, 1978

Mr. William Y. Thompson, Chairman
Board of Land and Natural Resources
P. O. Box 621
Honolulu, HI 96809

Dear Mr. Thompson:

Hale Pohaku Master Plan
EIS Preparation Notice

We have reviewed the subject document and have the following comments/concerns to offer. Please note that this reply is a joint response from the Hawaii County Mayor's office and the Planning Department. Our comments/concerns are as follows:

1. (Page 12) The sewage system for the park facility should be finalized and discussed in the EIS. Consideration should be given to a system which will allow joint hauling of wastes from the University of Hawaii sytem if possible.

2. (Page 13) It was noted in the draft EIS Preparation Notice that 10 picnic sites were proposed. The present proposed 12 picnic sites as indicated in the subject document is excessive. It was further noted in the draft EIS Preparation Notice that two (2) types of picnic facilities were under consideration and that basic components included tables and firepits. The EIS should fully discuss these facilities in respect to number, type and components.

3. (Page 38) The statement that the feral cat is a natural predator of Mauna Kea should be clarified. The feral cat (felis catus) is not endemic, and is therefore an introduced predator. In reference to

our prior comments on the draft EIS Preparation Notice, adequate controls should be developed to prevent domestic animals from being allowed at, and from becoming detrimental environmental factors of, the mid-level facility.

4. (Page 47) The EIS should discuss water, sewage, electrical, etc. demands and impacts in relation to the full development of this facility and not merely at the present level of use.

5. (Page 58) Although additional informational/warning signs may be useful, consideration of this proposal to the overall visual impact is needed.

The EIS should discuss the proposed activities in detail and at the full development level. For example, water storage requirements should be discussed at the full (78) occupancy level and not at the present level.

Thank you for bringing this document to our attention. We look forward to the drafting of the EIS, and hope that our comments will be of some value in this respect. Should you have any questions concerning the above, please do not hesitate to contact us.

Sincerely,

Sidney M. Fuke
Planning Director

BS:gs

cc: Mayor Matayoshi
Mildred Yamamoto, Hawaii Land Agent
Roland Higashi, Hawaii Board Member
Stephen K. Yamashiro, Council Chairman

GEORGE R ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS
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DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O BOX 621
HONOLULU, HAWAII 96809

RECEIVED
GROUP 70 LED, INC.

November 30, 1978

Mr. Sidney M. Fuke, Director
Planning Department
County of Hawaii
25 Aupuni St.
Hilo, Hawaii 96720

Dear Mr. Fuke:

Thank you for reviewing and commenting on the EIS Preparation Notice for the Hale Pohaku Master Plan. We appreciate your continued interest in this project.

In response to your specific comments:

1. The sewage system for Hale Pohaku will be discussed fully in the draft EIS. Consideration is being given to a system which will allow joint hauling of wastes from the University and park facilities.

2. The number and types of picnic sites are being re-evaluated. They will be discussed thoroughly in the draft EIS.

3. The statement concerning the feral cat was not intended to convey the impression that felic catus is native to Mauna Kea but rather that it is in their nature to hunt. Representatives from the Institute for Astronomy have given us their assurance that no pets will be allowed at the mid-level facility.

4. All activities will be disucssed in detail in the draft EIS and will be related to full (programmed) development.

5. Visual impact will be a major consideration for all structures and signs at Hale Pohaku.

We will have our consultant, Group 70, Inc., talk to you personally in the near future so that you can discuss the proposed plan with them before the draft EIS is published.

Very truly yours,

W. Y. Thompson

W. Y. THOMPSON
Chairman of the Board

LET US HAND TO CLEAN OUR LAND
STATE OF HAWAII

9300

POLICE DEPARTMENT

COUNTY OF HAWAII
349 KAPIOLANI STREET
HILO, HAWAII 96720

GUY A. PAUL
CHIEF OF POLICE

OUR REFERENCE

YOUR REFERENCE

November 8, 1978

Mr. W. Y. Thompson
Chairman of the Board
Board of Land and Natural Resources
P. O. Box 621
Honolulu, HI 96809

We have reviewed and offer the following comments on the Hale Pohaku EIS Preparation Notice.

Part II 12.6 Health and Safety, page 48

We concur with the statement that response time for police services can be one hour or longer due to the distance involved. It is also noteworthy that observatory personnel are voluntarily rendering emergency services to both visitors and other personnel and are also taking responsibility for the security of their facilities.

Part III 6 Visitors, pages 58-61

We are happy to see that State planners are cognizant of the health and safety of visitors and have taken measures to ensure their well being by the posting of signs, enforcement of anti-litter regulations by State personnel and visitor control by the ski patrol.

This opportunity to comment is appreciated.

GUY A. PAUL
CHIEF OF POLICE

WGC/k

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS:
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STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

November 30, 1978

Mr. Guy A. Paul, Chief
Police Department
County of Hawaii
349 Kapiolani St.
Hilo, Hawaii 96720

Dear Mr. Paul:

Thank you for reviewing and commenting on the EIS Notice of Preparation for the Hale Pohaku Mid-Elevation Facilities Master Plan. We appreciate your interest in this project and we hope you will feel free to comment further if you have any suggestions which may improve our Master Plan.

Very truly yours,

W. Y. Thompson

W. Y. THOMPSON
Chairman of the Board

cc: Group 70, Inc.

LEND A HAND TO CLEAN OUR LAND. STATE OF HAWAII

7202

HERBERT T. MATAYOSHI MAYOR
CLARENCE W. GARCIA, DIRECTOR

DEPARTMENT OF RESEARCH AND DEVELOPMENT

COUNTY OF HAWAII • 25 AUPUNI STREET • HILO, HAWAII 96720 • TELEPHONE (808) 961 8368

6 AS: 55

October 31, 1978

Mr. W. Y. Thompson
Chairman of the Board
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Hale Pohaku Mid-Elevation Facilities Master Plan,
EIS Preparation Notice

Thank you for this opportunity to review and comment on the above-mentioned subject. As you know the County of Hawaii, and in particular, the Department of Research and Development have been very much interested in the developments of the Mauna Kea management area.

We are of the opinion that multiple use of this area can be accomplished by proper planning and coordination of activities. The development of additional facilities at Hale Pohaku likewise should be carefully planned to insure best uses without seriously compromising values put forth in the "Mauna Kea Plan."

We reserve comments on this preparation notice. We will be happy to receive the EIS for study, review, and comments when complete.

Your cooperation in this matter is appreciated.

Clarence W. Garcia
CLARENCE W. GARCIA
DIRECTOR

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NOV 14
GROUP 70 LAB, INC.

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

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DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

November 30, 1978

Mr. Clarence W. Garcia, Director
Dept. of Research & Development
County of Hawaii
25 Aupuni St.
Hilo, Hawaii 96720

Dear Mr. Garcia:

Thank you for reviewing the EIS Preparation Notice for the Hale Pohaku Mid-Elevation Facilities Master Plan. We appreciate your interest in this project and we hope you will feel free to comment in the future if you have any suggestions which may improve our Master Plan.

We will place your name on the list of persons who are to receive the draft EIS.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Group 70, Inc.

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BERNICE P. BISHOP MUSEUM

P. O. Box 6037, Honolulu, Hawaii 96818 • Telephone 847-3511

November 3, 1973

RECEIVED
73 NOV 6 A9:54
DEPT OF LAND & NAT RESOURCES
STATE OF HAWAII

Mr. W. Y. Thompson
Chairman of the Board
Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Thompson:

Members of our staff have reviewed the EIS Preparation Notice for the Hale Pohaku Mid-Facilities Master Plan which we find generally acceptable. Our major concern is strict enforcement of the "Mauna Kea Entry Permit" in relation to recreation uses of the mountain above Hale Pohaku. The proposal for improved recreation facilities and an information kiosk at Hale Pohaku may stimulate more people to visit the upper part of the mountain which could have deleterious effects on the natural and cultural resources if not properly controlled. We are of the opinion that the adze quarry should be off-limits to the public until such time that a proper management plan is implemented.

We welcome the opportunity to review proposals concerning Mauna Kea and thank you for your consideration.

Three papers emanating from Dr. McCoy's research on the adze quarry are enclosed for your information and use in evaluations of the mountain's cultural significance.

Very truly yours,

Patrick C. McCoy

Patrick C. McCoy
Acting Chairman
Department of Anthropology

PCM/pb
Encls.

RECEIVED
NOV 14 1973
GROUP 70 LAB. INC.

GEORGE R ARIYOSHI
GOVERNOR OF HAWAII

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STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

January 12, 1979

Dr. Patrick C. McCoy
Acting Chairman
Department of Anthropology
Bernice P. Bishop Museum
P. O. Box 6037
Honolulu, Hawaii 96818

Dear Dr. McCoy:

Thank you for reviewing and commenting on the EIS Preparation Notice for the Hale Pohaku Mid-Elevation Facilities Master Plan. We appreciate very much the time that you and your staff have put into this project.

We share your concern for the Adze Quarry site since visitors may be tempted to disturb or remove artifacts from the site unless they are closely supervised. In our opinion, however, extreme protective measures, such as placing the Adze Quarry off-limits, should be implemented only if existing circumstances warrant it. Therefore, we are looking at several possibilities for control such as enforcing the Mauna Kea Entry Permit requirement and restricting summit access to guided tours. These items will be discussed more thoroughly in the draft EIS.

Thank you for your interest.

Very truly yours,

Susumu Ono

SUSUMU ONO
Chairman of the Board

cc: Group 70, Inc.

LE HAND TO CLEAN OUR LAND · STATE OF HAWAII

For the Protection of Hawaii's Native Wildlife

HAWAII AUDUBON SOCIETY

P. O. Box 5032
HONOLULU, HAWAII 96814

P. O. Box 275
Volcano, Hawaii 96785

July 16, 1979

Division of Water and Land Development
Department of Land and Natural Resources
P. O. Box 373
Honolulu, Hawaii 96809

Re: Comments on the EIS Preparation Notice for the Hale Pohaku Master Plan

We are pleased to learn that your office and the planning consultant are implementing the decision of the Board of Land and Natural Resources to give in-depth consideration to alternate sites on Mauna Kea for the mid-level facilities for astronomers. We understand that the Board took such action because Hale Pohaku is within the critical habitat of the Palila and a major construction project may not be feasible at that location.

In considering mid-elevation sites, the Society recommends that priority be given to the location originally chosen by the Institute for Astronomy and described in several Institute planning documents in 1974 and 1975.

This site is on the road to Hale Pohaku at 8,000 feet elevation on Hawaiian Homes Commission lands leased to Parker Ranch. It is below the Mauna Kea Forest Reserve, has been in grazing use for a long time, and is outside the critical range of Palila habitat. Although the Institute originally requested forty acres for the mid-level site, it appears that the five acres proposed in the EIS Notice (p. 17), would be ample for acclimatization and office facilities for astronomy personnel who work at the summit.

An information kiosk for visitors at this location would be more appropriate than at Hale Pohaku at 9,200 feet elevation. Here the remarkable natural assets of Mauna Kea, as well as the summit telescopes, could be pictured and described. Durable panels of photographs and diagrams could illustrate the mamane forest ecosystem with its rare birds, plants and invertebrates, game bird habitats, the alpine stone desert, the ancient Hawaiian adz quarry complex, Lake Waiau, the Mauna Kea Ice Age Natural Area and the summit observatories. Visitor interest and curiosity could be met at this lower elevation site and many would not need or want to take the physically demanding drive higher up the mountain.

A plan such as this would restore the State Park at Hale Pohaku for the primary use of Hawaii residents in search of wilderness experience. The old stone buildings, picnic tables and a primitive camping site would be sufficient for local hikers, hunters, naturalists, skiers and for a rest stop following snow play. In addition, the mamane forest would be protected from further development projects.

Documented observations of the Palila at Hale Pohaku should be included in the EIS (pp. 33 and 53). Enclosed is a field note on such a sighting that was published in the Society's journal, 'Elepaio, in July 1977. Also, Dr. J. Michael Scott of the US Fish and Wildlife Service has reported more recent observations at Hale Pohaku by Palila survey crews. The area is likely nesting habitat as well.

In the discussion of fauna the EIS could indicate that the critical habitat of the Palila extends to the 10,000 feet contour line -- 800 feet in elevation above Hale Pohaku. Please see the enclosed sheet from the Federal Register, August 11, 1977, for the precise habitat boundaries.

Concerning the Ice Age Natural Area, there is a discrepancy between the area defined on the EIS map (p. 41) and the Special Natural Area and Historic/ Archeologic Management Area that is described in the final Mauna Kea Plan adopted by the Board of Land and Natural Resources. The final Plan says (p. 6):

> "This area, which includes Lake Waiau, Puu Hau Kea, Adz Quarry and Puu Pohaku, will be designated as a natural area reserve under the State Natural Area Reserve System to preserve these important natural and historic features of Mauna Kea. . . ." (emphasis added)

Pu'u Pohaku, a major cone at 13,186 feet elevation and northwest of Lake Waiau, is excluded from the EIS map (p. 41) that delineates the Ice Age Natural Area. Since it is the intention of the Mauna Kea Plan that Pu'u Pohaku be a contiguous part of the natural area, the map should be corrected to include this prominent natural feature.

In further support of the natural area, it should be noted that the Mauna Kea boundaries of the Protective Subzone under Regulation 4 are drawn to encompass the same high elevation landmarks that are defined for the natural area in the Mauna Kea Plan. Construction of physical facilities is not a permitted use in the Protective Subzone.

In connection with the description of the environment it is important to note that native Hawaiian ecosystems exist above treeline to the summit. Ecosystems do not terminate at 10,000 feet elevation as the EIS suggests they do (p. 20). For example, although the high altitude aeolian ecosystem of Mauna Kea has scarcely been studied, the following research papers by Biologists treat several aspects of plant and animal life in the upper alpine zone of Mauna Kea:

Baker, G. E. and R. D. Goos. 1972. Endemism and evolution in the Hawaiian biota: fungi. In A natural history of the Hawaiian Islands, ed. E. A. Kay, pp. 414-415. Univ. Press of Hawaii. /fungi at Lake Waiau/

Bartram, E. B. 1952. High altitude mosses from Mauna Kea, Island of Hawaii. Bishop Museum Occasional Papers, 20(17):297-300.

Bryan, E. H., Jr. 1923. Insects from the summit of Mauna Kea. Hawaiian Entomological Society Proceedings, 5(2):287-288.

Bryan, E. H., Jr. 1926. Additional note on the insects occuring on Mauna Kea and Mauna Loa. Hawaiian Entomological Society Proceedings, 6(2):280-282.

Hartt, C. E. and M. C. Neal. 1940. The plant ecology of Mauna Kea, Hawaii. Ecology, 21(2):237-266. /principally high elevation research/

Massey, J. E. 1978. Lake Waiau: a study of a tropical alpine lake, past and present. Ph.D. thesis, University of Hawaii.

Richardson, F. and D. H. Woodside. 1954. Rediscovery of the nesting of the dark-rumped petrel in the Hawaiian Islands. Condor, 56(6):323-327. /on Mauna Kea all above 9,000 feet elevation/

Swezey, O. H. and F. X. Williams. 1932. Insects from the summit of Mauna Kea. Hawaiian Entomological Society Proceedings, 8(1):191-192.

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Thank you for the opportunity to be a consulted party in the preparation of the EIS.

Mae E. Mull
Island of Hawaii Representative

Enclosures

FIELD NOTE - Palila at Hale Pohaku *

On Sunday, May 8, 1977, following a trip to the summit of Mauna Kea, four of us stopped at Hale Pohaku State Park -- Bill Mull, Al Hart, Gretchen Feiker and I. At 9,200 feet elevation the sky was clear in mid-afternoon and a broken cloud layer was below us. Temporary dormitories for observatory construction crews form a quadrangle with the two old stone buildings that were formerly available to park visitors. Hale Pohaku has been leased to the University of Hawaii until a permanent mid-level facility for the astronomers is constructed at another site within the park's 200 acres.

Within minutes after our arrival we heard Palila calls and promptly located three adult Palila feeding in mamane trees close to the restrooms and the United Kingdom dormitory. For half an hour we watched these three Palila close-up as each would break off a single mamane pod from a hanging cluster of pods, hold the pod parallel against the branch with its foot, tear the pod open and extract seeds with its heavy bill. The feeding process was frequently interspersed with melodious calls or brief songs of several notes. On a couple of occasions all three were briefly feeding and calling in the same tree at the same time. Our closeness, even watching them from under the tree where they were feeding, did not appear to affect their behavior. Sometimes we used binoculars when the bird was sufficiently distant to get it in focus. The mamane trees in the area had an abundant crop of pods that may have covered two seasons because both green and brown pods were present on the same tree.

We picked up several pods from the ground as they were dropped by the birds. In one case every seed had been extracted from a small thin-coated pod. I watched one Palila with a brilliant yellow bead work at length on a pod, pausing five times in between to raise it's head and give a melodious call. When the bird dropped the thick pod and flew to another tree, I picked it up and was surprised to see that only part of one seed had been extracted after all that effort!

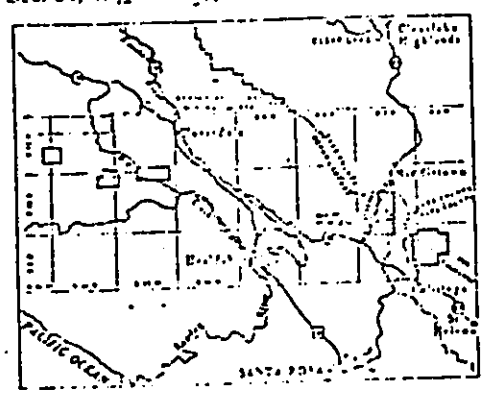
Mae E. Mull
June 10, 1977

* Published in 'Elepaio, July 1977 (Vol. 38, no. 1), Journal of the Hawaii Audubon Society.

SE¼ Sec. 4, NE¼ of SW¼ Sec. 4, E½ of NW¼ Sec. 4; T11N R11W E½ of SE¼ Sec. 33, E½ Sec. 34, S½ Sec. 35, W½ of SE¼ Sec. 36, SW¼ Sec. 36; (3) T11N R12W S½ Sec. 19, Sec. 30; T11N R13W SE¼ Sec. 24, E½ of SW¼ Sec. 24, E½ Sec. 25, E½ of SW¼ Sec. 25, E½ of NW¼ Sec. 25.

Palisades-Table Rock Zone: an area of land, water, and airspace in Napa County, with the following components (Mt. Diablo Base Meridian): T9N R6W S½ Sec. 5, S½ Sec. 6, Sec. 7, Sec. 8, Sec. 9, Sec. 16, Sec. 17, Sec. 18, Sec. 19, Sec. 20, T9N R7W E½ Sec. 12, E½ Sec. 13, NE¼ Sec. 24, E½ of SE¼ Sec. 24.

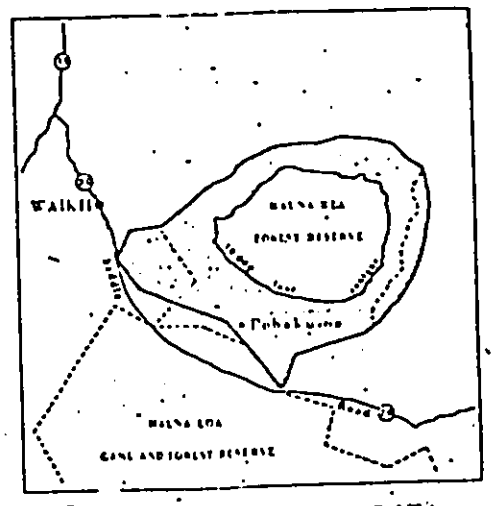
Mount St. Helena Zone: An area of land, water, and airspace in Lake, Napa, and Sonoma counties, with the following components (Mt. Diablo Base Meridian): T9N R7W W½ of NE¼ Sec. 3, W½ of SE¼ Sec. 3, W½ Sec. 3, Sec. 4, E½ Sec. 5, E½ of SW¼ Sec. 5, E½ of NW¼ Sec. 5; T10N R7W that portion of Sec. 20 east of Ida Clayton Road, Sec. 21, W½ of NE¼ Sec. 22, W½ of SE¼ Sec. 22, W½ Sec. 22, W½ of NE¼ Sec. 27, W½ of SE¼ Sec. 27, W½ Sec. 27, Sec. 28, that portion of Sec. 29 east of Ida Clayton Road, that portion of the NE¼ Sec. 32 east and south of Ida Clayton Road, SE¼ Sec. 32, E½ of SW¼ Sec. 32, that portion of the SE¼ of NW¼ Sec. 32 south of the Ida Clayton Road, Sec. 33, W½ of NE¼ Sec. 34, W½ of SE¼ Sec. 34, W½ Sec. 34.



CRITICAL HABITAT FOR THE AMERICAN PEREGRINE FALCON

PALILA (*Psittirostra bailleui*)

HAWAII. An area of land, water, and airspace on the Island of Hawaii, Hawaii County, with the following components: (1) The State of Hawaii Mauna Kea Forest Reserve, except (a) that portion above the 10,000 foot contour line, (b) that portion south of the Saddle Road (State Highway 20), (c) lands owned by the United States in the Pohakuloa Training Area north of the Saddle Road (State Highway 20) established by Executive Order 1719 (Parcel 6, State of Hawaii Tax Map Key 4-4-16, Third Division), (d) that portion (Parcel 10, Kaohe IV, State of Hawaii Tax Map Key 4-4-16, Third Division) lying north of the Saddle Road (State Highway 20) and south of the Power Line Road; (2) that portion of the State of Hawaii Kaohe Game Management Area (Parcel 4, State of Hawaii Tax Map Key 4-4-15, Third Division) to the north and east of the Saddle Road (State Highway 20); (3) that portion of the Upper Waikii Paddock (Parcel 2, State of Hawaii Tax Map Key 4-4-15, Third Division) northeast of the Saddle Road (State Highway 20); (4) that portion of the lands of Humuula between Puu Kahinahina and Kole lying southeast of the Mauna Kea Forest Reserve fence (portions of Parcels 2, 3, and 7, State of Hawaii Tax Map Key 3-8-1, Third Division) which are included in the State conservation district.



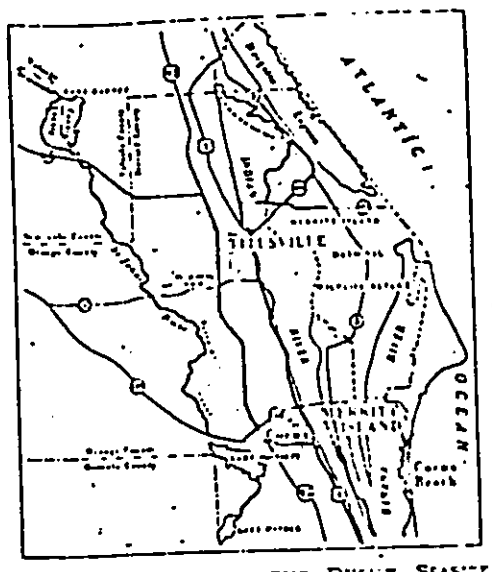
CRITICAL HABITAT FOR THE PALILA

YELLOW-SHOULDERED BLACKBIRD (*Agelaius xanthomus*)

Puerto Rico. Areas of land, water, and airspace with the following components: (1) All of Mona Island; (2) that portion of the main island of Puerto Rico within the following boundary: Beginning at a point where the Quebrada Boqueron joins the Bahia de Boqueron, thence proceeding southwesterly along the coast to Cabo Rojo, thence eastward along the coast, including offshore cays, to the point where Highway 332 meets the Bahia de Guanica, thence northward on Highway 332 to its junction with Highway 116, thence westward on Highway 116 to its junction with Highway 305, thence westward on Highway 305 to its junction with Highway 303, thence northward on Highway 303 to its junction with Highway 101, thence westward on Highway 101 to the point where it crosses Quebrada Boqueron, thence along the Quebrada Boqueron to the point where it joints the Bahia de Boqueron; (3) a circular portion of the main island of Puerto Rico with a one mile radius, the center being the junction of Highways 350 and 102 in the town of San German; (4) Roosevelt Roads Naval Station, southeast of Ceiba.

DUSKY SEASIDE SPARROW (*Ammospiza maritima nigrescens*)

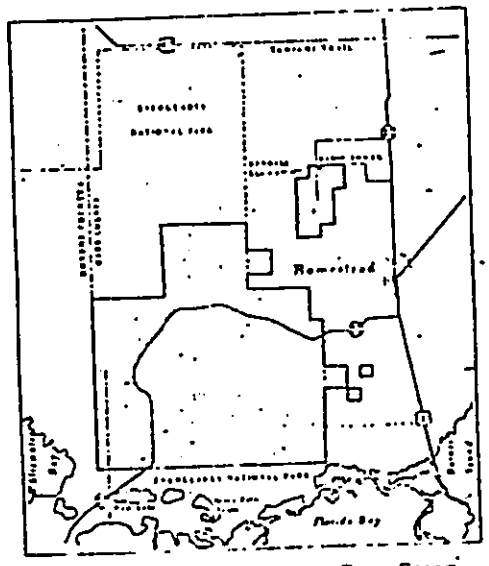
Florida. Cordgrass (*Spartina bakerii*) savannas and associated land, water, and airspace within the following boundary, Brevard County: Beginning at the point where Florida Highway 528 intersects Interstate Highway 95; thence westward along Florida Highways 528 and 520 to the main channel of the St. Johns River; thence northward along said channel to Florida Highway 46; thence eastward along Florida Highway 46 to Interstate Highway 95; thence southward along Interstate Highway 95 to the point of beginning. Marshes and associated airspace within the mosquito control impoundments designated by the Brevard County Mosquito Control District as T-10-J and T-10-K, northwest of Florida Highway 406 on the Merritt Island National Wildlife Refuge, Brevard County.



CRITICAL HABITAT FOR THE DUSKY SEASIDE SPARROW

CAPE SABLE SPARROW (*Ammospiza maritima mirabilis*)

Florida. Areas of land, water, and airspace in the Taylor Slough vicinity of Collier, Dade, and Monroe counties, with the following components (Tallahassee Meridian): Those portions of Everglades National Park within T57S R30E, T57S, R36½E, T57S R37E, T52S R31E, T53S R30E, T53S R37E, T58½S R31E, T58½S R36½E, T55S R35E, T55S, R36E, T55S R37E Areas outside of Everglades National Park within T55S R37E Sec. 36, T55S R38E Sec. 31, 32; T56S R37E Sec. 1, 2, 11-14, 23-26; T56S R38E Sec. 5-7, 18, 19; T57S R37E Sec. 5-8, T58S R38E Sec. 27, 29-32; T59S R38E Sec. 4.



CRITICAL HABITAT FOR THE CAPE SABLE SPARROW

(c) *Reptiles.*

AMERICAN CROCODILE (*Crocodylus acutus*)

Florida. All land and water within the following boundary: Beginning at the easternmost tip of Turkey Point, Dade

A Particular Point of View Dec 1 '76 Hon-Star Bulletin

Mauna Kea's Many Assets

By William P. Mull

Mr. Mull, a Volcano, Hawaii, resident, has long been active in conservation causes and in scientific study. He is a former president of the Hawaii Audubon Society.

THE MAUNA KEA "science city" controversy has one underlying aspect that deserves airing. The envisioned expansion of astronomical observatory facilities atop Mauna Kea might enhance prospects for advances in certain space studies at the expense of prospects for advances in certain earth studies.

Quite apart from its controversial use as a platform for astronomical research, Mauna Kea is incontrovertibly a unique scientific resource for research in specialized fields of geology, archeology and biology.

Mull argues that space studies should not be allowed to interfere with research in other fields on Mauna Kea.

Geologically, for example, it provides a variety of unique low-latitude ice age features, including multiple glacial phenomena and Pleistocene permafrost deposits. Archeologically, it has the greatest known adz quarry complex developed by Polynesian culture or, in fact, by Stone-Age man anywhere.

Biologically, it has fostered the evolution of unique Hawaiian plants and animals—including extant species still undescribed and unknown, as exemplified by several discovered as recently as two and three months ago. These specific examples are above treeline, largely within the presently designated astronomical "Science Reserve."

TO VIEW, as some do, the unforested expanse of Mauna Kea above Hale Pohaku as "barren wasteland" or "real estate"—with all that those terms imply—is to ignore its true character and innate worth.

In truth, it is a remarkable aggregation of rare and fragile scientific treasures in their natural state—promising great rewards for mankind if preserved for future scientific investigation, but susceptible to easy damage if not treated with sensitive appreciation.

Ironically, it is these singular Hawaiian scientific assets that would be most threatened by the kind of urbanization that might be expected to accompany the construction and maintenance of an astronomical "science city" on top of the mountain and support facilities downslope.

Particularly damaging, in this respect, could be the prospective exploitation by non-scientist interests of the easier access and various other attractions implicit in a "science city" on the mountaintop.

THIS IS A serious and important facet of the Mauna Kea Master Plan draft currently under consideration by the State Board of Land and Natural Resources. People with an interest in Mauna Kea should know about this. Proponents of a Mauna Kea astronomical "science city"—whether scientists or not, and whatever their motives—should examine their positions in this light.

Appropriately, the official State land-use designation for the whole mountain is "conservation district." Certainly there is much on the mountain to "conserve" for the benefit of all people for all time.

There is every reason for County, State and federal officials to closely scrutinize and stringently restrict any proposed activity within their purview that might damage any of Mauna Kea's unique natural resources—even when such activity is proposed in the name of science itself.

William P. Mull

mM

RECEIVED
OCT 5 1979
GROUP 70, INC.

August 7, 1979

Mrs. Mae Mull
Island of Hawaii Representative
Hawaii Audubon Society
P. O. Box 275
Volcano, Hawaii 96718

Dear Mrs. Mull:

Hale Pohaku Mid-Elevation Facilities
Master Plan, EIS Preparation Notice

Thank you for reviewing the subject EIS Preparation Notice. We appreciate your comments and will take them into consideration in the final site selection for the project. We hope you will review the draft EIS when it is published.

Very truly yours,

Edgar A. Hamasu

SUSUMU ONO
Chairman of the Board

RTC:JYY:jes

9762

RECEIVED

HAWAIIAN TELEPHONE COMPANY

P.O. BOX 2200 • HONOLULU, HAWAII 96841 • TELEPHONE (808) 546-7723 • CABLE TELHAWAII

GROUP 70, INC.

November 29, 1978

HERMAN S. L. HU

Mr. W. Y. Thompson, Chairman
State of Hawaii
Department of Land and
Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Dear Mr. Thompson:

Hale Pohaku Mid Elevation Facilities
Master Plan, EIS Preparation Notice

We wish to thank you for giving us an opportunity to comment on the EIS Preparation Notice for the Hale Pohaku Mid Elevation Facilities at Mauna Kea, Hawaii.

As you stated in your letter dated October 19, 1978, the Master Plan objective is the continued appropriate use of the land with minimum conflict of use and minimum damage to the natural resources and historic and visual values. In compliance with the objective, Hawaiian Telephone has plans to upgrade its communications facilities to provide support toward the development and use of the Hale Pohaku area for necessary research personnel on the summit, a central point for management of the Mountain and a day-use destination point for visitors and overnight campers.

A digital radio system link to Mauna Loa-Hilo using an 8 foot diameter microwave dish, mounted preferably on the side of the existing University of Hawaii building is being contemplated. This will eliminate the need to construct any support such as a tower. The terminal equipment could be housed in enclosed cabinets inside the UH building complex. The intent is to use existing buildings and facilities, whenever possible, to minimize any interruption to the natural environment. These are only preliminary plans and must be discussed with UH officials once the Development Plans for Hale Pohaku are firmed up.

A similar microwave radio system had been installed at the Mauna Kea summit without any adverse consequences to the environment.

We hope the above helps you in preparing the Environmental Impact Statement. Should you require more information, please call Richard Mau, Engineering and Construction Staff Manager, at 546-3650.

RM/FC/kk

GEORGE R. ARIYOSHI
GOVERNOR OF HAWAII

DIVISIONS
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

December 13, 1978

Mr. Herman S. L. Hu
Network Planning & Engineering
Director
Hawaiian Telephone Company
P. O. Box 2200
Honolulu, Hawaii 96841

Dear Mr. Hu:

Thank you for reviewing and commenting on the EIS Preparation Notice for the Hale Pohaku Mid-Elevation Facilities Master Plan. We appreciate your interest in the subject property.

We find your comments concerning the future plans of Hawaiian Telephone to upgrade its communications facilities to Hale Pohaku to be of great interest. Thus, our consultant, Group 70, Inc., will be contacting Mr. Richard May to discuss this further.

Very truly yours,

W. Y. THOMPSON
Chairman of the Board

cc: Group 70, Inc.

LEI HAND TO CLEAN OUR LAND. STATE OF HAWAII

REFERENCES AND FOOTNOTES

[1]Liebert Langraf. Department of Land and Natural Resources Division of Forestry, personal conversation September 17 1979.

[2]Hawaii Department of Land and Natural Resources The Mauna Kea Plan (February 1977), p. 7.

[3]Ibid.

[4]Ibid.

[5]Information from Forrest Bennett, Bennett & Drane.

[6]Information from Stanley Young, Fukunaga and Associates, Inc.

[7]Ibid.

[8]Paul Scrowcroft, U.S Forest Service, personal conversation, July 31, 1979.

[9]Neighbor Island Consultants, Final Environmental Impact Statement - Proposed Temporary Base Camp Expansion Hale Pohaku (Mauna Kea), Hawaii, (Honolulu: California - France - Hawaii Telescope Corporation ([1973]). p. IV-1.

[10]Ibid.

[11]Saul Price, "Snowfall in Hawaii" Weatherwise, December 1962.

[12]University of Hawaii, Institute for Astronomy.

[13]Neighbor Island Consultants, Final EIS - Proposed Temporary Base Camp Expansion, p. IV-3.

[14]University of Hawaii Institute for Astronomy, Finl Environmental Impact Statement - Existing Operations of the U.H. Observatory and the Construction and Operations of the New IRTF and UKIRT Observatories Mauna Kea Science Reserve, County of Hawaii, Hawaii (1975), P. III-50.

[15]U.S. Geological Survey and Hawaii Department of Land and Natural Resources Cooperating, Water Resources Summary - Island of Hawaii, by Dan A. Davis and George Yamanaga, DLNR Division of Water and Land Development Report R47 (1973). p. 28.

[16]University of Hawaii Institute for Astronomy, Final EIS - Existing Operations and New IRTF and UKIRT Observatories, pp. III-50, III-51.

[17]University of Hawaii, Institute for Astronomy. Mauna Kea - An OVerview. (1974), pp. 10-11.

[18]Neighbor Island Consultants, Final EIS - Proposed Temporary Base Camp Expansion, p. IV-11

[19]Charles van Riper, III, personal interview, July 28. 1979.

[20]Neighbor Island Consultants, Final EIS - Proposed Temporary Base Camp Expansion, p IV-5

[21]Patrick C. McCoy, The Mauna Kea Adz Quarry Complex. Hawaii: A First Analysis; Proceedings of the First Conferences on Natural Sciences In Hawaii, August 1979.

[22]Ibid.

[23]Neighbor Island Consultants, op. cit., p. IV - 17.

[24]Ibid. p. IV - 18.

[25]George Ariyoshi, Governor, State of Hawaii, Memo to E. Alvey Wright, William Thompson, and Fujio Matsuda, October 12 1977.

[26]University of Hawaii, Institute for Astronomy, personal conversation.

[27]Ibid.

[28]James B. Fisher, M.D., Altitde Sickness, An Experience in Acclimatization to High Altitude, in Journal of Kansas Medical Society, vol. 69, December 1968.

[29]Letters to Dr. John Jefferies, Director, University of Hawaii, Institute for Astronomy.

[30]Ibid.

[31]Liebert Langraf, Department of Land and Natural Resources, Division of Forestry, personal conversation September 17, 1979.

[32]Memorandum from Larry G. Olson, U.H. Department of Anthropology to Doak C. Cox, Director Environmental Center, May 16, 1979.

APPENDIX A

ARCHAEOLOGICAL RECONNAISSANCE SURVEY

BY

PATRICK C. McCOY

BERNICE P. BISHOP MUSEUM

P. O. Box 6037, Honolulu, Hawaii 96818 • Telephone 847 3511

August 22, 1979

Mr. Francis Oda
President, Group 70 Inc.
924 Bethel Street
Honolulu, Hawai'i 96813

Dear Mr. Oda:

The archaeological reconnaissance survey you requested for preparation of the Mauna Kea Mid-Elevation Facilities Master Plan was conducted on August 17, 1979. As I expected, we found no archaeological or historic sites in either of the two upper-elevation alternative areas, at Hale Pōhaku and at the 8000-ft elevation. The gate to the Humu'ula Sheep Station was padlocked; because we did not have permission to enter the land, we did not inspect the grounds within the fenced area. In view of what you said about the viability of this third alternative location for the astronomy facilities, it did not seem warranted to trespass. There are no visible archaeological remains in the general area of the station, however, and thus no reason to predict that any exist within the Station proper. The absence of sites in the surveyed areas is understandable for reasons briefly outlined below.

The Mauna Kea Summit Road, from the Saddle Road junction to Hale Pōhaku, is in a high-elevation, moderately arid environment that on current evidence was minimally exploited by pre-contact Hawaiians. There is, for example, no adze-quality basalt in this area and no other apparent resources (e.g., birds and wood) that would have required the establishment of camps with substantial housing during short periods of resource exploitation. The most likely locations of any such camps in proximity to the modern summit road would have been along the Humu'ula Trail. Archaeological sites have been found along the trail, but all of them are located much higher on the mountain, in the adze quarry. The known site nearest to Hale Pōhaku is at roughly the 10,000-ft elevation on Waikahalulu Gulch.

If the Humu'ula Sheep Station should be reconsidered as a potential site for the astronomy facilities, further archival research may be required to establish the Station's historical significance. Joseph Brennan mentions in his book, The Parker Ranch of Hawaii, that the Humu'ula Sheep Station was added to the ranch holdings on March 3, 1914, and that the area was prime sheep country. There is, then, some history associated with the Station, but I don't know whether or not any of the original buildings remain.

We appreciate the opportunity to do this survey for you. Please call me if we can be of any further assistance.

Sincerely,

Patrick C. McCoy

Patrick C. McCoy
Archaeologist

PCM:gmc

APPENDIX B

VEGETATION SURVEY

BY

GRANT GERRISH

Botanical Survey of Principal Site (Hale Pohaku)

And Two Alternate Sites

For

THE PROPOSED MAUNA KEA OBSERVATORY MID-ELEVATION

FACILITY AND HALE POHAKU STATE PARK

By Grant Gerrish, Botanist

1.0 General Introduction.

A botanical survey of Hale Pohaku and two alternative sites proposed for the construction of the Mauna Kea Observatory Mid-Elevation Facility and the Hale Pohaku State Park was conducted on June 14 and 15, 1979. The findings of that survey and recommendations based on those findings are presented in this report. The principal site (Hale Pohaku) and the two alternative sites are discussed in separate sections.

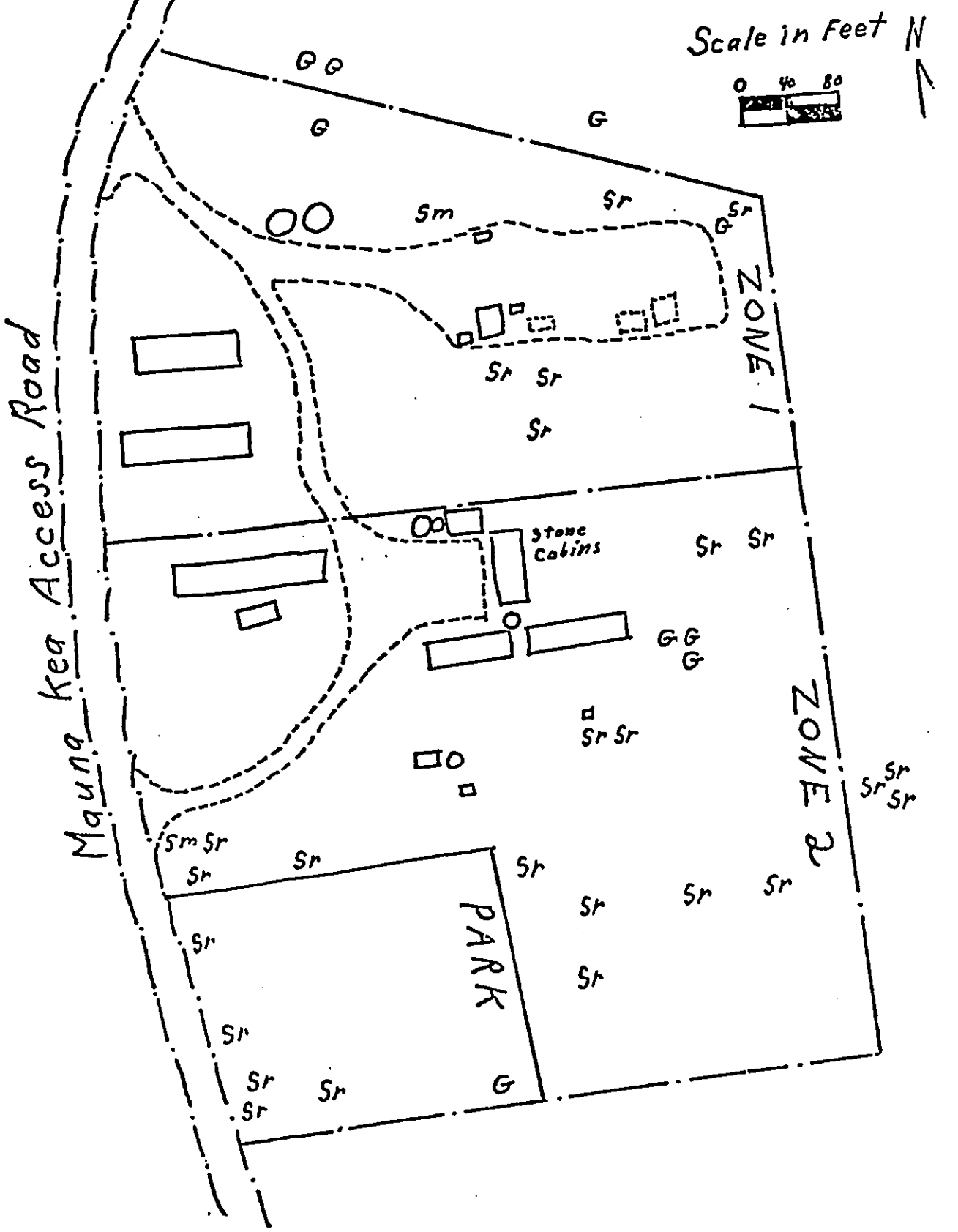
2.0 Hale Pohaku.

2.1 Introduction.

2.11 Nature of Survey.

Approximately eight hours were spent by one field worker surveying the site. The site (Fig. 1) was explored on foot; each part of the site was visited several times. Observations of the nature and condition of the vegetation were recorded. Other features, such as soil condition and present use

Figure 1. Hale Pohaku Existing Site Plan showing zonation of site and location of some plants of interest: G = Geranium cuneatum, Sr = Stenogyne rugosa, Sm = Stenogyne microphylla. (Based on sketch map provided by Group 70 Lab Inc.)



of the site, were also noted. A list of all vascular plants (Appendix) found on the site was drawn up (algae, mosses, and funqi are not vascular plants). Specimens of many species were collected. These specimens were compared with herbarium collections in Honolulu to confirm field identifications. Special attention was given to locating and identifying rare plants that might be growing on the site. No quantitative data were recorded other than a count of mamane (Sophora chrysophylla) trees on the site.

2.12 Zonation of Site.

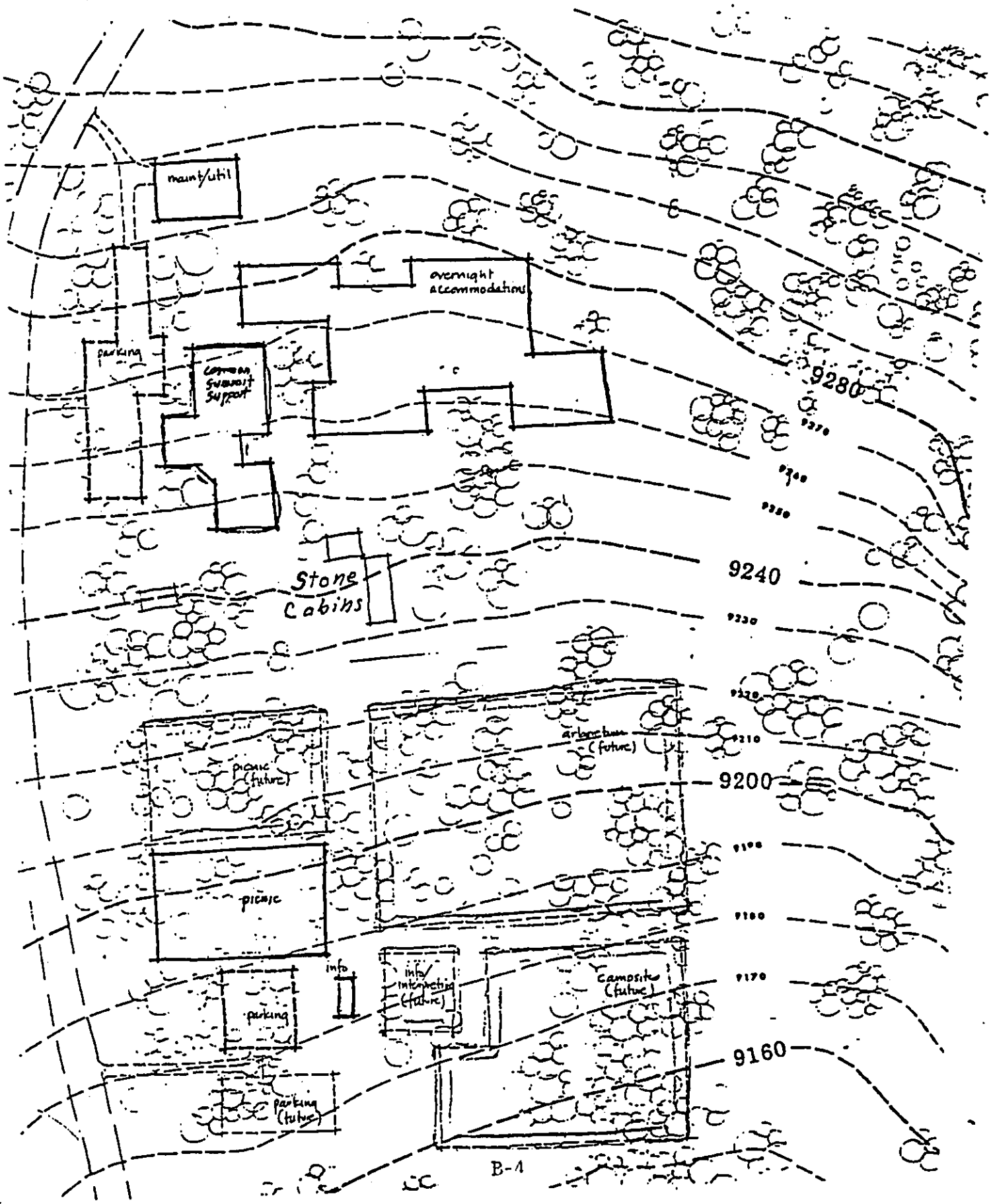
Figure 1 is a sketch map of the site as it now appears (map provided by Group 70 Inc.). The area in which it is proposed to construct the new Mid-Elevation Facility (MEF) has been designated "Zone 1," and the area that includes the proposed park with its future additions is "Zone 2." Figure 2 is a sketch map (provided by Group 70 Inc.) showing the proposed locations of buildings and park facilities. These two figures are the basis of, and are central to, this botanical report.

2.2 Description of Vegetation and Habitat.

2.21 Zone 1 (MEF).

About one-third to one-half of Zone 1 is covered by buildings, artificially graded areas, or driveways. The vegetation of the undisturbed

Figure 2. Hale Pohaku Proposed Site Plan. (Provided by Group 70 Inc.)



portion of the area is a parkland of mamane (Sophora chrysophylla) trees and mixed grasses. About 25 percent of the undisturbed area is covered with mamane trees ranging from two to eight meters tall which grow in scattered clumps. Most of these clumps are made up of many stems, making it difficult to distinguish between individual trees. Saplings and seedlings are sometimes found growing under or near the larger trees. Regeneration of mamane could be described as "fair to good". A rough count indicated that there are about 150 mamane trees in Zone 1. About 35 trees are on or very near the sites of the proposed buildings.

Several species of grasses are common. Chief among these are the native grasses Deschampsia australis, Trisetum glomeratum (mountain pili), and the exotic Stipa cernua. These grasses do not form a carpet or sod, but grow in bunches or tussocks. Near the mamane trees these grasses form dense stands mixed with other herbaceous plants, especially such weeds as Erigeron bonariensis (hairy horseweed), Senecio vulgaris (common groundsel), and Verbascum sp. (mullein). In the open spaces between the mamane trees, the ground cover is less dense and much bare ground is exposed. In some places the exposed surface

is a fine, dusty sand, and in others it is bare rock.

Several native shrubs or vines occur on the site, usually near the mamane trees. These include the silver geranium, Geranium cuneatum, and Chenopodium oahuense (āheahea). Two species of Stenogyne were found growing under the mamane trees. These two members of the mint family grow as low shrubs or sometimes climb up into the crowns of trees and grow as vines several meters above the ground.

Erosion is an obvious problem on the site. Banks created by grading the existing site are undermining one clump of mamane and may, in the future, threaten others.

2.22 The vegetation of Zone 2 is much the same as in Zone 1 (Section 2.21). The mamane trees are more dense and there is less evidence of human disturbance. Approximately 190 mamane trees occur in Zone 2. Patches of Stenogyne spp. are very common, some containing 20 to 100 individuals. Verbascum sp. (mullein) is locally abundant. A small grove of eucalyptus trees is near the former site of the ranger's shack.

2.3 Plants of Special Interest.

2.31 Definitions and Concepts of Rare Plants.

Various government agencies, organizations, and individuals have published lists of plants believed to be rare, endangered, or threatened with extinction. Several plant taxa which occur at Hale Pohaku are included on one or more of these lists.

It is an inherent quality of most rare plant species that they are not well known or widespread. In many cases, rare plants are not well known even to botanical science. That is to say, the geographic distribution of a particular plant species is not known, nor is it understood how a particular plant taxon (a unit of classification, such as species, subspecies, or variety) relates to similar taxa. In some cases, a subdivision of a species, such as subspecies, variety, or form, is recognized as rare or endangered, while the entire species is not.

Problems in identifying plants as belonging to these lower taxonomic subdivisions exist. To quote from a publication of the Fish and Wildlife Service on Endangered and Threatened Species (Federal Register 1976), "The Service recognizes that plant taxonomy is not an exact science, that

the knowledge of plants continues to develop, and that scientific nomenclature reflects such understanding.". The determination of the proper name and rank of a plant is of more than academic interest. For example, if a local population of plants is classified as a subspecies or variety or a more widespread species, then this local population might be considered a rare plant taxon. If, on the other hand, the local population is not considered to differ from the widespread species, the plants of that population will not be thought of as "rare".

The literature was examined, and persons with knowledge of the plants in question were consulted; however, the following determinations and opinions are those of the writer alone.

2.32 Rare Plants.

2.321 Sophora chrysophylla var. circularis.

Collections from several of the mamane trees found at Hale Pohaku were determined to belong to the variety named above. This variety has been proposed for "endangered" status by the Fish and Wildlife Service (Federal Register 1976), and is listed in the IUCN Red Data Book (published by Kew Gardens) which identifies rare and endangered plants and animals around the world. The

taxonomy of Sophora chrysophylla is not well understood and is subject to revision.

Mamane, of any variety, is the major food source of a number of bird species, including the rare palila. Because of the mamane forest on the site, Hale Pohaku is in an area designated "critical habitat" for the palila.

2.322 Geranium cuneatum var. hololeucum.

The above variety of geranium has been proposed for "endangered" status by the Fish and Wildlife Service (Federal Register 1976). Two individuals of this geranium were found in Zone 1 (MEF), and four in Zone 2 (park). The approximate location of each of these shrubs is shown in Figure 1 by the symbol "G".

2.323 Stenogyne.

Two species of this native plant occur at Hale Pohaku. One of them, Stenogyne microphylla, has been proposed for "endangered" status by the Fish and Wildlife Service (Federal Register 1976). The locations of two individuals of this species are shown in Figure 1 by the symbol "Sm ". This species has been listed as "probably extinct" or "extinct" in several publications (e.g. Fosberg and Herbst 1975). However, since that time, this species has been collected and identified by other botanists.

Stenogyne rugosa is common at Hale Pohaku, especially in Zone 2 (park). The locations of the more conspicuous stands are shown in Figure 1 by the symbol "Sr". One form of this species was listed by Fosberg and Herbst (1975) as "probably extinct". It is not certain whether or not the populations of Stenogyne rugosa at Hale Pohaku belong to this form.

The taxonomy of the genus, Stenogyne, is not well understood and is currently being revised by Dr. H. St. John.

2.33 Exotic Plants.

Many plants that were brought to Hawaii by man in the last 200 years are established in the vegetation at Hale Pohaku. Some of these exotic plants, especially some of the grasses and other herbs, now make up an important part of the vegetation. These species are naturalized and can be expected to maintain their presence on the site indefinitely.

Seeds or seedlings of exotic plants are brought to a site such as Hale Pohaku intentionally by man (as in the case of the eucalyptus trees, and the aloe planted near the stone cabins) or unintentionally by man (e.g. in the mud on vehicle tires) and by birds and other animals. Because

the ground is not densely covered by vegetation, it is relatively easy for any plant that can survive the environmental conditions of the site to become established.

2.4 Feral Herbivores.

It has been suggested that the human activity around Hale Pohaku has served to frighten away feral herbivores (sheep, mouflon, and goats). During this survey, none of these mammals nor any sign, such as tracks or droppings, were found within the surveyed site. However, by walking approximately one-quarter of a mile east of the stone cabins (Figure 1), an area was reached where tracks and droppings of at least one species of feral herbivores are abundant. In this area, the vegetation did not give evidence of being suppressed or heavily damaged by grazing or browsing. Specifically, regeneration of mamane did not appear to be markedly inferior to the regeneration of mamane closer to the buildings at Hale Pohaku. No measurements or counts were made; the above conclusion is based on general observations only.

In recent years the number of feral mammals on Mauna Kea has been decreasing. There have been situations in Hawaii, where the vegetation of an area has changed dramatically after being freed from the pressure of feral herbivores by the building of a fence. In what

is probably the most spectacular of these cases (Mueller-Dombois and Spatz 1972), a small plot in the lowlands on the island of Hawaii was fenced to keep out feral goats. After 19 months and dominant annual grasses were replaced by perennial bunch grasses and woody shrubs; and, it was found, that 50 percent of the plot was covered by a native herbaceous vine which previously had not even been known to exist (St. John 1972). While it is not possible to predict that such results will occur in the Hale Pohaku area, the present and possible future reduction of the number of herbivores in the area may allow a regeneration of the ecosystem. This regeneration will not produce an ecosystem of all native plants similar to that which existed before the disturbance by man and his animals, but it can be expected to produce a more diverse and stable plant community. The finding of such plants as Stenogyne microphylla (mentioned in section 2.323) which were thought to be extinct, is an indication that such regeneration may have begun.

2.5 Impacts and Recommendations.

2.51 Impacts.

The decision to build, and the construction of, the MEF at Hale Pohaku will have several immediate impacts. The most obvious among these impacts is the displacement of the plants which grown on or very near the proposed construction sites. As was stated in section 2.21, about 35 mamane trees might be disturbed by the construction. Figure 1 shows the location of several

individuals or clumps of Geranium and Stenogyne on or very near the proposed construction sites. It may be possible to carefully remove these and other plants and use them in landscaping the site. However, a high success rate of transplanting should not be expected.

The commitment of the Hale Pohaku site would have important implications. It is possible that future expansion of astronomy facilities at the summit and concomitant expansion of support facilities may be desired by user agencies. This possible future expansion of the MEF at Hale Pohaku would make further inroads into the area of an already limited vegetation type i.e., the Mauna Kea mamane forest or parkland ecosystem.

Some impacts will not be assessable at once, but will be felt with the passage of time. Construction of permanent facilities, and especially the construction of a public park, at Hale Pohaku is likely to increase the number of people using the site. Increased foot traffic in the surrounding vegetation will have negative impacts. The vegetation will be trampled and otherwise disturbed; erosion may be started. Increased traffic to and within the area increases the chance of new exotic species being introduced into the area. With increased use of Hale Pohaku, the zone of damaged and degraded vegetation which surrounds the existing facilities will be expanded.

2.52 Recommendations.

Whether the proposed projects are located at Hale Pohaku or at an alternative site, care should be taken in landscaping. Erosion is a severe problem at Hale Pohaku and elsewhere on the mountainside. If left unchecked, gullies or bank erosion can undermine the vegetation and building foundations.

It is probably unfeasible to control erosion by planting grass or shrubs. The grasses native to the area do not form a continuous sod, and are relatively slow growing due to the low air temperature, low soil moisture, and other stressful factors related to high altitude. It is unlikely that a non-native grass or vegetation would yield better performance under these conditions. Moreover, it is strongly recommended that no non-native plants be propagated on the site (an exception might be made for an exotic grass, such as Stipa cernua, which is already well established throughout the region). Any exotic plant species brought to the site for landscaping might become established and spread throughout the region, thus decreasing the resources (moisture, soil nutrients, etc.) available for native plants such as mamane. In light of these considerations, it is recommended that erosion be

controlled by physical means such as contouring, terracing, and careful control of runoff water. In the long term, a good cover of grasses and other plants can be established.

If an arboretum is established on the mid-elevation slopes of Mauna Kea, as is being considered by the Department of Land and Natural Resources, care must be taken in the selection of seed stocks. The plants in the arboretum should be grown from seeds collected in the immediate vicinity. Even within a species or variety of plants, there sometimes are "races" genetically adapted to different environments. If plants from outside seed stocks are grown on Mauna Kea, cross-pollination and interbreeding with the plants in the surrounding vegetation would be likely. Degeneration of the local population of that species or other unwanted affects might result.

3.0 Alternative Sites.

3.1 Hawaiian Homes Land Site.

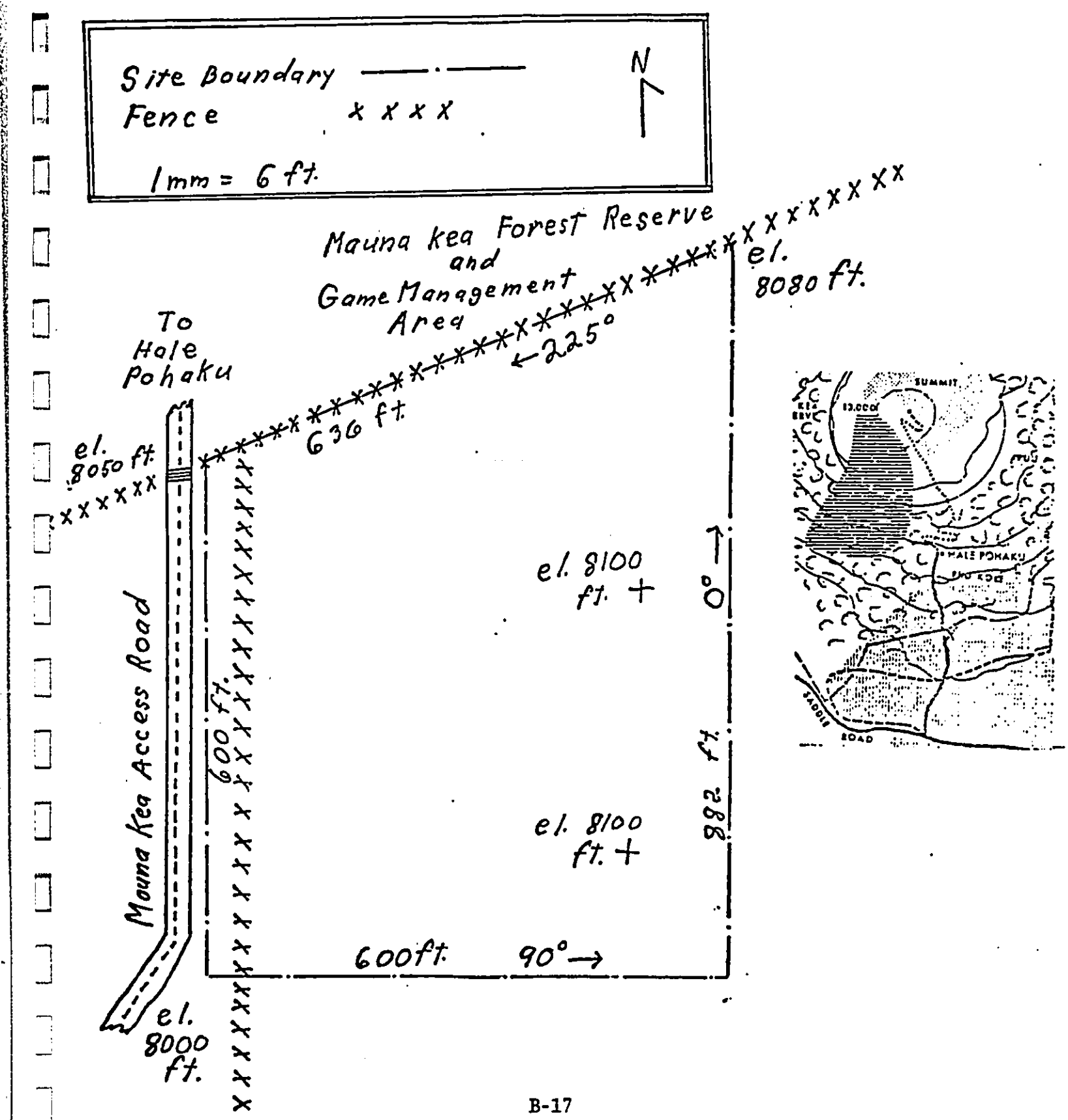
3.11 Description.

As an alternative location for the construction of the new MEF and park, a site located at an elevation of 8,000 feet was surveyed on June 15, 1979. This site, on the east side of the Mauna Kea Access Road, is immediately below (outside) the Mauna Kea Forest Reserve and Game Management

Area (Figure 3). The woven-wire fence of the Mauna Kea Game Management Area is the northern boundary of the surveyed site; the western boundary is marked by the road itself. The southern and eastern boundaries of the site were paced off, with a compass used to establish the headings. The area surveyed is slightly larger than ten acres.

The vegetation on the site is a savanna of mixed grasses and scattered mamane (Sophora crysophylla) trees. A very few pukiawe (Styphelia tameiameiae) shrubs also occur there. Mamane trees and saplings of all sizes are present. The smaller saplings and seedlings appear to have been browsed, but many are still viable. The more abundant grasses are Deschampsia australis, Anthoxanthum odoratum, Bromus rigidus, and Poa pratensis. Other common herbaceous plants include Rumex acetosella, Trifolium repens, T. arvense, Pellaea ternifolia, Pteridium aquilinum, Verbascum sp., and Achillea sp. The approximately 30 mamane trees on the site cover no more than 10 percent of the area. Herbaceous plants cover less than 50 percent of the ground. Hummocks and ridges of outcropping rocks dominate the site; however, there are several level areas 30 to 50 yards in diameter.

Figure 3. Sketch map of alternative site on Hawaiian Homes Land showing area surveyed and inset showing location (X) on Mauna Kea. Distances not corrected for slope.



In these areas the soil is a fine loamy sand similar to the soil at Hale Pohaku.

3.12 Comments and Recommendations.

There is a marked difference between the vegetation on the surveyed site and the vegetation across the fence in the Mauna Kea Game Management Area. The vegetation on the site is much less dense, the herbaceous plants are not as tall, and fewer species of shrubs and trees are present. The vegetation below the fence has been much more severely affected by grazing or browsing.

No rare plants or other native plants of special interest, except the mamane trees mentioned above, occur on the site. It is possible that the buildings of the MEF could be constructed without removing any trees. This location is judged to be an acceptable site for the MEF and/or park from a botanical point of view.

3.2 Humuula Sheep Station.

3.21 Description.

The locale of the Humuula Sheep Station is considered a possible alternative location of the MEF. Since no specific site had been

chosen, the vegetation on both sides of the Mauna Kea Access Road between the elevations of 6,000 and 6,800 feet was superficially surveyed on June 15, 1979.

This area is a pastureland, currently used for grazing cattle. The vegetation is a savanna of introduced pasture grasses and other herbs with scattered mamane (Sophora chrysophylla) trees. The mamane trees are all large, mature individuals; no saplings or seedlings were seen. It is estimated that the mamane trees cover less than one percent of the area. The herbaceous vegetation especially the grasses, form a nearly complete ground cover over the areas with deep soil. On the few spots with rock outcrops, the native ferns, Pteridium aquilinum and Pellaea ternifolia, are common.

The most common pasture grasses are Poa pratensis, Festuca sp., and Bromus rigidus. Common pasture weeds include Verbascum sp., Cirsium vulgare, and Hypochoeris radicata.

On the east side of the road there are a couple of groves of conifer trees.

3.22 Comments and Recommendations.

No rare plants or other plants of special interest, other than the mamane mentioned above, were seen in the area; nor is it likely that a more thorough search would discover any. Years of cattle grazing have completely altered the native vegetation. Construction of the MEF or of the proposed public park in this area would have no unacceptable impact on the vegetation or local biota.

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APPENDIX

Vascular plants from Hale Pohaku listed by family. Nomenclature follows that of H. St. John. 1973. List and Summary of the flowering plants in the Hawaiian Islands.

N = Native to Hawaii, E = Exotic (brought to Hawaii by man).

	BOTANICAL NAME	FAMILY	COMMON NAME
		Ferns	
		Cheilanthaceae	
N	Pellaea ternifolia(Cav.) Link		
		Gymnosperms	
		Pinceae	
E	Pinus sp.		Pine
		Angiosperms	
		Chenopodiaceae	
N	Chenopodium oahuense	(meyen) Aellen	'āheahea
		Compositae	
E	Cirsium vulgare	(Savi) Tenore	Bull thistle
E	Erigeron bonariensis	L.	Hairy horseweed
N	Gnaphalium sandwicensium	Gaud	'enaena
E	Hypochoeris radicata	L.	gosmore
E	Senecio vulgaris	L.	common grounsel
E	Sonchus oleraceus	L.	sow thistle

	BOTANICAL NAME	COMMON NAME
	Cruciferae	
E	Lepidium virginicum L.	wild peppergrass
	Epacridaceae	
N	Styphelia tameiameiae (Cham.) F. Muell	pūkiawe
	Geraniaceae	
E	Erodium circutarium (L.) L'Hér ex Ait.	filaree
N	Geranium cuneatum Hook var. hololeucum Gray	
	Gramineae	
E	Anthoxanthum odoratum L.	sweet vernal grass
E	Bromus rigidus Roth	ripgutgrass
N	Deschampsia australis Nees ex Steud.	
E	Holcus lanatus L.	velvet grass
E	Lolium L. sp.	ryegrass
E	Poa pratensis L.	Kentucky bluegrass
E	Stipa cernua Stebbins & Love	
N	Trisetum glomeratum (Kunth) Trin. in steud	mountain pili
	Labiatae	
N	Stenogyne microphylla Benth.	
N	Stenogyne rugosa Benth.	

	BOTANICAL NAME	FAMILY	COMMON NAME
		Leguminosae	
E	Cytisus palmensis (Christ) Hutch		tagasaste
N	Sophora chrysophylla (Salisb.) Seem cf. subsp. circularis Chock var. circularis		mamane
		Liliaceae	
E	Aloe vera L.		panini 'awa'awa, aloe
		Myrtaceae	
E	Eycalyptus L'Hér sp.		eucalyptus
		Onagraceae	
E	Epilobium cinereum A. Rich		pūkāmole
		Papaveraceae	
E	Escholtzia californica Cham.		California poppy
		Polygonaceae	
E	Rumex acetosella L.		sheep sorrel
		Scrophulariaceae	
E	Verbascum (Tourn.) L. sp.		Mullein
		Solanaceae	
E	Solanum nigrum L.		black nightshade

APPENDIX C

AVIAN SURVEY

BY

MAILE STEMMERMAN

APPENDIX C

PRELIMINARY AVIAN SURVEY OF HALE POHAKU AND ALTERNATIVE SITES, MAUNA KEA, HAWAII

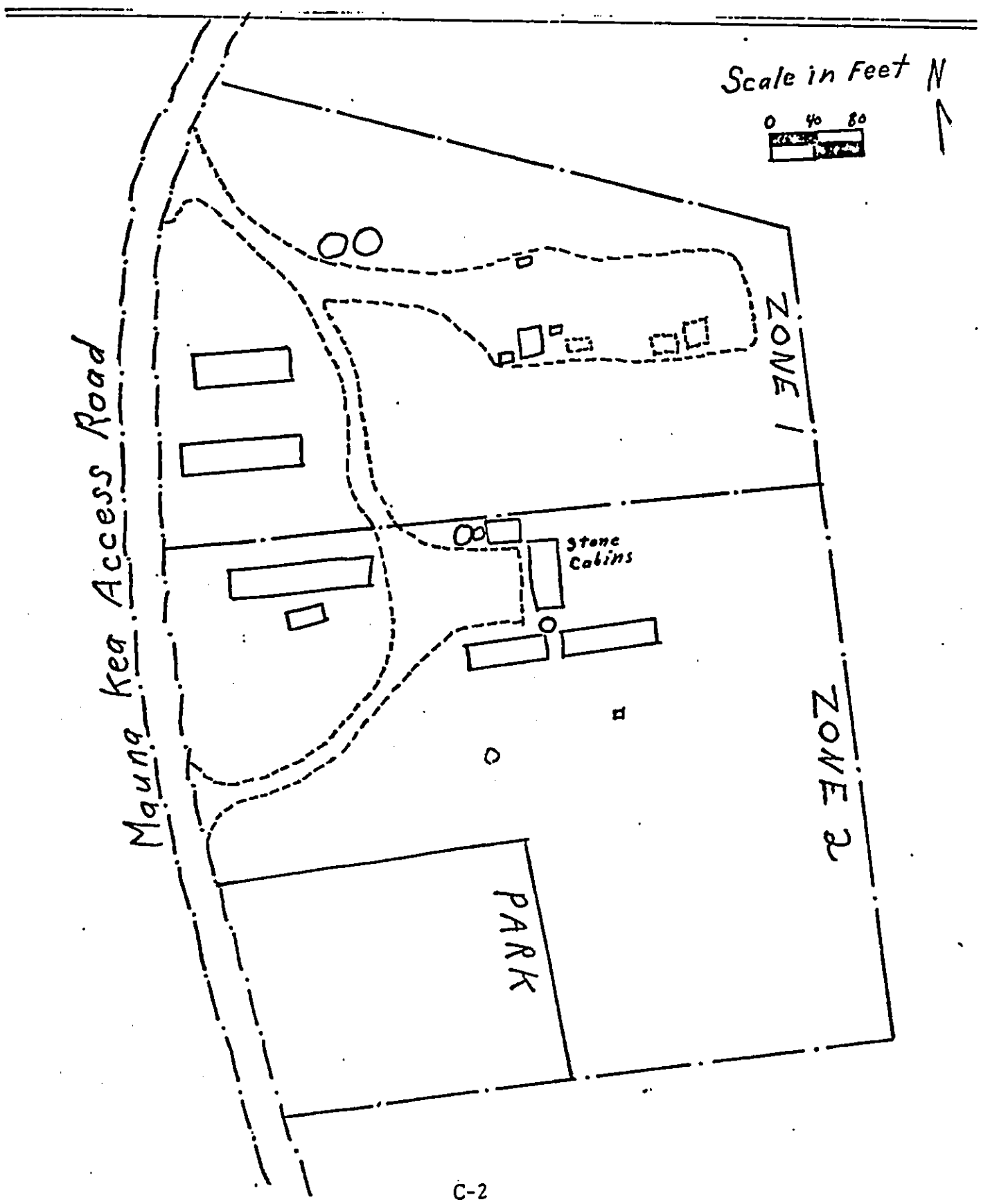
By Maile Stemmerman, Ornithologist

A. THE SITES: DESCRIPTION AND SUITABILITY

1.0 Hale Pohaku (Figure 1)

This site, consisting of the present developed area as well as some surrounding forest, exhibits the best avian habitat of the three sites censused. Forest cover is in most places intact, and erosion and browsing of mamane by feral mammals are minimal. The generally good conditions of the mamane forest at Hale Pohaku is reflected in the larger number of species observed here as compared with the alternate sites. Nine bird species were seen at Hale Pohaku or in the immediate vicinity; all but two were exotic (non-native). While most of the birds were utilizing the mamane forest in its natural state, a few of the birds appeared to be attracted to the facility itself, presumably for water. This pattern was most clearly seen in two of the exotic species, the House Finch and the House Sparrow, both of which were densely concentrated in the vicinity of the stone cabins. Hale Pohaku may be suitable for use by non-passerine natives such as the Pueo (*Asio flammeus*), the 'Io (*Buteo solitarius*) or the Dark-Rumped Petrel (*Pterodroma phaeopygia sandwichensis*). Known nesting

Figure 1. Hale Pohaku Existing Site Plan Showing Zonation of Site.



localities on Mauna Kea for the latter species are considerably above the Hale Pohaku site, and while usage of well vegetated areas is not unknown for this species (Hirai personal communication and personal observation), nesting in such areas appears unlikely.

Small mammals, as well as gamebird chicks in the Hale Pohaku area would provide adequate food supply for the other two non-passerines. Mice were seen both in the vicinity of the buildings on the site and in the mamane forest. Other small unidentifiable mammalian tracks, possibly from rats or mongooses, were also observed. While Nene (Branta sandvicensis) are known to roost on Mauna Kea, no records of their use of Hale Pohaku have been published.

The critical habitat of the Palila encompasses Hale Pohaku and extends above it to the 10,000 feet level. This endangered species is dependent upon the Mamane-Naio Ecosystem (such as that which extends around Hale Pohaku) for food and nesting, and Palila have been observed at this site. (See checklist comments). From extensive census data (van Riper et al., 1978), it appears that Palila, when they do appear, are most abundant at and just below the tree line in the regions surrounding Hale Pohaku. Presumably this is because of the presence of large Mamane in those areas. The increase in density of the Palila with increasing elevation was seen both in the breeding and non-breeding seasons but was most marked during the former. The importance of higher elevation forests such as

those surrounding Hale Pohaku as both feeding areas and, more importantly, potential breeding areas for the Palila should be kept in mind while considering sites for construction and development. The possible effects of construction at Hale Pohaku on the biology of the Palila are twofold; and both positive and negative impacts are to be expected. Because human habitation at the site causes avoidance of the area by feral mammals, limited habitat improvement has occurred. Such an effect would be expected to continue, however, even if the Hale Pohaku site was not used for mid-elevation facilities, provided that it was utilized in some capacity, such as a State park. Unfortunately, Unfortunately, these effects are limited to a small area around the proposed site. The sighting of four feral goats less than 1/4 mile downslope from Hale Pohaku emphasizes the limited nature of such positive effects.

The primary negative impacts on the biologies of both the Palila and other bird species result from an increase in the use of the Hale Pohaku area not only by astronomers but also by park users. It is clear from census data (see comments above) that the site is potentially an important feeding locality and possibly even a breeding site for the Palila. In spite of the fact that Palila seem to be fairly tame while feeding (personal observation), breeding birds are likely to be far more susceptible to disturbance. Palila are only able to raise one set of young per season (van Riper 1978); thus disturbance of breeding birds would have

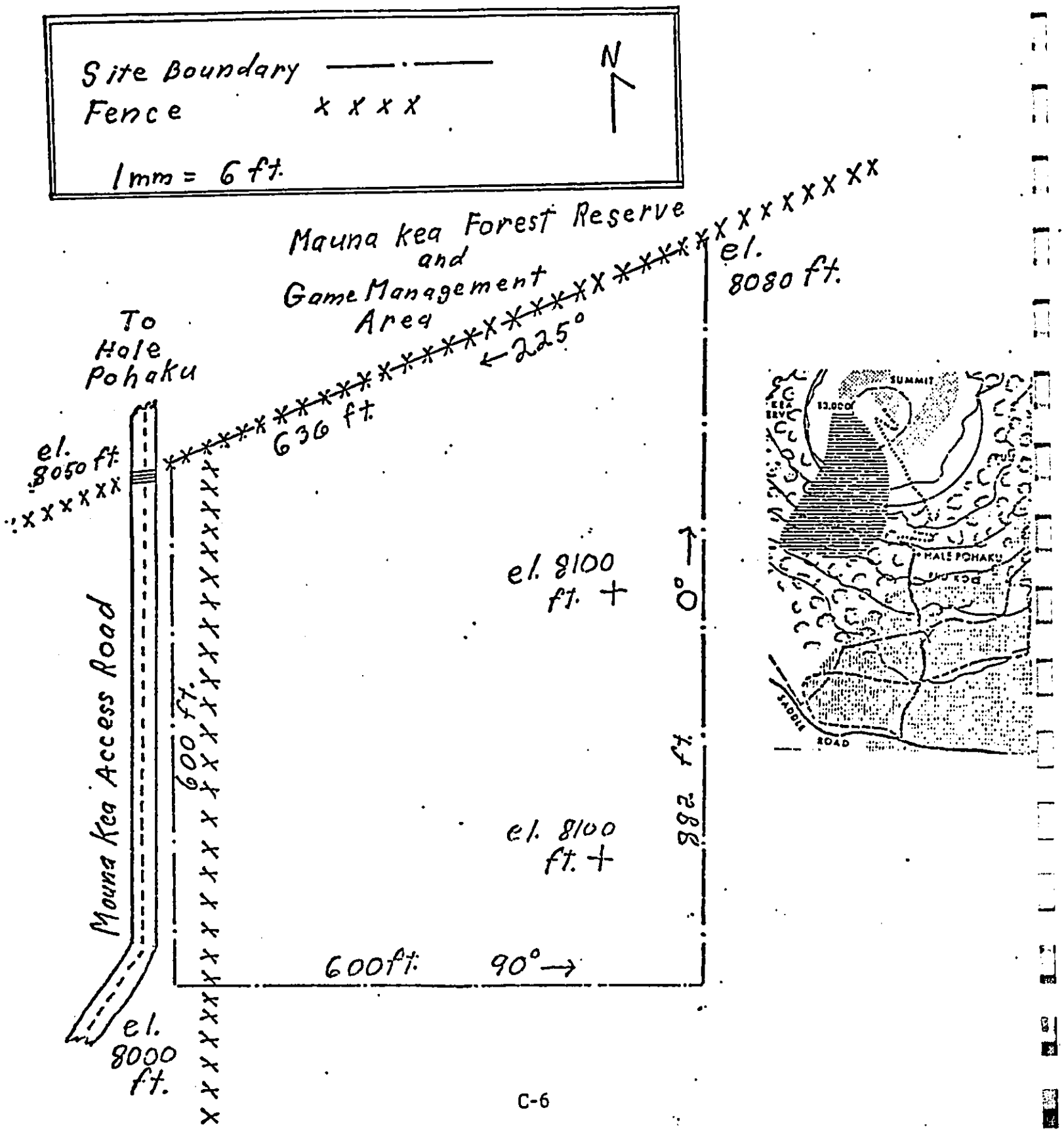
a far more serious effect on productivity in the Palila than in multiple brooded species such as the 'Amakihi. While breeding actively has not been observed at Hale Pohaku, the fact remains that if it does occur there (and the potential is considerable); and if human activity does increase, the possibility of decreasing productivity through disturbance and nest desertion is quite strong.

2.0 Hawaiian Homes Commission Lands (Figure 2)

This site, situated immediately downslope of the Boundary of the Mauna Kea Game Management Area, consists of mamane forest which has been heavily grazed by cattle (Parker Ranch leases the land from the State). As a result of the prolonged grazing pressure, the forest has been reduced to several widely scattered clumps of mamane and a few isolated dead or dying individual trees. This site is outside of the critical habitat of the Palila as described in the Federal Register (Aug. 11, 1977).

Four bird species were observed here, one of which was native (see Table 1), reflecting the limited suitability of the site for avian habitation. The savannah-like habitat provides marginal game bird range (it is less than ideal due to lack of cover), but appears to be suitable for several passerines such as the Skylark and the House Finch. The disturbed nature of the forest would clearly not provide adequate resources for Palila populations. Less specialized native species, particularly the 'Amakihi and the 'Apapane, may be able to exist here during periods of intense mamane bloom.

Figure 2. Sketch Map of Alternative Site on Hawaiian Homes Land.



Lack of suitable food sources probably renders this site unusable for the Nene, but the habitat appears suitable for both the Pueo and the 'Io. Abundant spoor of what appeared to be House (Mus musculus) or small Rat (Rattus Spp.) in the northeast portion of the site attest to the suitability of the area for avian predators such as the Pueo or 'Io. Due to the already highly disturbed nature of the Hawaiian Homes Commission Land, construction of mid-elevation facilities at this site would have no effect on Palila populations, and would certainly have little appreciable impact on other bird species. From an ornithological point of view, the greatly reduced potential impact on both populations of Palila and other native birds posed by construction at this site constitutes a major advantage for the use of this as an alternate site.

3.0 Humu'ula

This possible alternative site, situated near the present sheep station, consists of grassland and pasture as well as occasional stands of exotic conifers. Aside from its minor potential for supporting native predators ('Io and Pueo), and few exotic passerines and game birds, the Humu'ula location is marginal bird habitat. For species were recorded here, all of which were exotic.

Impact of construction at this site on native bird communities and on existing exotic fauna is virtually nil.

B. RECOMMENDATIONS

The following list of recommendations pertains to the construction and management of facilities at both Hale Pohaku and the Hawaiian Homes Commission site. The greater length of the list pertaining to Hale Pohaku reflects its greater potential and importance as avian habitat.

1. Hale Pohaku

Zone 1 - Mid-elevation Facilities

a. Construction-related impacts should be minimized as much as possible. This pertains particularly to noise during avian breeding seasons, as breeding birds are more sensitive to disturbance than during other times of the year. Particularly noisy activities such as bulldozing or grading should be done between the months of October and February to minimize these problems.

b. Buildings should be placed in areas which have been already disturbed. Suitable sites include the graded area north of the present buildings (where the fuel storage and generators are presently situated), and the area covered by dirt road presently running between buildings.

This plan would minimize the number of mamane which would need moving.

c. Plant mamane, from local seed stocks, in areas disturbed by construction, and protect such plantings from bruising. These plantings may minimize erosional problems and may even encourage an influx of native birds once they have begun to produce flowers and seed.

d. The site should be fenced to prevent disturbance by both park users and feral mammals.

Zone 2 - State Park; Arboretum

a. Hunting should be encouraged in adjacent areas outside the 400' safety limit to reduce goat, sheep, and mouflon impact on surrounding forests.

b. Traps for small mammals such as rodents, feral cats, and mongoose in both the park and the astronomy facilities would reduce the negative effects of these species on nesting birds, both native and exotic. Mammalian predation is one of the most significant limiting factors to Palila breeding success (van Riper, 1978).

c. Several rules pertaining to visitors should be posted and enforced, the most important of which are as follows:

(1) no open fires

(2) no removal of any plant material

(3) no motorcycles or 4-wheel drive vehicles allowed off paved or dirt roads.

d. Information emphasizing the unique nature of the Mamane/Naio Ecosystem and its fragility and need for protection should be posted on a Kiosk. Information on the natural history of the Palila should be included, as well as that on other native bird species present on Mauna Kea.

e. The exotic Eucalyptus trees at the site appear to be extremely attractive to exotic bird species such as the House Finch. Removal of these trees would allow mamane regeneration, which would be more favorable for native birds.

2. Hawaiian Homes Commission Site

a. Grading should be minimized (or, if possible, not done at all) due to reduced plant cover at the site.

b. Planning of construction around the present groups of trees and landscaping with local mamane seedlings could prevent negative visual impact and would also encourage native birds to use the site.

c. Construction of buildings away from the present access road would reduce both the danger from vandalism and the visual impact of such facilities on visitors to Mauna Kea.

C. ANNOTATED SPECIES LIST

1.0 Introduction

The following checklist was compiled from two days of field work encompassing Hale Pohaku and two alternative sites at lower elevations. The duration of the survey renders this checklist somewhat incomplete; that is, several species are absent from the list in spite of their known presence in the area. There are three major reasons for such omissions:

1.1 During the non-breeding season (generally September through February), several game bird species such as the Chukar (Alectoris chukar) and the California Quail (Lophortyx california) form large, obvious coveys. When these flocks are disbanded during the breeding season, the birds are secretive and far more difficult to detect. This factor probably accounts for the absence of several of the commoner game birds from all three of the sites during this survey. Many passerine species (including the Palila) are also known to be less vocal and less obvious during the breeding season.

1.2 Breeding activity affects the distributions of some species as well as their detectability. The effect of breeding activity on the distribution of the Palila was documented by van Riper et al. (1978). Palila censuses over the species' known range revealed a more dispersed pattern of sightings in the non-breeding season as compared with those in the breeding season. The dispersal was most obvious on a elevational basis, but was also seen to some extent on a lateral basis around Mauna Kea. Lack of Palila sightings (and possibly those of other native species), therefore may be due partially to the breeding season range of the species.

1.3 The fact that few native passerine species were recorded at the sites may also be due to the phenophases of their food plants, primarily those of mamane (Sophora chrysophylla) and naio (Mysporum sandwichense).

The most commonly observed native passerine, the Amakihi (Loxops virens) is a generalist with regard to its food sources is able to shift readily from one food source to another in the event of a shortage. This bird is not dependent on any one plant species. The other three species of Drepanididae known to occur with any regularity at Hale Pohaku, ('Apapane, Himatione sanguinea; 'I'iwi, Vestiaria coccinea; and Palila, Psittirostra bailleui), are more specialized than the 'Amakihi. These species might be expected to leave an area when plants no longer supply adequate amounts of their preferred foods. The 'I'iwi and 'Apapane are nectorous and feed on nectar from mamane and naio flowers on Mauna Kea. The Palila is heavily dependent on the green pods of mamane and also takes varying amounts of brown pods as well as flowers (Berger, 1972, Shallenberger, 1978, van Riper, 1978). The absence of these three species from the Hale Pohaku and Hawaiian Homes Commission Lands sites on this survey was not unusual because neither of the sites had significant amounts of blooming or seeding mamane.

It must be emphasized, however, that the above phenomenon is strictly seasonal and neither reflects nor detracts from the long term suitability of the habitat of any of the native passerines. We can assume that all three use Hale Pohaku at times of the year when the phenophase of the mamane is suitable. The Hale Pohaku area provides an excellent habitat for these species because there are very few dying trees and browsing by sheep and goats is minimal in the vicinity of the site. Surveys conducted on a year round basis would clarify the importance of the sites for specialized bird species.

While there are very few published sightings of Palila at Hale Pohaku (Mull, 1977, van Riper et al., 1978), the species has been seen with regularity there over the last five years (Conant, Woodside, and Ziegler, personal communications). It can be surmised that Palila use Hale Pohaku regularly, at least for feeding. The fact that no breeding activity has been recorded at the site may well be nothing more than an artifact of the lack of study of Palila in the Hale Pohaku area.

Table 1 - Bird Species Present at Each of the Three Sites Surveyed

(Numbers are approximate densities given in bird numbers per 10 acres).

SPECIES	SITES		
	Hale Pohaku	H'wn. Homes	Humu'ula
Francolinus erckelii (Erckel's Francolin)	3	1	1
Lophortyx californicus (California Quail)	5	-	-
Acridotheres tristis (Myna)	-	-	6
Alauda arvensis (Skylark)	-	2	1
Zosterops japonica (White Eye)	2	-	-
Leiothrix lutea (Red-Billed Leiothrix)	1	-	-
Loxops virens ('Amakihi)	12	4	-
Himatione sanguinea ('Apapane)	4	-	-
Carpodacus mexicanus (House Finch)	13	5	10
Passer domesticus (House sparrow)	5	-	-

PHASIANIDAE*

Lophortyx californicus (California quail)

A covey of five quail were seen on the road about 1/4 mile below Hale Pol·aku (8,950'). At least four of the birds were juveniles nearly 3/4 adult size. Large coveys of this species may occur in the non-breeding season.

COLUMBIDAE

Columba livia (Rock dove)

Two individuals were seen flying north of Humu'ula and appeared to be transitory, although they could have been roosting at the sheep station.

*Family and species names from Pyle (1977)

ALAUDIDAE

Alauda arvensis (Skylark)

These birds are common in the open Mamane Savannah such as that at the Hawaiian Homes Commission Land Site and at Humu'ula. Not seen at Hale Pohaku.

TIMALIIDAE

Leiothrix lutea (Red-billed Leiothrix)

One individual was seen at Hale Pohaku, on the northeastern portion of the proposed mid-elevation facility site. The area is probably a marginal habitat for this species.

ZOSTEROPIDAE

Zosterops japonica (White Eye)

This bird, although abundant in most lower elevation habitats, was found only in very low densities at the Hale Pohaku site. Seasonal shifts in the range of the bird with relation to mamane bloom are to be expected as it readily takes mamane nectar.

STURNIDAE

Acridotheres tristis (Myna)

This species is commonest around human habitations and was found only at Humu'ula during the present survey.

DREPANIDIDAE

Loxops Virens ('Amakihi)

This endemic passerine was common at Hale Pohaku and in surrounding forest, as well as at the Hawaiian Homes Commission site. Habitat in the latter area appeared much less suitable for this species, as reflected in the lower numbers of 'Amakihi detected.

Himatione sanguinea ('Apapane)

While not seen at the Hale Pohaku site itself, a flock of five 'Apapane was observed at 9,100' elevation near the Mauna Kea Access Road. As with the 'Amakihi and the White Eye, the densities of this species would be expected to increase dramatically with an increase in mamane bloom in the area.

PLOCEIDAE

Passer domesticus (House Sparrow)

Common at Hale Pohaku in the vicinity of the water storage areas, but not seen in the surrounding forest. The birds may have been using the buildings for roosting and/or nesting sites.

FRINGILLIDAE

Carpodacus mexicanus (House Finch)

This species was present at all three localities and appeared most abundant at the Hale Pohaku and Humu'ula sites. This was possibly due to presence of buildings and water sources. (See comments above for Passer domesticus.) It also occurred in moderate numbers in the forest around the Hale Pohaku site. This species appeared to be at least as abundant as the 'Amakihi at Hale Pohaku, and showed less variation in numbers between the three sites than did any of the other species.

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APPENDIX D

TRI-PARTITE AGREEMENT

TRIPARTITE AGREEMENT AMONG:

THE NATIONAL RESEARCH COUNCIL OF CANADA,
THE CENTRE NATIONAL DE LA RECHERCHE
SCIENTIFIQUE OF FRANCE,
AND THE UNIVERSITY OF HAWAII

CONCERNING

THE CONSTRUCTION AND OPERATION OF
A LARGE OPTICAL TELESCOPE ON MAUNA KEA

Recognizing the increasing development of astronomical research and the quality and the quantity of related scientific work carried out in the universities and specialized research centres of Canada, France, and Hawaii,

Considering the need for instruments to be available for use by the astronomers of Canada, France, and Hawaii,

Considering the desirability of developing international cooperation in large-scale scientific undertakings,

the National Research Council of Canada (NRC)
the Centre National de la Recherche
Scientifique(CNRS) and
the University of Hawaii (UH)

hereinafter referred to as the Agencies, having obtained the approval as appropriate of their respective governments, that is those of Canada, of France, of the United States of America and of the State of Hawaii, agree:

1 - GENERAL PROVISIONS

1. That the NRC, CNRS, and UH will establish under Hawaii law a Corporation to be named the Canada-France-Hawaii

Telescope Corporation, to design, construct and operate on Mauna Kea, Hawaii, a large optical telescope of 3.6 meter aperture along with laboratories, equipment and associated installations, which will remain the exclusive property of the Corporation during the existence of the Corporation.

2. The Corporation will be directed by a Board of Directors assisted by a Scientific Advisory Council.

2.1 The Board of Directors shall be composed of:

4 members appointed by NRC
4 members appointed by CNRS
2 members appointed by UH

The Board of Directors shall be responsible for coordination on technical and administrative problems, and in particular, must ensure that the design and operation of the telescope and its ancillary installations will satisfy the needs of the astronomers.

It is responsible for the use of the funds of the Corporation.

Its decisions will be taken by majority vote, provided there is a quorum and that at least one of the directors named by each agency joins in that majority.

If the need arises the Chairman may take action between meetings of the Board as specified in the bylaws.

2.2 The Scientific Advisory Council shall be composed of:

4 members appointed by NRC
4 members appointed by CNRS
2 members appointed by UH

and up to 4 other members to be named by the Board of Directors.

It meets at least twice per year.

This Council shall be responsible for making recommendations to the Board of Directors and the Executive Director on scientific and technical matters relevant to the aims of the Corporation.

3. For the duration of the construction phase, the management of the telescope project is placed under the direction of a Project Officer and an Associate Project Officer appointed by the Board of Directors on the nomination of NRC and CNRS.

The Project Officer and the Associate Project Officer will be jointly responsible to the Board of Directors for carrying out the design and construction activities. In particular, they must ensure that the equipment provided satisfies the requirements for its intended use.

The Project Officer and the Associate Project Officer may attend meetings of the Scientific Advisory Council. On occasion the Council may deliberate without their presence, if it so wishes. Before these meetings the Project Officer will send to the Scientific Advisory Council a report on work in progress or completed within the scope of the project.

The responsibilities of the Project Officer and Associate Project Officer and the organization and working procedures of the Project Office are detailed in Annex A.

4. The powers necessary for the management of the Corporation shall be delegated to an Executive Director and to an Associate Executive Director appointed by the Board of Directors upon the proposal of NRC and CNRS following their consultation of UH.

The authority and the duties of the Executive Director and of the Associate Executive Director are defined in the bylaws.

5. During the construction phase and in any case as long as it deems it necessary, the Board of Directors may name the Project Officer, Executive Director of the Corporation, and the Associate Project Officer, Associate Executive Director..

6. All senior employees of the Corporation shall be appointed by the Board of Directors in such a manner as to reflect the interests of the Agencies.

7. The Director of the Institute for Astronomy of UH has the authority to ensure that all persons on property over which the Institute has jurisdiction abide by the general rules and regulations of the institute.

II - FINANCIAL PROVISIONS

8. That the total capital cost, exclusive of taxes and duties, and including components and studies already in existence, will be 91 million French Francs, as estimated on February 1, 1973, providing the construction commences in 1973 and is completed by 1977. The general technical characteristics of the project are given in Annex B.

NRC and CNRS will equally share responsibility for providing to the Corporation the work, components and sums necessary for the construction of the telescope, its basic instrumentation, its dome and associated buildings. NRC and CNRS will also equally share the cost and jointly assume responsiblity for the design of the telescope.

As soon as the Corporation is formed, the Corporation will take the steps necessary to assume any and all contractual obligations previously assumed by NRC and CNRS and to enter into all further contractual obligations necessary for the completion of this project.

In as equal a fashion as possible, maximum use will be made of French and Canadian industrial capacity in the design and construction of the telescope, its basic instrumentation, its dome and associated buildings, and in the production of high-technology components.

9. The University of Hawaii will

9.1 furnish a sub-lease at no cost to the Corporation until the year 2033 for part of the land UH now holds under Lease Number S4191 from the State of Hawaii, the boundaries of which are shown on the site plan, dated 15 December 1973, attached as Annex C. The University of Hawaii also agrees to seek from the State the renewal or extension of its Lease during the life of the Corporation and, if received, to renew or extend the Corporation's sub-lease for the life of the Lease or the life of the Corporation whichever is shorter.

9.2 construct and maintain an access road - having characteristics consistent with the overall plan for the development of the Mauna Kea Observatory area - to a boundary line of the sub-leased property.

9.3 construct an electric power line to a central terminal near the Mauna Kea Observatory area, of approximately 750 KW capacity to meet the requirements of the projected installations of the Corporation (approximately 350 KW) and the presently anticipated needs of the existing UH installations and to grant to the Corporation access to this power through an easement over UH leased land. The cost of connection from the telescope site to the central terminal, and of electric power, are to be paid by the Corporation.

9.4(a) construct at a mid-level station two family dwellings with a total area of approximately 220 sq. m. for exclusive use by permanent personnel associated with the

Corporation. In the same general area, UH will also construct an office and laboratory building. This structure is presently expected to contain 10 offices - of which 5 (containing approximately 70 sq. m.) will be made available to the Corporation. In addition, a data analysis laboratory of approximately 60 sq. m. and two darkrooms are contemplated, access to which will be accorded to the Corporation on an equitable basis between the UH and the Corporation.

These facilities will be maintained by UH. The Corporation will, however, be charged on an equitable basis for operating costs incurred by UH in providing such facilities on a basis of no profit or loss to the UH and no participation of the Corporation in amortization.

9.4(b) undertake to provide at the same mid-level station, dormitory type living accommodations (including kitchen and dining facilities) sufficient to meet the combined needs of the University and the Corporation. The UH will assume responsibility for construction, subsequent operation and maintenance with the understanding that the pro rata cost of providing these accommodations, including amortization, shall be charaged direct to the individual who uses them.

9.4(c) obtain for the Corporation should the need arise, authority to construct on the mid-level area additional offices, laboratories and housing on condition that such construction be undertaken within five years from signature of this agreement, that financing be arranged by NRC and CNRS, and that the proposed style, materials, and location of such building be approved by the State and the University of Hawaii.

9.5 furnish approximately 75 sq. m. of office space to the Corporation, for its permanent staff, in the new buildings of the Institute for Astronomy on the Manoa campus. This space will be maintained by the UH and all operating costs will be charged to the Corporation on a basis of no profit to the UH.

9.6 place at the disposition of visiting astronomers using the CFH Telescope, two offices in the Manoa campus building, and afford to them the same facilities as those available to the members of the staff of the Institute for Astronomy, on a basis of no profit to the UH.

9.7 solicit maximum cooperation from the local authorities and users of the site in protecting the natural qualities of the site for astronomical observations.

10. Operating costs.

10.1 That after the completion of the construction phase, the Agencies will annually contribute funds to cover the expenses budgeted by the Corporation up to one million dollars US, as estimated on February 1, 1973, with appropriate provision for variations in the cost of living, in the proportion of NRC 42.5%, CNRS 42.5%, and UH 15%.

These funds will be assigned to cover necessary operating expenses of the Corporation (in particular, meetings of the Board of Directors and the Scientific Advisory Council, staffing and operating the telescope) and for developing further the instrumentation of the telescope.

Similar costs which will be incurred before the end of the construction phase, will be shared in the same proportions; however, in consideration of the other contributions by UH, no cash contributions will be required from UH before July 1, 1975.

The date on which the construction phase will be considered as completed will depend on the date set for commencement of the telescope's normal operation. This date of completion of the construction phase will be determined by the Board of Directors in agreement with each of the Agencies.

10.2 NRC and CNRS will respectively support directly or through the Corporation Canadian and French staff working

within the frame-work of the Project Office. Other expenses of the Project Office will be shared equally by NRC and CNRS.

With this aim in view special operating funds will be provided by NRC and CNRS to the Corporation upon the recommendation of the Board of Directors.

11. Personnel hired by the Corporation will be paid by the Corporation. The schedule of salaries will be that in use at the UH.

If the Corporation deems it necessary, the UH will assist the Corporation in arranging through an appropriate organization for payment of salaries and granting of social benefits to employees of the Corporation.

12. It is understood by the Agencies that the applicable laws of the State of Hawaii currently accord relief from state corporate, income, real estate and excise taxes to non-profit corporations registered exclusively in the State of Hawaii.

It is further understood by the Agencies that the non-profit Corporation referenced in this agreement will benefit from these facilities and that the UH will undertake to use its best efforts to ensure the continued availability of these benefits to the Corporation.

III - FINAL PROVISIONS

13. That in consideration of their respective contributions, the three Agencies will receive equitable interest in the Corporation as follows:

NRC 42.5%

CNRS 42.5%

UH 15.0%

14. That their respective contributions entitle the Agencies to averaged observation time in the following proportions:

NRC 42.5%

CNRS 42.5%

UH 15.0%

Only applications for observation time which are sponsored by a member of the Corporation shall be submitted to the Corporation for consideration.

Transfer by a member of the Corporation of part of its observation time to a third party (scientific agencies in countries other than France, Canada or the USA) can only take place with the unanimous agreement of the Directors present at the meeting when this proposal is discussed and upon the advice of the Scientific Advisory Council.

15. The Agencies must attempt as much as possible to resolve amicably any dispute concerning the interpretation or application of this agreement.

If the dispute cannot be settled amicably, it shall be submitted to a tribunal of arbitration constituted as follows: each Agency shall appoint two members; these members shall propose a 7th member as chairman; his appointment shall be jointly confirmed by the Agencies.

All members of the tribunal shall be appointed within two months after any Agency has informed the other Agencies that it wishes to submit the dispute to a tribunal of arbitration. At the end of this period any Agency may request the Director General of the United Nations Educational, Scientific, and Cultural Organization to make the appointments not yet effected.

The tribunal shall determine the place where it shall sit, its own procedures and all other administrative matters. A decision shall be taken by a simple majority vote within three months from the date of its establishment.

The tribunal shall transmit a certified copy of its decision to each Agency.

Each Agency shall bear the costs for the members it appoints to the tribunal of arbitration. The costs of the chairman as well as those entailed by the arbitration procedure shall be borne in equal parts by the agencies unless the tribunal otherwise decides.

The decision of the tribunal shall be final and binding on the agencies.

16. That, after the completion of construction of the telescope and the laboratories, equipment and installations necessary for its operation and in any case not more than five years from the date of the signature of this agreement, authorized representatives of the Agencies shall meet to examine if it would be required to propose modifications to the text of this agreement. Thereafter such a revision will be possible every three years upon the express request of one of the Agencies.

17. That, the Agencies taking into account any recommendation of the Board of Directors, shall select the method of dissolution of the Corporation.

18. That, this agreement shall come into force when the authorized representatives of the three Agencies have duly signed the original texts of the agreement.

Signed in six copies, three in English and three in French, the texts in both languages having equal validity,

at *Ottawa* on *May 24, 1974*

by *W.G. Schneider*

for the National Research Council of Canada

at *Saint-Michel* on *June 20, 1974*

by *P. Creyssel*

for the Centre National de la Rechere Scientifique

at *Honolulu* on *May 31, 1974*

by *J. Jefferies*

for the University of Hawaii

APPENDIX E

CONSULTATION BETWEEN NASA AND U.S. FISH & WILDLIFE SERVICE

PALILA CRITICAL HABITAT

NASA
National Aeronautics and
Space Administration
Washington, D.C.
20546

RECEIVED
DEC 12 1979
GROUP 70, INC.
DEC 07 1979

Reply to Attn of: LB-4

December 3, 1979

Dr. John Jefferies, Director
Institute for Astronomy
2680 Woodlawn Drive
Honolulu, Hawaii 96822

Dear Dr. Jefferies:

I am forwarding to you a copy of a letter to NASA from Mr. E. B. Chamberlain, Acting Regional Director, U.S. Department of Interior, Fish and Wildlife Service, Portland, Oregon (letter enclosed). In this letter, Mr. Chamberlain has transmitted to NASA the results of our consultation regarding the possible effects of the operations and use of the proposed mid-level facility at Hale Pohaku on Mauna Kea. As is apparent from the letter, the Fish and Wildlife Service has concluded that NASA's participation in funding a share of the operations and use is not likely to jeopardize the existence of the palila and its critical habitat. Thus, the consultation is successfully completed.

We trust the University will continue its special efforts to promote conservation of the palila and its critical habitat. In their letter, the Service has noted three specific actions which would contribute to that objective, and we urge the University to make use of these suggestions to the maximum extent possible. Please keep me informed of progress in this regard; further, should you introduce project modifications or changes in site selection, please let me know as soon as possible so that I can discuss these with the Fish and Wildlife Service.

Sincerely,

Nathaniel B. Cohen

Nathaniel B. Cohen, Director
Management Support Office

Enclosure

cc:
Mr. E. B. Chamberlain, DOI

NASA

National Aeronautics and
Space Administration

Washington, D.C.
20546

Reply to Attn of LB-4

December 3, 1979

Mr. E. B. Chamberlain
U.S. Department of the Interior
Fish and Wildlife Service
500 N.E. Multnomah Street
Portland, OR 97232

Dear Mr. Chamberlain:

We have received your letter concluding consultation on NASA's participation in the operation and use of the proposed mid-level facility at Hale Pohaku on Mauna Kea, Hawaii. That letter has been forwarded to the University of Hawaii for their information along with NASA's specific urging that the University take the compensation and enhancement actions listed in your letter. We will be sure to notify you if any reason to reinitiate the consultation arises.

Sincerely,

Nathaniel B. Cohen

Nathaniel B. Cohen, Director
Management Support Office

Enclosure

cc:
Dr. John Jefferies, U of H

United States Department of the Interior

FISH AND WILDLIFE SERVICE
LLOYD 500 BUILDING, SUITE 1692
500 N.E. MULTNOMAH STREET
PORTLAND, OREGON 97232

November 2, 1979

In reply refer to:
AFA-SE, #1-2-79-F-66

Mr. Nathaniel B. Cohen, Director
Management Support Office
National Aeronautics and Space Administration
Washington, D.C. 20546

Dear Mr. Cohen:

This responds to your letter of May 14, 1979, requesting formal consultation pursuant to Section 7 of the Endangered Species Act of 1973, as amended in 1978 (PL 95-632). It pertains to the involvement of NASA in the operations and use of the mid-level facility at the Halepohaku Area on Mauna Kea, Hawaii. The palila (Psittirostra bailleui) and its designated critical habitat may be affected by the construction of the mid-level facility.

Because the original request did not provide sufficient information to allow us to adequately assess the project, we requested additional site information. A project map, showing the location of roads and structures, was forwarded by Ms. Plasch on September 9, 1979. This document indicated the approximate location and layout of the proposed mid-level facility and provided supplemental information concerning the project. This consultation will address the proposed project as indicated in Plasch's letter of September 9, 1979, through NASA's participation in the operation and use of the mid-level facility.

The palila, a finch-billed member of the endemic Hawaiian honeycreeper family (Drepanididae), was listed as an endangered species in 1966. This recognition was made on the basis of drastic reduction of its historical range, adverse habitat modification by feral sheep browsing, and low estimated population. Its present range is restricted to only the mamane (Sophora chrysophylla)- naio (Myoporum sandwicense) forests on the southeastern, southern, and western slopes of Mauna Kea, on the Island of Hawaii. The palila formerly ranged over an extensive area in the North and South Kona Districts, and all slopes of Mauna Kea, including the windward portions in the Hamakua District.

Adverse modification of habitat by feral sheep has resulted in destruction or suppression of mamane regeneration, particularly along the upper fringes of the forest. Tree density continues to decline in

these areas and poses a severe threat to the palila because its life cycle is inextricably related to the mamane. This tree provides most of the food, shelter, and nest sites for the palila. Their preferred food consists of fully developed, unhardened mamane seeds in green pods, or mature pods that are just beginning to turn brown. Census data revealed that palila concentrations coincided with those areas where developed green pods on large mamane trees occurred.

NASA's involvement in the project consists of payments for use of the facilities. This source of funding encouraged construction of the proposed mid-level facility at Halepohaku on Mauna Kea; however, NASA funding is not responsible for its construction.

The impact of the mid-level facility on the palila is two-fold. The facility (buildings, parking areas, etc.) will be constructed in palila critical habitat, and it may also constitute a significant source of disturbance to the birds that reside or transit through the general area once constructed. The total area involved is not of such magnitude as to constitute a severe threat to the species or its critical habitat. The Halepohaku mid-level site is at the upper limits of the tree line where the mamane forest is sparse. The architect has been instructed to lay out the buildings in such a manner as to require a minimum removal of mamane trees. Possible disturbance to palila may be more than compensated for by reduction in feral sheep numbers in this portion of palila critical habitat through increased human activity and better access for hunting, and its beneficial effect on regeneration of mamane.

It is, therefore, our opinion that NASA's participation in funding the use and operation (no construction) of the mid-level facility at Halepohaku on Mauna Kean, Hawaii, is not likely to jeopardize the continued existence of the palila and its critical habitat.

We would also like to emphasize that NASA has the opportunity to utilize this project authority to promote the conservation of this endangered species as outlined in Section 7(a) of the Endangered Species Act through compensation and enhancement actions at or near the mid-level facility. We believe NASA should use its cooperator status to encourage the State to promote conservation of the palila and its critical habitat by assuring that:

1) Layout of the buildings are planned so that a minimum number of mamane trees need to be removed;

2) Mamane and ulei (Osteomeles anthylidifolia) are planted to enhance the project site and adjacent area, and also replace the estimated three to ten trees that may have to be removed during construction; and

3) Construction is initiated in the summer, after the late spring nesting season of the palila, to reduce disturbance during their breeding season.

This concludes our formal consultation on the mid-level facility at Halepohaku, Mauna Kea, Hawaii. If site selection or project modification beyond those submitted to the Service or discussed above occur, or if new information on listed species becomes available, reinitiation of consultation may be appropriate. We would appreciate notification of your intent in light of this opinion.

Sincerely yours,

Acting Regional Director

APPENDIX F

LETTERS TO UNIVERSITY OF HAWAII, INSTITUTE FOR ASTRONOMY

ACCLIMATIZATION

UNIVERSIDAD NACIONAL MAYOR DE SAN MARCOS
Centro de Investigación
Instituto de Biología Andina
Apartado 5073
LIMA — PERU

MAR 1 0 1976

Lima, March 5, 1976.

Mr. John T. Jefferies
Director
University of Hawaii at Manoa
Institute of Astronomy
2680 Woodlawn Drive
Honolulu, Hawaii, 96822

Dear Sir:

Your letter of December 8, 1975, arrived during one of my trips outside of the country. Please forgive me the delay in answering it.

In regard to your inquire, I am of the opinion that an operating base situated at 1800 m of altitude is not going to be of any help in regard to acclimatization to high altitude. I consider that your operating base at 2800 m must be better in this regard. It is the belief of the people of this Institute that the physiological adjustments begin to operate at about 3000 m of altitude, considering that up to this altitude there are no changes in the hemoglobin dissociation curve. However, at 2800 m there might be some discomfort for sleeping. Considering this last fact, may be, it might be more advisable to build the station for acclimatization at some altitude situated between 2500 and 2800 m. 9200 ft

Looking forward to be of any further help, I remain,

Sincerely yours,

E. Picón Reátegui

E. Picón-Reátegui, M.D.

EPR/mcv.
Arch.

FEB 9 1976

UNIVERSITY OF CALIFORNIA, BERKELEY

BERKELEY • DAVIS • IRVINE • LOS ANGELES • RIVERSIDE • SAN DIEGO • SAN FRANCISCO — SANTA BARBARA • SANTA CRUZ

WHITE MOUNTAIN RESEARCH STATION

BUILDING T-2251
BERKELEY, CALIFORNIA 94720

6 February 1976

Dr. John T. Jefferies, Director
Institute for Astronomy
University of Hawaii at Manoa
2680 Woodlawn Drive
Honolulu, Hawaii 96822

Dear Dr. Jefferies:

I am pleased to respond to your letter of 15 January concerning the matter of high-altitude acclimatization for astronomical work at 4.2 km altitude. Actually, we have operated a similar research facility up to a somewhat higher elevation since 1950, and have considered the physiological problems in some detail.

The properties of the oxygen-carrying hemoglobin of the blood are such that the ambient oxygen partial pressure can fall to about 75% of its sea-level value before the oxygen content of the arterial blood leaving the lungs begins to be materially reduced. This corresponds to an altitude of about 2.4 km, and is why pressurized commercial airliners routinely maintain a cabin altitude of 8,000 feet in normal substratospheric or stratospheric flight. Also, military pilots in nonpressurized planes are required to breathe oxygen only when flights are made above this altitude.

While the effect does not involve a sharp (7,874 ft) threshold, the curve describing the relationship between altitude and blood oxygen content does decrease more and more in slope once an elevation of 2.4 km is exceeded. Therefore, this is usually taken as a practical level above which hypoxic challenge to the individual begins to recruit the physiological adaptive mechanisms significantly. On these grounds it is clear that your mid-level facility at 2.8 km altitude is far better located to trigger the process of high-altitude acclimatization (9200 ft) than would be a facility located at an elevation of 1.8 km. (6000 ft)

In the case of our Station, we operate Laboratories at successive elevations of 1.2 km, 3.0 km, 3.8 km and 4.3 km. Experience over the years has shown that for short, intermittent periods of work at the higher elevations such as you describe, individuals generally adapt more rapidly by quartering at 2.8-3.0 km (9,200 – 9,843 ft) than they do by quartering below 2.4 km. (7,874 ft)

The situation is somewhat more complicated, however. It is evident that there is wide individual variation in the ability to tolerate hypoxia, whether short-term or long-term. In fact, some individuals seem to lack completely the ability to acclimatize to high altitude. Thus, it does not matter where a poor or non-adapter quarters -- he will be miserable. Conversely, there are fortunate individuals who seem to be able to go from sea level to 4 km altitude at will,

and remain free of symptoms of acute mountain sickness. Also, full acclimatization to these altitudes requires literally months to reach completion. Thus, it is difficult to make hard-and-fast recommendations for any given individual.

I hope these few remarks will be helpful, and I certainly think you are on the right track to insist on 2.8 km rather than 1.8 km for your mid-level facility.
9,200 ft 6000 ft

Sincerely yours,

Nello Pace

Nello Pace
Professor of Physiology
& Director

NP:emn

University of Hawaii at Manoa

School of Medicine • Department of Physiology
Biomedical Sciences Building T-608 • 1960 East West Road • Honolulu, Hawaii 96822
Cable Address UNIHAW

February 23, 1976

John T. Jefferies
Director, Institute for Astronomy
2680 Woodlawn Drive
Honolulu, HI 96822

Dear Dr. Jefferies,

Several weeks ago you asked me to submit my views as to the location of the intermediate stage of your high altitude observatory. As I understand, the problem there are several levels possible, ranging from 1,800 to 3,000 meters, and the level most advantageous for acclimatization is desired.

Based upon my 2 years research experience in the Andes, I would suggest that the 2,500 to 3,000 meter level is probably the best for the intermediate station. I believe this for two reasons. First, in unacclimatized men, there is no appreciable hyperventilation below about 3,000 m. Since hyperventilation is the cause of mountain sickness, acclimatization cannot begin until hyperventilation does. Allowing for differences between men 2500 would be the minimal altitude to begin acclimatization. Second, there are psychological and perceptual changes which occur upon exposure to altitude in the unacclimatized state. These could be reduced by initiation of acclimatization at the 2500 to 3000 m level where adjustment is easier.

I hope this will be adequate for your requirements.

Yours truly,

Joel M. Hanna, Ph.D.
Associate Professor of Physiology

JMH:lk

AN EQUAL OPPORTUNITY EMPLOYER

State University of New York at Buffalo

DEPARTMENT OF PHYSIOLOGY
Schools of Medicine and Dentistry

DEC 23 1975

December 16, 1975

Dr. John T. Jefferies
Institute for Astronomy
University of Hawaii at Manoa
2680 Woodlawn Drive
Honolulu, Hawaii 96822

Dear Dr. Jefferies:

I am in receipt of your letter concerning the location of a permanent mid-level support facility for your high altitude astronomical observatory on Mauna Kea, Hawaii.

9,200 ft

I was most interested to learn of your empirical success in operating a support base at an altitude of 2800 meters and would wholeheartedly endorse the theory that that level be chosen for a permanent mid-level support facility.

13,124

On the basis of my experience with altitude adaptation to the 4000 meter level in the Rocky as well as the Andean Mountains, I would say that very little 6000 ft support can be achieved with a mid-level support facility at 1800 meters since adaptation at that level will probably not be sufficient for operating well at the 4000 meter level. At 2800 meters you begin to precipitously slide down the oxygen dissociation curve, and it is the most ideal altitude for acclimating the average person for temporary excursions to the 4000 meter level.

I am forwarding your letter to Dr. Nello Pace, Director of the White Mountain Research Laboratory, who over the years has gained a lot of experience with acclimation problems at three different levels, and in case you have not approached him directly, I hope that he may be willing to give you his opinion.

Sincerely yours,

Hermann Rahn
Professor of Physiology

cc: Dr. Pace

120 SHERMAN HALL BUFFALO, NEW YORK 14214 TEL.(716)831-2738

JAN 15 1976

THE PENNSYLVANIA STATE UNIVERSITY

511 SOCIAL SCIENCES BUILDING
UNIVERSITY PARK, PENNSYLVANIA 16802

Department of Anthropology
Human Biology Program

Area Code 814
865-1897

January 12, 1976

Mr. John T. Jefferies, Director
Institute for Astronomy
University of Hawaii
2680 Woodlawn Drive
Honolulu, Hawaii 96822

Dear Mr. Jefferies:

In response to your letter of December 4, I must begin by agreeing with you that no definitive studies have been completed on the impact of acclimatization at various middle latitudes on behavior capacities at high altitudes. However, there is in fact a very solid physiological reason why such studies have not appeared justifiable. That is, the nature of the oxygen dissociation curve in man indicates that oxygen transports to human tissues is not substantially affected until altitudes of 2500 meters and above are reached. This is not to say that there are no effects until this altitude but because of the nature of the relationship the total impact of 1800 meters on oxygen transport capabilities are so small as to not be measurable by standardized measures such as maximum oxygen consumption capacity.

8,200 ft.

6000 ft.

I would emphasize, therefore, that in my opinion attempts to acclimatize men to 4000 meters by an intermediate stop at 1800 meters would be useless. On the other hand, 2800 meters is sufficient so that individuals spending two-three days at this altitude should experience less difficulty in functioning at 4200 meters. As you know, such an intermediate stop is to be strongly recommended since individuals going directly from sea level to 4200 meters can suffer serious effects of altitude induced pulmonary edema and even if not so affected will generally suffer a number of symptomatic responses which reduces their capability to function for several days.

14,000 ft.

For a careful documentation of these points perhaps the best source is a recently published book by Michael Ward entitled Mountain Medicine: A Clinical Study of Cold and High Altitude published by Crosby Lockwood Staples, London, 1975.

I hope these remarks have been of some assistance.

Sincerely yours,

Paul T Baker

Paul T. Baker
Professor

APPENDIX G

COMMENTS AND RESPONSES ON THE ENVIRONMENTAL IMPACT STATEMENT

The following agencies, organizations and firms reviewed and commented on the Environmental Impact Statement during the review period. Those who made substantive comments concerning the proposed action received written responses to their concerns. They are indicated by an asterisk (*) in the following list. All of the letter received and responses sent are reproduced on the following pages of this Appendix.

State Agencies

* Office of Environmental Quality Control
* Department of Accounting and General Services
  Department of Agriculture
  Department of Planning & Eonomic Development
  Department of Transportation
  Hawaii Air Reserve National Guard
  University of Hawaii
    * Environmental Center
      Lyon Arboretum

Federal Agencies

  U.S. Department of the Air Force
  U.S. Department of the Army
* U.S. Army Engineer District
  U.S. Department of Energy
  U.S. Department of the Navy
* U.S. Fish and Wildlife Service

County of Hawaii

Department of Parks and Recreation
Department of Public Works
Department of Water Supply
* Planning Department
* Police Department

Firms and Organizations

* Conservation Council, Hawaii Chapter
* Hawaii Audubon Society, Island of Hawaii Representative
* Hawaiian Telephone

GEORGE R. ARIYOSHI
GOVERNOR

JOHN FARIAS, JR.
CHAIRMAN, BOARD OF AGRICULTURE
YUKIO KITAGAWA
DEPUTY TO THE CHAIRMAN

STATE OF HAWAII
DEPARTMENT OF AGRICULTURE
1428 SO. KING STREET
HONOLULU, HAWAII 96814

November 19, 1979

MEMORANDUM

TO: Office of Environmental Quality Control

SUBJECT: EIS - Hale Pohaku Mid-Elevation Master Plan
Department of Land and Natural Resources
Hamakua, Mauna Kea, Hawaii - TMK: III - 4

The Department of Agriculture has reviewed this EIS and finds no agricultural impact. The copy of the EIS is returned for your further use.

Thank you for the opportunity to comment.

JOHN FARIAS, JR.
Chairman, Board of Agriculture

Enclosure

cc: DLNR

DEPARTMENT OF PLANNING
AND ECONOMIC DEVELOPMENT

GEORGE R. ARIYOSHI
Governor

HIDETO KONO
Director

FRANK SKRIVANEK
Deputy Director

Kamamalu Building, 250 South King St., Honolulu, Hawaii • Mailing Address: P.O. Box 2359, Honolulu, Hawaii 96804

November 15, 1979

Ref. No. 0267

Mr. Richard L. O'Connell
Director
Office of Environmental Quality
Control
State of Hawaii
550 Halekauwila Street, Rm. 301
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

Subject: Environmental Impact Statement - Hale Pohaku
Mid-Elevation Facilities Master Plan, Mauna Kea, Hawaii

We have reviewed the subject EIS and find that it has adequately addressed the impacts anticipated to result from the proposed project.

Thank you for the opportunity to review the document.

Sincerely,

Frank Skrivanek
for Hideto Kono

cc: Department of Land and Natural
Resources

STATE OF HAWAII
DEPARTMENT OF TRANSPORTATION

RYOKICHI HIGASHIONNA PH.D.
DIRECTOR

XXXXXXXXXXXXXX
XXXXXXXXX
Jack K. Suwa
James B. McCormick

November 28, 1979

STP 8.5861

Dr. Richard O'Connell
Director
Office of Environmental
Quality Control
550 Halekauwila Street, Rm. 301
Honolulu, Hawaii 96813

Dear Dr. O'Connell:

Subject: Environmental Impact Statement
Hale Pohaku Mid-Elevation
Master Plan

Thank you very much for giving us the opportunity to review and comment on the above-captioned EIS. We have no substantive comments to offer which could improve the Statement.

Sincerely,

AH LEONG KAM
State Transportation Planner

GEORGE R ARIYOSHI
GOVERNOR

VALENTINE A SIEFERMAN
MAJOR GENERAL
ADJUTANT GENERAL

STATE OF HAWAII
DEPARTMENT OF DEFENSE
OFFICE OF THE ADJUTANT GENERAL
~~FORT RUGER HONOLULU HAWAII 96816~~

HIENG

14 NOV 1979

Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Gentlemen:

Hale Pohaku Mid-Elevation Master Plan
Hamakua, Mauna Kea, Hawaii

Thank you for sending us a copy of the "Hale Pohaku Mid-Elevation Master Plan" Environmental Impact Statement. We have no comments to offer at this time.

Sincerely,

WAYNE R. TOMOYASU
Major, CE, HARNG
Contr & Engr Officer

University of Hawaii at Manoa

Harold L. Lyon Arboretum
3860 Manoa Road • Honolulu, Hawaii 96822

5 December 1979

Mr. Donald A. Bremner, Chairman
Environmental Quality Commission
State of Hawaii
Officer of the Governor
550 Halekauwila Street Room 301
Honolulu, Hawaii 96813

Dear Mr. Bremner,

Thank you for transmitting to us the EIS of Hale Pohaku Mid-Elevation Master Plan. The EIS was reviewed by our staff and we have no critical comments. In fact we found it to be quite good.

Again, thank you for giving us the opportunity to review and comment on this EIS.

Yours truly,

Robert T. Hirano
Acting Director
Lyon Arboretum

RTH:ef

cc: Department of Land and Natural Resources

AN EQUAL OPPORTUNITY EMPLOYER

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS 15TH AIR BASE WING (PACAF)
HICKAM AIR FORCE BASE, HAWAII 96853

REPLY TO ATTN OF: DEEV (Mr Shiroma, 449-1831)

10 DEC 1979

SUBJECT: EIS Hale Pohaku Mid-Elevation Master Plan

TO: Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, HI 96813

1. This office has reviewed the subject EIS and has no comment to render relative to the proposed project. Attached is the copy of the EIS for your use.

2. We greatly appreciate your cooperative efforts in keeping the Air Force apprised of your project and thank you for the opportunity to review the document.

ROBERT Q. K. CHING
Chief, Engrg & Envmtl Plng Div
Directorate of Civil Engineering

1 Atch
EIS

Cy to: Department of Land & Natural Resources wo Atch
P. O. Box 621
Honolulu, HI 96809

DEPARTMENT OF THE ARMY
HEADQUARTERS UNITED STATES ARMY SUPPORT COMMAND, HAWAII
FORT SHAFTER, HAWAII 96858

20 NOV 1979

APZV-EHE-E

Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Gentlemen:

The Environmental Impact Statement (EIS) for the Hale Pohaku Mid-Elevation Facilities Master Plan, Mauna Kea, Hawaii has been reviewed and the following comments are offered.

US Army Support Command, Hawaii (USASCH) concurs with the selection of Alternative B as being the least environmentally detrimental of the three plans discussed for Hale Pohaku. Pohakuloa Training Area (PTA), a USASCH installation, is located nearby on the lower slopes of Mauna Kea. The proposed project is not expected to have significant adverse impacts on Army training. Army activities to date are not believed to have interfered with astronomical observations at the summit of Mauna Kea. The proposed park and mid-level support facilities are not expected to be affected in the future. If more background information regarding Army training on Mauna Kea (i.e. Military Management Area in the Mauna Kea Plan) is needed for future planning purposes or for inclusion in the proposed information/interpretive station at the park, please do not hesitate to contact this office.

Sincerely,

PETER D. STEARNS
COL, EN
Director of Engineering and Housing

Copy Furnished:
Department of Land and Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Department of Energy
Pacific Area Support Office
P. O. Box 29939
Honolulu, Hawaii 96820

Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, HI 96813

Dear Sirs:

HALE POHAKU MID-ELEVATION MASTER PLAN

Thank you for your letter of November 7, 1979, offering us the opportunity to comment on the Environmental Impact Statement for the Hale Pohaku Mid-Elevation Master Plan. We have reviewed the EIS and have no comments to offer.

We are retaining the EIS in our office as we find it to contain a wealth of information which we can use in carrying out our programs in the Hawaiian Area.

Sincerely,

W. J. Stanley
Director

OP-782
JWM:jhf

cc: Department of Land and Natural Resources
P.O. Box 621
Honolulu, HI 96809

HEADQUARTERS
NAVAL BASE PEARL HARBOR
BOX 110
PEARL HARBOR, HAWAII 96860

002A:amn
Ser 2366

21 NOV 1979

Office of Environmental Quality Control
State of Hawaii
550 Halekauwila Street
Honolulu, Hawaii 96813

Gentlemen:

Environmental Impact Statement for
Hale Pohaku Mid-Elevation Facilities Master Plan
Hamakua, Mauna Kea, Hawaii

The Environmental Impact Statement for Hale Pohaku Mid-Elevation Master Plan forwarded by the Environmental Quality Commission's letter of 7 November 1979 has been reviewed, and the Navy has no comments to offer. The subject EIS will be retained by this Command for future reference.

The opportunity to review the EIS is appreciated.

Sincerely,

J. W. CARL
LIEUTENANT COMMANDER, CEC, USN
DEPUTY FACILITIES ENGINEER
BY DIRECTION OF THE COMMANDER

Copy to:
State DLNR

DEPARTMENT OF PARKS & RECREATION
COUNTY OF HAWAII

Herbert Matayoshi, Mayor
Milton Hakoda, Director

November 19, 1979

Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Subject: Hale Pohaku Mid-Elevation Master Plan/EIS
Hamakua, Hawaii

We have no adverse comments to offer on the master plan/EIS.

Thank you for the opportunity to review the report.

Milton T. Hakoda
Director

encl. - EIS

cc: Dept. of Land & Natural Resources

• 25 AUPUNI STREET • HILO, HAWAII 96720 • TELEPHONE 961-8311

HERBERT T. MATAYOSHI
EDWARD K. HARADA
ARTHUR T. ISEMOTO

DEPARTMENT OF PUBLIC WORKS

COUNTY OF HAWAII · 25 AUPUNI STREET · HILO HAWAII 96720 · TELEPHONE (808) 961-8321

November 21, 1979

Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, HI 96813

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT
HALE POHAKU MID-ELEVATION MASTER PLAN
HAMAKUA, MAUNA KEA, HAWAII

Thank you for the opportunity to review the subject EIS. We have no comments to offer.

The document is being returned attached as requested.

EDWARD HARADA
Chief Engineer

cc: Department of Land & Natural Resources, Honolulu

Attach.

DEPARTMENT OF WATER SUPPLY • COUNTY OF HAWAII

November 15, 1979

Environmental Quality Commission
Office of the Governor
550 Halekauwila Street, Room 301
Honolulu, HI 96813

ENVIRONMENTAL IMPACT STATEMENT
HALE POHAKU MID-ELEVATION MASTER PLAN

We have no comments to the subject Environmental Impact Statement.

Inasmuch as we have no further use for the Environmental Impact Statement, it is being returned.

Akira Fujimoto
Manager

QA

Enc.

cc - Department of Land and Natural Resources

... Water brings progress...

6857

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
OFFICE OF ENVIRONMENTAL QUALITY CONTROL
OFFICE OF THE GOVERNOR
550 HALEKAUWILA ST
ROOM 301
HONOLULU, HAWAII 96813

RICHARD O'CONNELL
DIRECTOR
TELEPHONE NO.
548-6915

RECEIVED
DEC 20 AM 11:45
LAND DEVELOPMENT

December 10, 1979

MEMORANDUM

TO: Mr. Susumo Ono, Chairman
Board of Land and Natural Resources

FROM: Richard L. O'Connell, Director
Office of Environmental Quality Control

SUBJECT: Environmental Impact Statement for Mid-Level Facilities Master Plan for Hale Pohaku, Hamakua, Mauna Kea, Hawaii

We have reviewed the subject statement and offer the following comments for your consideration:

PAGE 1 DESCRIPTION

It is inferred that the Master Plan incorporates all intended uses of Hale Pohaku and that the mid-elevation astronomy facility will not be expanded at some future date. If that is the present intention, it should be so stated. If future expansion is being considered, it should be shown and included in the environmental analysis.

SIZE OF MID-LEVEL FACILITY

Facilities proposed will accomodate 60 persons on 9 acres whereas only 25 persons use the present facilities on 4 acres. What is the basis for more than doubling the size of the existing facility? Is this increased capacity being provided to allow for future growth or to meet only current needs?

PAGE 19

Clarification should be given when referring to "ATV's".

PAGE 28, NOISE

What is the basis for the assumption that "prevailing winds would carry the (generator) noise away from the day sleepers?"

PAGE 29, GENERATOR SHELTER

Will the "acoustically insulated generator shelter" be constructed of dense materials such as concrete block which will attenuate the transmission of sound?

PAGE 30, DIESEL GENERATORS

The EIS lacks quantification of the impacts resulting from the generators. What are the noise and air emission levels? What will the resulting ambient levels be in the living and working areas? What mitigation measures are rpoposed to reduce such impacts? These should be discussed in the EIS.

PAGE 30, UTILITIES

It is not clear what energy sources will be used for space heating and cooking. Every effort should be made to employ a passive solar energy system for space heating to reduce energy consumption and fuel hauling.

PAGE 41, LANDSCAPING

Consideration should be given to the use of treated wastewater for irrigation to reduce water hauling.

PAGE 42, NOISE

What is the basis for statements that trees and shrubs will "buffer noise" and suppress unwanted sound"? What kind of trees and shrubs will be planted?

PAGES 52-54 AIR POLLUTION

The EIS lacks documentation to substantiate conclusions that air quality is not a problem. The impact of fugutive dust from the site should be considered and consideration should be given to dust emissions during construction. What impact will dust levels have on surrounding vegetation and the palila?

PAGE 73, NATIONAL HISTORIC LANDMARK

The discussion regarding the National Historic Landmark should be expanded to include National Natural Landmarks. On December 28, 1972, the Department of Interior placed Mauna Kea on the National Registry of Natural Landmarks. The boundary of the 83,900-acre site is the same as the boundary of the Mauna Kea Forest Reserve which means the proposed improvements to the mid-level facilities are within the Landmark area. Because landmark areas are to be unspoiled examples of nature, there is the possibility that the proposed improvements could threaten the national natural landmark status of the site. A discussion on this matter is warranted.

PAGE 89

What is the basis for the conclusion that prevention of flooding and erosion will "...allow the re-establishment of native vegetation in formerly barren area?"

PAGE 92

What "pollution control devices" will be installed on the generator?

PAGE 93

What "water conserving devices" will be used?

PAGE 93

Consideration should be given to restricting travel between the mid-level site and the summit to scheduled trips to reduce energy consumption, air pollution, and opportunities for accidents.

PAGE 98, TOUR BUSES

The EIS indicated that tour buses will be discouraged from making the trip to the park because turn-around areas and parking will not be provided. However, the smaller van type of tour buses would not be discouraged. How would they be dealt with?

COST

The cost of the mid-level facilities and the park should be given. What type of funding has the proposed actions received? Are these state, federal, and/or county funds? If so, how much from each level of government?

PAGE 121, ALTERNATIVES, NO ACTION

In the discussion of "no action," consideration was not given to the impact on the palila habitat. Discussion is warranted.

HOOMOMO

The EIS implies that the use of Hawaiian Home Lands is not feasible because of the uncertain availability. Has a land exchange with Hawaiian Homes been considered? Has the Department of Hawaiian Home Lands been consulted?

PAGE 149, SHORT-TERM USES VS. LONG-TERM PRODUCTIVITY

The discussion should be expanded to include the possibility of secondary impacts through increasing the potential for expansion of the summit activities such as by adding more telescopes.

We trust that our comments will be helpful to you in preparing the revised EIS. For your convenience, we have attached a list of commentors.

We thank you for the opportunity to review this document.

Attachment

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND
RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February 1980

Mr. Richard L. O'Connell, Director
Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

Thank you and your staff for reviewing and commenting on the EIS for the Hale Pohaku Mid-Elevation Facilities Master Plan. Responses to your specific comments are as follows.

PAGE 1 DESCRIPTION

Comment: "It is inferred that the Master Plan incorporates all intended uses of Hale Pohaku and that the Mid-Elevation Astronomy Facility will not be expanded at some future date. If that is the present intention, it should be so stated. If future expansion is being considered, it should be shown and included in the environmental analysis."

Response: The Mid-Level Facilities are being planned to support the six telescopes currently on the summit of Mauna Kea. These are the only telescopes which the Board of Land and Natural Resources has approved for the mountain. Any future proposal to expand this facility would require an environmental assessment and, if the assessment indicates that it is necessary, an EIS. A Conservation District Use permit would also be required prior to any additional construction.

PAGE 2 SIZE OF MID-LEVEL FACILITY

Comment: "Facilities proposed will accommodate 60 persons on 9 acres whereas only 25 persons use the present facilities on 4 acres. What is the basis for more than doubling the size of the existing facility? Is this increased capacity being provided to allow for future growth or to meet only current needs?"

Response: The proposed Mid-Level Facility site will encompass seven acres, including the four developed acres. Much of this will be open space as can be seen in Figure 1 on page 2 of the text. The facility is being planned to meet only the immediate needs of the observatories when all six telescopes at the summit are fully operational. At the present time, three of the major telescopes are still in the testing phase. Although some operations are being performed, a full operation schedule has not been implemented as yet and thus a full complement of observers and support staff are not in residence.

PAGE 19

Comment: "Clarification should be given when referring to 'ATV's'."

Response: The statement has been changed to read ... "will discourage persons in other than approved vehicles..."

PAGE 28 NOISE

Comment: "What is the basis for the assumption that 'prevailing winds would carry the (generator) noise away from the day sleepers?'"

Response: The statement on page 28 refers to the maintenance area. It is prudent planning to locate such facilities, which because of their openness generate more noise than a closed building, downwind of sleeping areas. Even though no surface wind data is available for Hale Pohaku, observatory officials indicate that the prevailing winds blow from the northeast.

PAGE 29 GENERATOR SHELTER

Comment: "Will the 'acoustically insulated generator shelter' be constructed of dense materials such as concrete block which will attenuate the transmission of sound?"

Response: It is being recommended in the design criteria for the project that the generator shelter be built of acoustical concrete masonry units which will attenuate the transmission of sound.

PAGE 30 DIESEL GENERATORS

Comment: "The EIS lacks quantification of the impacts resulting from the generators. What are the noise and air emission levels? What will the resulting ambient levels be in the living and working areas? What mitigation measures are proposed to reduce such impacts? These should be discussed in the EIS."

Response: Because the project has not been designed, it is premature to quantify noise and air emission levels that may result from the generator. Design criteria will specify that the generators be equipped with purifiers that will insure air emission levels meet air and safety standards. Design criteria will also specify that a muffler be attached to the generator for the purpose of reducing noise. The purifiers and muffler are readily available manufactured items. The generator shelter will also be designed to assure a minimal ambient noise level.

PAGE 30 UTILITIES

Comment: "It is not clear what energy sources will be used for space heating and cooking. Every effort should be made to employ a passive solar energy system for space heating to reduce energy consumption and fuel hauling."

Response: Propane gas will be the energy source for cooking as is the current practice. The amount of propane gas required will be less than is currently used because hot water will be provided by waste heat recovery. Propane gas will be trucked to the area on an "as needed" basis.

Your comment on employing passive solar is a good one. During this phase of the development process, we can only set general criteria for design. It will be recommended, though, that buildings in the complex be oriented southward to take advantage of natural energy from the sun. It is planned that energy for space heating will be provided by heat pumps.

PAGE 41 LANDSCAPING

Comment: "Consideration should be given to the use of treated wastewater for irrigation to reduce water hauling?"

Response: Landscaping materials will primarily consist of vegetation present in the existing eco-system; vegetation which will adapt easily to the low moisture conditions of Hale Pohaku without the need for artificial watering. Irrigation will be used primarily to establish the new plantings in the area. It is planned to eliminate irrigation entirely when the new and transplanted plantings no longer require it.

Wastewater reclamation and re-use require a high degree of treatment to remove bacteria, putrescible matter, and other suspended solids. Such treatment is necessary to prevent the spread of pathogens, creation of obnoxious odors, and clogging of irrigation systems. To produce the high effluent, a complete "packaged" treatment plant would be

required, and the system must be capable of removing more than 85 percent of the wastewater BOD and suspended solids. The system must also include chlorination facilities, effluent pumping equipment, and seepage pits to dispose of the excess wastewater.

A separate landscape irrigation system would also be required to convey treated effluent from the pumps to the irrigation distribution system. Special valves and warning signs must also be posted to alert residents and visitors to the use of non-potable water for irrigation.

Based on preliminary estimates, it appears that upgrading the wastewater disposal system for reclamation and re-use would be about three times more expensive than using water from the proposed system supplemented by water from roof catchment as described in the EIS. Because it is planned to utilize artificial irrigation for only a short period of time, it was felt that the additional expense necessary to recycle wastewater was not justified.

PAGE 42 NOISE

Comment: "What is the basis for statements that trees and shrubs will 'buffer noise and suppress unwanted sound'? What kind of trees and shrubs will be planted?"

Response: Trees and shrubs attenuate sound. The word "suppress" has been changed to "attenuate" in the Revised EIS. As stated in the text, page 41, "Landscaping of buildings, infrastructure, and other facilities will be with plants native to Mauna Kea. .... Mamane trees and U'ulei (Osteomeles) will be the primary landscaping materials."

PAGES 52 - 54 AIR POLLUTION

Comment: "The EIS lacks documentation to substantiate conclusions that air quality is not a problem. The impact of fugutive dust from the site should be considered and consideration should be given to dust emissions during construction. What impact will the dust levels have on surrounding vegetation and the palila?"

Response: Your question assumes that dust emissions will increase as a result of the development. The fact is that much of the land within the proposed development site is highly eroded and therefore dusty. The natural areas surrounding the proposed project, because of low rainfall and lack of adequate ground cover, are also very dusty. The proposed development, through drainage improvements, paving, and planting, will help to alleviate some of this problem on the

project site. As was stated in the EIS, page 93, "the unpaved condition of the road to the summit appears to be a major cause of locally generated pollution in the area." Dust problems are exagerated during earth moving. Specific measures to mitigate dust during construction will be incorporated into the construction contracts and design criteria are being established which will minimize grading. As with noise, construction dust may cause birds to temporarily leave the area.

Although no studies have been done to test tolerable dust limits on surrounding vegetation, it is not anticipated that this will become a problem. The contractor will be told to minimize the dust level, especially during dry spells.

PAGE 73 NATIONAL HISTORIC LANDMARK

Comment: "The discussion regarding the National Historic Landmark should be expanded to include National Natural Landmarks. On December 28, 1972, the Department of Interior placed Mauna Kea on the National Registry of Natural Landmarks. The boundary of the 83,900 acres site is the same as the boundary of the Mauna Kea Forest Reserve which means the proposed improvements to the Mid-Level Facilities are within the Landmark area. Because landmark areas are to be unspoiled examples of nature, there is the possibility that the proposed improvements could threaten the National Natural Landmark status of the site. A discussion on this matter is warranted."

Response: Mauna Kea has been designated as a National Natural Landmark and is listed in the "Federal Register", which is apparently the "National Registry of Natural Landmarks." But, in spite of the register, Mauna Kea (among others also designated) is not a registered landmark. A registered landmark is when the landowner has agreed to the designation. As of this date, the Board of Land and Natural Resources has not officially agreed to the designation.

PAGE 89

Comment: "What is the basis for the conclusion that prevention of flooding and erosion will '... allow the re-establishment of native vegetation in formerly barren area?'"

Response: There are areas adjacent and on the site on which vegetation has not taken and erosion is evident. Erosion of the surface and sub-surface carries away the fines which provide the nutrient source for plants. Once erosion is contained, and the fines can be stabilized, the soil base will again provide nutrients so that vegetation can be re-established.

PAGE 92

Comment: "What 'pollution control devices' will be installed on the generator?"

Response: The design criteria for the project will recommend the installation of pollution control devices such as air purifiers and mufflers. Because the project has not yet been designed, it is premature to specify the exact type of pollution control devices that will be used.

PAGE 93

Comment: "What 'water conserving devices' will be used?"

Response: Specific details will be determined during the design phase of the project. It is being recommended, however, as part of the design criteria for the project, that various water conserving devices be considered. These devices will include flow restrictors, water-saving water closets, etc.

PAGE 93

Comment: "Consideration should be given to restricting travel between the Mid-Level site and the summit to scheduled trips to reduce energy consumption, air pollution, and opportunities for accidents."

Response: This comment has been passed on to the University of Hawaii, Institute for Astronomy for their consideration.

PAGE 98 TOUR BUSES

Comment: "The EIS indicated that tour buses will be discouraged from making the trip to the park because turn-around areas and parking will not be provided. However, the small van type of tour bus would not be discouraged. How would they be dealt with?"

Response: The "small van type of tour buses" will be treated as private automobiles. No special facilities will be provided for them.

COST

Comment: "The cost of the Mid-Level Facilities and the park should be given. What type of funding has the proposed actions received? Are these state, federal, and/or county funds? If so, how much from each level of government?"

Response: Although costs at this time are very conceptual, because the project has not been designed, it is estimated that the total costs will be approximately $5.8 million including design and equipment. The project will be 100% State funded through General Obligation and Revenue Bonds. Approximately $1.1 million has been appropriated to date and another $4.7 million is being requested by the University of Hawaii in their 1980/81 budget.

PAGE 121 ALTERNATIVES, NO ACTION

Comment: "In the discussion of 'no action', consideration was not given to the impact on the palila habitat. Discussion is warranted."

Response: Since the "no action" alternative assumes the status quo, it was assumed that the extensive discussion given to the palila habitat in the description of the existing environment was sufficient. As was stated several times in the text, the habitat will be reduced by 3 - 10 trees due to construction of the facilities. This however, should be mitigated in the future through the replanting program that will occur upon completion of the new facilities. The botanical consultant also noted that erosion is undermining one clump of mamane and may threaten others (page B - 6). The proposed drainage improvements should help to mitigate this condition whereas in the "no action" alternative, it would be assumed that no such improvements would be made.

HO'OKOMO

Comment: "The EIS implies that the use of Hawaiian Home Lands is not feasible because of the uncertain availability. Has a land exchange with Hawaiian Homes been considered? Has the Department of Hawaiian Home Lands been consulted?"

Response: The main reason for rejecting the Hawaiian Homes Land site was because it may not be of sufficient altitude to assure acclimatization of all personnel who work at the summit. The Department of Hawaiian Homes Land was consulted regarding availability of the site and requirements for obtaining a lease, prior to the publication of the EIS. The information which is given in the EIS concerning availability (page 131,k.) was obtained from discussions with their personnel. (Hawaiian Homes Lands was inadvertently ommitted from the list of persons consulted in the preparation of the EIS.) Other methods of land acquisition, such as a land exchange, were not pursued because Hale Pohaku was determined to be the most suitable site for the location of the Mid-Elevation Facilities.

PAGE 149 SHORT-TERM USES VS. LONG-TERM PRODUCTIVITY

Comment: "The discussion should be expanded to include the possibility of secondary impacts through increasing the potential for expansion of the summit activities such as by adding more telescopes."

Response: There is no basis for assuming that the construction of the mid-level facilities at Hale Pohaku will lead to more telescopes on the summit. The mid-level facilities are being provided to support the six telescopes which are approved for the summit. Any proposals for additional telescopes on the summit will require approval from the Board of Land and Natural Resources and the submission of an EIS.

We hope that we have answered your comments sufficiently and cleared up any misunderstandings that you might have concerning the project.

Very truly yours,

DEPARTMENT OF LAND AND NATURAL RESOURCES

Susumu Ono
Chairman

GEORGE R. ARIYOSHI
GOVERNOR

HIDEO MURAKAMI
COMPTROLLER

MIKE N. TOKUNAGA
DEPUTY COMPTROLLER

STATE OF HAWAII
DEPARTMENT OF ACCOUNTING AND GENERAL SERVICES
P. O. BOX 119, HONOLULU, HAWAII 96810

LETTER NO. (P)2150.9

NOV 21 1975

Mr. Donald Bremner
Chairman
Environmental Quality Commission
550 Halekauwila Street, Room 301
Honolulu, Hawaii

Dear Mr. Bremner:

Subject: Hale Pohaku Mid-Elevation Master Plan
Environmental Impact Statement

We have reviewed the subject EIS and have the following comments to offer:

1. Page 42 - Landscaping

   The use of trees and shrubs adjacent to the generator building, recreation facilities, and maintenance area will "mask" unwanted sound with the sound of wind rustling through the trees and shrubs. However, the ability of vegetation to "suppress unwanted sound" is questioned.

2. Page 115 - Negative Impacts

   The site selected will be noisier than the site that was originally chosen for the complex. However, the University of Hawaii has specified the need to provide mechanical ventilation for the dormitory building because the natural air humidity is too low for comfortable sleeping for most people. Thus, the negative impact of noise will be mitigated to some extent.

If there are any questions, please have your staff call Mr. Stanley Shin of the Division of Public Works at 548-5703.

Very truly yours,

HIDEO MURAKAMI
State Comptroller

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February 1980

Mr. Hideo Murakami, Comptroller
Dept. of Accounting & General Services
1151 Punchbowl
Honolulu, Hawaii 96813

ENVIRONMENTAL IMPACT STATEMENT
HALE POHAKU MID-ELEVATION MASTER PLAN

Dear Mr. Murakami:

Thank you for reviewing and commenting on the subject EIS. The responses to your comments are as follows:

1. PAGE 42 - LANDSCAPING

Comment: "The use of trees and shrubs adjacent to the generator building, recreation facilities, and maintenance area will "mask" unwanted sound with the sound of wind rustling through the trees and shrubs. However, the ability of vegetation to 'suppress unwanted sound' is questioned."

Response: The word "suppress" has been changed to "attenuate" in the Revised EIS.

2. PAGE 115 - NEGATIVE IMPACTS

Comment: "The site selected will be noisier than the site that was originally chosen for the complex. However, the University of Hawaii has specified the need to provide mechanical ventilation for the dormitory building because the natural air humidity is too low for comfortable sleeping for most people. Thus, the negative impact of noise will be mitigated to some extent."

Response: You are correct in stating that the negative impact of noise will be mitigated to some extent. The users of

the Astronomy Facility, though, had expressed a desire to rely on natural ventilation whenever possible. Because the site that was originally chosen for the complex was located farther away from the road and the park, and thus much quieter, it was felt that there would be more opportunities for taking advantage of natural ventilation there than at the site which was finally selected.

Very truly yours,

DEPARTMENT OF LAND AND NATURAL RESOURCES

Susumu Ono
Chairman of the Board

University of Hawaii at Manoa

Environmental Center
Crawford 317 • 2550 Campus Road
Honolulu, Hawaii 96822
Telephone (808) 948-7361

Office of the Director

December 7, 1979

RE:0293

Mr. Richard O'Connell, Director
Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

Draft Environmental Impact Statement
Hale Pohaku Mid-Elevation Facilities Master Plan
Hamakua, Mauna Kea, Hawaii

The Environmental Center of the above cited DEIS has been prepared with the assistance of Sheila Conant, General Science; Ruth Gay and Clifford Smith, Botany; Iraphne Childs, Geography student; Doak C. Cox, Barbara Vogt, Colleen Brady, Vincent Shigekuni, and Elizabeth Cunningham, Environmental Center. Our reviewers have found the document to be comprehensive and the information clearly presented. We have several comments to make, however.

CONSTRUCTION TIMING

As the DEIS indicates, it is important that construction activity be timed to minimize disturbance of breeding birds. On page 101 the statement is made, "if at all possible, heavy construction activity will begin mid-June or later so that any inhabiting Palila cah possibly have one brood that season before being disturbed by construction noise and activity." However, Maile Stemmerman's letter on page C-8 states; "Particularly noise activites such as bulldozing or grading should be done between October and February to minimize these problems (disturbance of breeding birds)." As different recommendations for commencement of construction are given in the DEIS and Stemmerman's letter, could clarification be provided as to when construction activities are actually planned?

INFRASTRUCTURE AND UTILITIES

Alternative energy sources

Although the DEIS includes a discussion on pages 34-35 of alternate energy sources, some portions of section 3.32 need further clarification. Can we interpret this section to mean space heating needs will be provided without additional generator demand? Will the structures also be insulated to reduce heating requirements?

As an alternative or supplement to oil fired generators, could a wind generator be used?

AN EQUAL OPPORTUNITY EMPLOYER

Fire protection

At the present the discussion of fire hazard appears inadequate.

Could some discussion be provided indicating by what means the astronomy complex fire flow mentioned on pages 32-33 will service the park? We note that fire extinguishers will be available at the information station. However, it is unclear what control measures will be available to park users when the information station is closed during the evenings, during which time hazard may be the greatest. Could some consideration be given to providing fire extinguishers throughout the park?

Water conservation

Has consideration been given to water faucets which automatically shut off in order to conserve water.

VEGETAION AND BIOLOGY

Native flora on construction site:

Botanical aspects of the EIS appear to be adequately addressed. Possible impacts of construction on two plants proposed for endangered status by the U.S. Fish and Wildlife Service, i.e. Geranium cuneatum var. Hololeucum, Stenogyne microphylla and Sophora chrysophylla var. circularis have not been addressed.

The locations of Geranium and Stenogyne are given on the map on page B-2, however, a comparison of that map with the proposed site plan on page B-4 suggests that a maintenance/utility building may cover a specimen of Stenogyne microphylla. Mitigating measures or adverse environmental effects of this possibility are not mentioned either in Parts IV or V of the DEIS.

The omission of locations of Sophora chrysophylla var. circularis raises the question whether any of the 3 - 10 mamane to be removed and transplanted might be of this variety. This question is answered on pages B-8 and B-9 where it is noted that the taxonomy of this species is not well understood and is subject to revision. However, reference to these taxonomic problems does not appear in the main body of the EIS.

Introduced flora

On page 103 the DEIS indicates additional traffic will increase the occurrence of exotic species in the area. What mitigative measures are being considered to deal with this problem?

Small mammal traps

The DEIS makes reference to small mammal traps on page 101. Frequent monitoring of these traps after the park is in operation is essential to limit the population of these predators.

PARK VISITORS

It is unclear by what means the person on duty at the information station will stop and register vehicles proceeding up the mountain, particularly since that person will have other duties as well.

How will monitoring of Hale Pohaku park visitors be accomplished?

The DEIS indicates on page 108 that access to the adze quarry may be limited in the future "if traffic to Hale Pohaku and the summit becomes heavy and if problems of perserving the unique features of the upper slopes of Mauna Kea become intensified." Could consideration be given to a manned gate at Hale Pohaku when the park opens rather than after damage has been done?

We appreciate the opportunity to review this document and hope our comments have been useful to you.

Yours truly,

Doak C. Cox
Director

DCC/ck

cc: Susumu Ono, DLNR
Clifford Smith
Ruth Gay
Sheila Conant
Barbara Vogt
Elizabeth Cunningham
Iraphne Childs
Vincent Shigekuni
Colleen Brady

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February 1980

Dr. Doak C. Cox, Director
Environmental Center
University of Hawaii
2250 Campus Road, Crawford 317
Honolulu, Hawaii 96822

Dear Mr. Cox:

Thank you and the named reviewers for your comments on the EIS for the Hale Pohaku Mid-Elevation Facilities Master Plan. The answers to your specific comments and questions are as follows:

CONSTRUCTION TIMING

COMMENT: "As the DEIS indicates, it is important that construction activity be timed to minimize disturbance of breeding birds. On page 101 the statement is made, 'if at all possible, heavy construction activity will begin mid-June or later so that any inhabiting Palila can possibly have one brood that season before being disturbed by construction noise and activity.' Maile Stemmerman states on page C-8: 'Particularly, noise activities such as bulldozing or grading should be done between October and February to minimize these problems (disturbance of breeding birds).' As different recommendations for commencement of construction are given, could clarification be provided as to when construction activities are actually planned?"

Response: Subsequent to the completion of the Stemmerman study, an interview was held with Dr. Charles van Riper, Palila expert. He suggested the mid-June date. This is noted in the text on page 104. Since the project is still in the planning phase, there are no dates as yet as to when construction will actually begin. The U.S. Fish and Wildlife Service has asked NASA to assure that "Construction is initiated in the summer, after the late spring nesting season of the Palila, to reduce disturbance during their breeding season." One guideline that will be included in the development criteria will be that constructon begin mid-June or later.

INTRASTRUCTURE AND UTILITIES

ALTERNATIVE ENERGY SOURCES

Comment: "Although the DEIS includes a discussion on pages 34 - 35 of alternate energy sources, some portions of section 3.32 need further clarification. Can we interpret this section to mean space heating needs will be provided without additional generator demand?"

Response: The generator capacity which was stated in the text (250kv) includes heating needs. Since the heat pump reduces generator demand, the space heating requirements can be provided without increasing the generator capacity. Use of alternative energy sources may even result in a reduction of the generator size. This will be determined in the design phase of the project.

Comment: "Will the structures also be insulated to reduce heating requirements?"

Response: Yes. Although there is no specific design for the structures as yet, design criteria for the project will specify insulated walls and windows.

Comment: "As an alternative or supplement to oil fire generators, could a wind generator be used?"

Response: There is a possiblity that wind generators will be investigated in the design phase of the project. A wind generator, though, would require a large building for energy storage. In addition, windmills would be difficult to locate so that they would not visually dominate the landscape.

FIRE PROTECTION

Comment: "At the present the discussion of fire hazard appears inadequate. Could some discussion be provided indicating by what means the astronomy complex fire flow mentioned on pages 32 - 33 will service the park?"

Response: Water to the park facilities will be piped from the astronomy complex via a 4" water main. This direct connection to the astronomy complex water storage tanks can provide sufficient volume and fire flows to the park site. The fire flow requirements for the permanent park facilities would be much less than the astronomy complex, especially since the park structure would be constructed of more fire resistant materials.

1 February 1980

Comment: "We note that fire extinguishers will be available at the Information Station. However, it is unclear what control measures will be available to park users when the Information Station is closed during the evenings, during which time fire hazard may be the greatest. Could some consideration be given to providing fire extinguishers throughout the park?"

Response: Providing fire extinguishers throughout the park and other means of fire control will be considered in the design phase of the project.

WATER CONSERVATION

Comment: "Has consideration been given to water faucets which automatically shut off in order to conserve water?"

Response: Specific details will be determined during the design phase of the project. It is being recommended, though, that various water conserving devices be considered. These devices will include flow restrictors, water savings water closets, etc.

VEGETATION AND BIOLOGY

Comment: "Botanical aspects of the EIS appear to be adequately addressed. Possible impacts of construction on two plants proposed for endangered status by the U.S. Fish and Wildlife Service, Geranium cuneatum var. Holoeucum, Stenogyne microphylla, and Sophora chrysophylla var. circularis have not been addressed."

Response: Page 100, paragraph (b) of the text states that "...care will be taken to not disturb existing vegetation, rare plants will be fenced so that they will not be disturbed in the constructon phases of the project..." Page 102, section 3.0, paragraph 2 states that "There are other rare plants, besides mamane, at the site. These include Geranium cuneatum var. Holoecum and two species of Stenogyne. These plants will either be fenced during construction so that they will not be disturbed or transplanted to other locations on the project site. Any of these species found growing in the park area will be fenced and identified with signs. The Information/Interpretative Station will have information available concerning the native plants in the area."

Since classification of the species of mamane is not well understood and is subject to revision, it is difficult at this time to predict what, if any, impact on endangered varieties of mamane will result from construction. We

1 February 1980

are, therefore, considering all mamane as worthy of preservation and the plan has been designed to minimize removal of this slow-growing tree. A qualified horticulturist will be consulted, prior to construction, to identify the location of possibly endangered species of mamane and to advise the architect a means to minimize disturbance to this species and other rare plants on the site.

Comment: "The locations of Geranium and Stenogyne are given on the map on page B-2. However, a comparison of that map with the proposed site plan on page B-4 suggests that a maintenance/utility building may cover a specimen of Stenogyne microphylla. Mitigating measures or adverse environmental effects of this possibility are not mentioned either in Parts IV or V of the DEIS."

Response: The proposed site plan on page B-4, which was used by the botanical consultant, was an early conceptual plan. The proposed plan, as describe in the EIS, is more accurately depicted in Figure 1 on page 2 of the text. The plan,which was completed after the botanical survey, was designed to avoid rare and possibly endangered plants and to minimize destruction of mamane.

Comment: "The omission of locations of Sophora chrysophylla var. circularis raised the question whether any of the 5 - 10 to be removed and transplanted might be of this variety. This question is answered on pages B-8 and B-9 where it is noted that the taxonomy of this species is not well understood and is subject to revision. However, reference to these taxonomic problems does not appear in the main body of the EIS."

Response: A reference to the taxonomic problems of the species has been included in the text in the Revised EIS.

INTRODUCED FLORA

Comment: On page 103, the DEIS indicates additional traffic will increase the occurrence of exotic species in the area. What mitigative measures are being considered to deal with this problem?"

Response: As stated in the text, this problem is already occurring. Although the proposed action may increase the chance of new exotic species being introduced into the area, the magnitude of the impact is felt to be not much greater than that experienced under existing conditions. No specific measures are being prescribed to mitigate this

impact although qualified horticulturist will be consulted prior to construction for suggestions on means to minimize this type of disturbance to native flora. No exotic species will be intentionally introduced into the area.

SMALL MAMMAL TRAPS

Comment: "The DEIS makes reference to small mammal traps on page 101. Frequent monitoring of these traps after the park is in operation is essential to limit the population of these predators."

Response: This is a good point and the recommendation will be included in the development guidelines.

PARK VISITORS

Comment: It is unclear by what means the person on duty at the Information Station will stop and register vehicles proceeding up the mountain, particularly since that person will have other duties as well."

Response: As stated in the text, a large sign requiring persons to stop and register before they proceed up the mountain will be posted near the Information Station. The exact registration procedures have not been worked out as yet. If experience shows that people will not obey the sign, then additional control measures may have to be instituted.

Comment: "How will monitoring of Hale Pohaku park visitors be accomplished?"

Response: No specific details of the procedure have been developed as yet. Voluntary registration in guest books, such as is used at other parks, is one method being considered.

Comment: "Could consideration be given to a manned gate at Hale Pohaku when the park opens rather than after damage has been done?"

Response: A manned gate at Hale Pohaku was considered, but it was decided that signs and a manned Information Station would be more appropriate control measures at the present time. This decision was made so as to not unduly restrict the public from enjoying the resources of the mountain. The policy will be reevaluated after the park is opened to the public.

1 February 1980

Thank you for your comments. We appreciate your concern for the natural features of the mountain and we hope that we were able to answer your comments satisfactorily.

Very truly yours,

DEPARTMENT OF LAND AND NATURAL RESOURCES

Susumu Ono
Chairman of the Board

DEPARTMENT OF THE ARMY
U. S. ARMY ENGINEER DISTRICT, HONOLULU
BUILDING 230
FT. SHAFTER, HAWAII 96858

PODED-PV

6 December 1979

Mr. Richard L. O'Connell, Director
Office of Environmental Quality Control
State of Hawaii
550 Halekauwela Street
Honolulu, Hawaii 96813

Dear Mr. O'Connell:

We have read the Environmental Impact Statement (EIS) for the Hale Pohaku Mid-Elevation Facility Master Plan and have determined that there are no applicable Corps requirements. During the review of the EIS and Plan we noticed several items which you may wish to consider.

Item	Page NO.	Comment
1	xi	Line 1: Various elevations for the observatory are used throughout the report, i.e., 13,500±, 13,800, and 14,000 feet.
2	22	Your discussion failed to indicate the method of conveyance of water to the catch basins. Is it by pipe culverts, drain lines, or revetted or paved swales?
33	32,33, & 49	There is no discussion of water demand for fire protection. Fire protection water could require a pumping system independent of the domestic demand pumping system. Frost protection for water lines and storage may be necessary at this elevation. Data from "Atlas of Hawaii" published by the University of Hawaii shows low temperatures at the observatory are around 10° F.
4	35	Para. 3.4: Proposed plan appears to be inconsistent with Part II, "Septic Tank - Soil Absorption System for Institutions" in "Manual of Septic Tank Practice", Publication No. 526, reprinted in 1972 published

6 December 1979

		by the US Department of Health, Education and Welfare.
5	112	Para. 3.0, Bottom of page: "Visitor load may deplete available water supply". Closing of the restrooms appears to be an incomplete solution since visitors would then be compelled to use nature's outdoor accommodations unless other options are available.
6	General	The estimated cost for the proposed improvements and comparative costs for alternative plans have not been addressed.

Thank you for the opportunity to comment on the EIS.

Sincerely yours

KISUK CHEUNG
Chief, Engineering Division

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February, 1980

Mr. Kisuk Cheung, Chief
Engineering Division
Department of the Army
U.S. Army Engineer District (Honolulu)
Building 230
Ft. Shafter, HI 96858

Dear Mr. Cheung:

Thank you for reviewing and commenting on the Environmental Impact Statement for the Hale Pohaku Mid-Elevation Facility Master Plan. In answer to your specific comments:

1. Comment: (Line 1, page xi) "Various elevations for the observatory are used throughout the report, i.e. 13,500±, 13,800, and 14,000 feet."

   Response: The State of Hawaii Data Book, Department of Planning and Economic Development, November 1978, page 84 gives the elevation of the summit at Mauana Kea as 13,796 feet. The observatories are sited at altitudes ranging from about 13,500 feet to about 13,700 feet. The reference to 14,000 feet will be changed to 13,800 feet in the revised EIS.

2. Comment: (Page 22) "Your discussion failed to indicate the method of conveyance of water to the catch basins. Is it by pipe culverts, drainlines, or revetted or paved swales?"

   Response: Conveyance of water to the catch basins will be via pipe culverts and swales. The swales will probably be lined with vegetation and may not be paved.

3. Comment: (Pages 32,33, and 49): "There is no discussion of water demand for fire protection. Fire protection water could require a pumping system independent of the domestic demand pumping system. Frost protection for water lines and storage may be necessary at this elevation. Data from "Atlas of Hawaii" published by the University of Hawaii shows low temperatures at the observatory are around 10 degrees Fahr."

Response: The EIS indicated that 40,000 to 60,000 gallons must be stored on-site for fire flow. This amount is based on an estimated fire flow of 1,000 gpm for one hour. Due to inadequate water pressures, an independent fire flow pumping system would be required to service the astronomy complex.

With reference to frost protection, prior discussions with Hale Pohaku staff indicated that they have not experienced any need for frost protection at the 9000 foot elevation. This subject will be given further consideration during the design phase.

4. *Comment:* (Page 35, Paragraph 3.4) "Proposed plan appears to be inconsistent with Part II, 'Septic Tank-Soil Absorption System for Institutions' in 'Manual of Septic Tank Practice', Publication No. 526, reprinted in 1972 published by the U.S. Department of Health, Education and Welfare."

Response: The "Manual of Septic Tank Practice" provides guidelines for designing soil absorption systems based on percolation rates. Percolation rates for the Hale Pohaku area, as indicated by the USDA Soil Conservation Service report entitled "Soil Survey of Island of Hawaii, State of Hawaii" issued December 1973, are much higher than the highest percolation rate indicated in the USPHS manual. Based on the anticipated high percolation rate and present satisfactory performance of existing cesspools, the EIS presented two concepts for wastewater disposal. Indications are that both systems are practicable and feasible. However, these may be adjusted upon reviewing the results of a soils investigation report which would be prepared prior to the design phase.

5. Comment: (Page 112, Paragraph 3.0) ."'Visitor load may deplete available water supply.' Closing of the restrooms appears to be an incomplete solution since visitors would then be compelled to use nature's outdoor accommodations unless other options are available."

Response: This paragraph is no longer applicable since the present plan is to supply water to the park from storage tanks located at the Astronomy facility. The paragraph has been revised to read: "An increased visitor load at any one time may deplete the available water supply below a level adequate to meet both user needs and fire flow requirements. If this should occur, stringent water conservation measures may have to be initiated."

1 February 1980

6. Comment: "The estimated cost for the proposed improvements and comparative costs for alternative plans have not been addressed."

Response: Project costs, at this time, are very conceptual and applicable only for short periods of time for planning purposes. Because the project has not been designed as yet, any cost estimates must, of necessity, be based on assumptions that are subject to change. Comparative costs for alternative plans were addressed only as relative costs (less than or greater than the proposed plan) and not hard dollars for the same reason.

A recent calculation, based on square footage costs of similar construction and adjusted for the remoteness of the site, estimates the total construction cost of the facilities at Hale Pohaku as approximately $5.1 million and total project cost of $5.8 million. Alternative plans vary only with respect to site and utilities costs.

Very truly yours,

DEPARTMENT OF LAND & NATURAL RESOURCES

Susumu Ono
Chairman of the Board

United States Department of the Interior

FISH AND WILDLIFE SERVICE
300 ALA MOANA BOULEVARD
P.O. BOX 50167
HONOLULU, HAWAII 96850

IN REPLY REFER TO
ES
Room 6307

December 7, 1979

Office of Environmental Quality Control
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

Re: Hale Pohaku Mid-Elevation Master Plan, Mauna Kea, Hawaii

Dear Sir:

We have reviewed the subject Environmental Impact Statement (EIS) and offer the following comments.

The botanical coverage is adequate. We did notice, however, that the Silversword Management Area listed on page 8 was not included in the referenced Figure 4.

The section on Fauna was well done. The discussions were good in that they pointed out the problems clearly and gave excellent background information.

The discussion of anticipated environmental impacts and proposed mitigation measures was very good. If the plan is followed carefully, adverse impacts to endangered species will be significantly reduced. In this light, we believe that our office of endangered species will not have to reinitiate consultation on the project.

We appreciate this opportunity to comment.

Sincerely yours,

Maurice H. Taylor

Maurice H. Taylor
Field Supervisor
Division of Ecological Services

cc: NMFS
HDF&G
EPA, San Francisco
DLNR

CONSERVE AMERICA'S ENERGY

Save Energy and You Serve America!

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February 1980

Mr. Maurice H. Taylor
Field Supervisor
U.S. Department of Interior
Division of Ecological Services
P.O. Box 50167
Honolulu, HI 96850

Dear Mr. Taylor:

ENVIRONMENTAL IMPACT STATEMENT
HALE POHAKU MID-ELEVATION MASTER PLAN

Thank you for your comments on the subject Environmental Impact Statement. We appreciate your concern for the area and assure you that the project architect will be instructed to follow the plan carefully when designing the facilities. In response to your comment concerning the Silversword Management Area, Figure 4 has been changed to include the location of this area in the Revised EIS.

We appreciate your participation and assistance in the preparation and revision of the subject EIS.

Very truly yours,

DEPARTMENT OF LAND AND NATURAL RESOURCES

Susumu Ono
Chairman of the Board

PLANNING DEPARTMENT

25 AUPUNI STREET • HILO, HAWAII 96720

COUNTY OF HAWAII

HERBERT T. MATAYOSHI
Mayor

SIDNEY M. FUKE
Director

DUANE KANUHA
Deputy Director

December 18, 1979

Mr. Donald A. Bremner, Chairman
Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, HI 96813

Dear Mr. Bremner:

Draft EIS
Hale Pohaku Mid-Elevation Master Plan
November 1979

We have recently completed our review of the subject document and have noted several areas within the text that are in need of further discussion and/or revision. Our comments are as follows.

1. The scope of the subject EIS-Master Plan should be expanded. The present draft document addresses facility requirements and environmental impacts only at the present user demand. Does this EIS-Master Plan assume that no expansion of the facilities either at the summit or mid-elevation is contemplated? If so, this assumption should be stated. If not, then the potential expansion and anticipated impacts should be discussed.

2. During the recent processing of the Conservation District Use Permit (CDUA) for the 850 KW generator facility on the summit, the University of Hawaii indicated that the proposed generator facility was a temporary infrastructure, and that the long range plan proposed the installation of a powerline from the Saddle Road sometime in the early 1980's. Since it is feasible that this powerline may also service the Mid-Level facility, it should be discussed within the text.

3. The EIS should discuss the proposed Mid-Level facility in respect to project costs and phasing. It is unclear as to whether or not other temporary structural improvements will be needed. The anticipated "temporary" relocation of some facility functions during construction (Page 114, Section F-3.0) should be elaborated on to detail the "which, where, when, and duration" of any facility relocations.

4. The proposal to provide fire pits at recreational picnic sites (Section 1.2) should be reconsidered. In view of the fragile nature of the local environment, potential fire hazard and limited water availability, no fire pits should be provided and an out-right ban on fires be initiated. Despite the probability that park users will still bring "hibachis," the construction of fire pits should be reconsidered since fires are potentially hazardous and the presence of pits facilities would encourage fires despite "no fires" postings. It is also unclear as to whether or not any fires will be allowed at the Mid-Level facility. (See also No. 6 below.)

5. The discussion of the structural improvements should include dimensional references (i.e. building length, height, width and capacity) for each proposed component and not just the total gross floor-area. For example, the capacity of the fuel storage tank(s) at Hale Pahaku is not indicated. Further, although the structural character of the facility is stated to limit building height to tree level, no height reference is given for the surrounding Mamane trees. The proposed building height and number of stories of the Mid-Level facility is unclear. It is also unclear as to exactly how many separate structures are proposed.

6. The proposed location of the summit road access control gate (Page 19, Section 1.31) should be re-evaluated. In our previous correspondence with the Board of Land and Natural Resources concerning Mauna Kea Plan amendment proposals, we had suggested that the gate facility would be more suitably located at a lower elevation since it would save visitors from the inconvenience of having to drive almost three-quarters (3/4) of the distance to the summit only to find that the summit area is closed.

Likewise, the proposal to have unregulated daylight access to the summit should also be re-evaluated since it seems to be inconsistent with the intent of the access control facility.

Further, the provision for the one (1) enforcement officer to operate the information center, patrol the park for fire hazard and police the summit area seems inadequate and should be re-evaluated. It may be desirable to provide additional enforcement personnel and/or perhaps reinstate the entry permit system to monitor recreational usage.

7. The indicated natural ponding area below the proposed Park parking lot area (Section 4.1-Drainage) should be designated on the site map since it will be the final disposal area for drainage waters.

8. The EIS Preparation Notice made reference to feral cats being predators on Mauna Kea. The current text does not include the feral cat in the list of mammals of Mauna Kea (Table IV - page 70).

9. The last word in the paragraph should be changed from Maui to Hawaii (page 151).

Thank you for the opportunity to provide some comments on the subject EIS-Master Plan. We will await the opportunity to review the subsequent revised EIS-Master Plan. Mahalo.

Sincerely,

SIDNEY FUKE
Planning Director

BS/VKG:wkm

cc: Susumu Ono
Hal Tanaka

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February 1980

Mr. Sidney Fuke
Planning Director
County of Hawaii
25 Aupuni Street
Hilo, Hawaii 96720

Dear Mr. Fuke:

Thank you for reviewing and commenting on the EIS for the Hale Pohaku Mid-Elevation Facilities Master Plan. We recognize that the project is of great interest to you. The responses to your specific comments and questions are as follows:

1. Comment: "The scope of the subject EIS-Master Plan should be expanded. The present draft document addresses facility requirements and environmental impacts only at the present user demand. Does this EIS-Master Plan assume that no expansion of the facilities either at the summit or mid-elevation is contemplated? If so, this assumption should be stated. If not, then the potential impacts should be discussed."

   Response: As stated in the EIS, the Plan and EIS are for mid-level facilities to support the existing six telescopes at the summit. These are the only telescopes which the Board of Land and Natural Resources has approved for Mauna Kea. Should any further telescopes be proposed, or any expansion required at the mid-level, environmental assessments would have to be made to ascertain impacts and to determine whether an additional impact statement is required. A Conservation District Use Permit would also be required prior to any additional construction.

2. Comment: "During the recent processing of the Conservation District Use Permit (CDUA) for the 850 KW generator facility on the summit, the University of Hawaii indicated that the proposed generator facility was a

temporary infrastructure and that the long range plan proposed the installation of a powerline from the Saddle Road sometime in the early 1980's. Since it is feasible that this powerline may also service the Mid-Level Facility, it should be discussed within the text."

Response: At the present, as stated in the EIS, electrical power at the mid-level is planned to be provided by a 250 KV generator. In the future, the University plans to apply for funding and approvals to design and construct a permanent electrical powerline from the Saddle Road to the Summit of Mauna Kea and eventually replace the generators at Hale Pohaku and the Summit. When funding becomes available and plans are initiated, an assessment of the power line impacts will be made. Generators may be retained to provide a source of emergency standby electrical power at the mid-level facility.

3. Comment: "The EIS should discuss the proposed Mid-Level Facility in respect to project costs and phasing. It is unclear as to whether or not other temporary structural improvements will be needed. The anticipated 'temporary' relocation of some facility functions during construction (Page 114, Section 3.0) should be elaborated on to detail the 'which, where, when, and duration' of any facility relocations."

Response: Because the project has not been designed, costs are very conceptual. It is estimated, though, that the total project may cost approximately $5.8 million, including design and equipment.

At the present time, it is not anticipated that the project itself will be phased. This is subject to change, however, depending on funding.

It will be necessary for the astronomers to continue to occupy the existing facilities while the new complex is being constructed. This may require some temporary relocation of functions to different structures within the complex as construction progresses. The kitchen/dining functions, for example, may have to be temporarily relocated to the buildings near the stone cabins, which are currently being occupied by the University of Hawaii personnel, until the new common areas are completed. There was no intention in the EIS to imply that the relocation of existing buildings or new temporary buildings would be necessary during the construction phase. If

any relocation of functions is required, it will only take place within the existing temporary structures.

4. Comment: "The proposal to provide fire pits at recreational picnic sites (Section 1.2) should be reconsidered. In view of the fragile nature of the local environment, potential fire hazard and limited water availability, no fire pits should be provided and an out-right ban on fires to be initiated. Despite the probability that park users will still bring 'hibachis', the constructon of fire pits should be reconsidered since fires are potentially hazardous and the presence of pit facilities would encourage fires despite 'no fires' postings. It is also unclear as to whether or not any fires will be allowed at the Mid-Level Facility."

Response: After careful consideration, it was determined that a ban on fires in the park area would be difficult to enforce. Therefore, measures have been proposed which should minimize the danger. It is the experience of the State Parks Division that the biggest problem with fire in parks is that people habitually throw hot coals onthe ground. Mr. Robert Barrel, State Director of the National Park Service, suggested that a fire cache be provided, so fires that are started could be easily extinguished. It was therefore decided to place pits in the picnic areas so that hot coals could be conveniently disposed of without risking damage and fire to the surrounding area.

During the design phase of the project, various means for minimizing fire risks in the picnic area will be investigated. Concrete picnic tables and various types of fire breaks will be among the alternatives considered. Fire flow is being provided at both the Park and Astronomy Facility.

5. Comment: "The discussion of the structural improvements should include dimensional references (i.e. building length, height/width and capacity) for each proposed component and not just the total gross floor area. For example, the capacity of the fuel storage tank(s) at Hale Pohaku is not indicated. Further, although the structural character of the facility is stated to limit building height to tree level, no height reference is given for the surrounding Mamane trees. The proposed building height and number of stories of the Mid-Level Facility is unclear. It is also unclear as to exactly how many separate structures are proposed."

Response: At this stage of the development process, prior to design, buildings are merely conceptual. It is premature to discuss dimensions of structures or exact number of buildings. The purpose of the plan is to show the proposed location and spatial relationships of functional areas and approximate area to be covered by buildings. Design criteria and concepts developed within the plan (such as buildings no higher than tree top) will guide the architect in the design of the structures within the project. A complex development report, which specifies the design criteria and guidelines in more detail than the EIS, is being prepared. A copy of a draft of this report will be sent to you for comment as soon as it is completed. In relation to the diesel fuel storage tanks, the proposed capacity of 15,000 gallons is stated on page 29, paragraph (g) in the text. Gasoline storage (two 6,000 gallon tanks) is described in paragraph (f) on the same page.

6. Comment: "The proposed location of the summit road access control gate (Page 19, Section 1.31) should be re-evaluated. In our previous correspondence with the Board of Land and Natural Resources concerning Mauna Kea Plan amendment proposals, we had suggested that the gate facility would be more suitably located at a lower elevation since it would save visitors from the inconvenience of having to drive almost three-quarters (3/4) of the distance to the summit only to find that the summit area is closed."

Response: Other locations were considered for the gate. It was decided though, that persons could be adequately warned of the hours the gate was closed by means of a sign posted near the information station. A reference to this sign has been included in the Revised EIS.

Comment: "Likewise, the proposal to have unregulated daylight access to the summit should also be re-evaluated since it seems to be inconsistent with the intent of the access control facility."

Response: At the present time, the Department feels that people should not be completely restricted from enjoying the resources of the mountain. The signed and manned Information Station are intended to provide some measure of access control. These items are discussed in the EIS. This policy will be re-evaluated in the

future and if necessary more stringent control measures will be instituted. It should be noted, though, that in the past, gates placed at Hale Pohaku have been broken.

Comment: "Further, the provision for the one (1) enforcement officer to operate the Information Center, patrol the park for fire hazard and police the summit area seems inadequate and should be re-evaluated. It may be desirable to provide additional enforcement personnel and/or perhaps reinstate the entry permit system to monitor recreational usage."

Response: The Department of Land and Natural Resources has had very little experience in operating a facility such as the one proposed for Hale Pohaku. Until such a time as we can determine the usage of the Facility with more precision, one person will be expected to perform the necessary duties. This person will not be solely responsible for enforcing all of DLNR's regulations for the area but rather he or she will have the full resources of the enforcement division, and other Department personnel on the Island of Hawaii, to call upon if the need arises. The person on duty at the Information Station will not be required to police the summit area.

The effects of this policy will be monitored and, in the event that one person can not adequately perform all the required duties, additional personnel may be added. Reinstatement of the entry permit system to monitor recreational usage is one means of control that will be re-evaluated when regulations that apply to Hale Pohaku and surrounding environs are updated.

7. Comment: "The indicated natural ponding area below the proposed Park parking lot area (Section 4.1 - Drainage) should be designated on the site map since it will be the final disposal area for drainage."

Response: The natural ponding area will be shown on Figure 5 in the Revised EIS.

8. Comment: "The EIS Preparation Notice made reference to feral cats being predators on Mauna Kea. The current text does not include the feral cat in the list of mammals of Mauna Kea (Table IV - Page 70)."

Response: The feral cat will be included in the list of mammals of Mauna Kea in the Revised EIS.

1 February 1980

We hope that we were able to address your concerns sufficiently. You will be kept informed of progress on the project and your comments will be solicited periodically.

Very truly yours,

DEPARTMENT OF LAND AND NATURAL RESOURCES

Susumu Ono
Chairman of the Board

POLICE DEPARTMENT
COUNTY OF HAWAII
349 KAPIOLANI STREET
HILO, HAWAII 96720

GUY A. PAUL
CHIEF OF POLICE

OUR REFERENCE

YOUR REFERENCE

November 19, 1979

Environmental Quality Commission
Office of the Governor
550 Halekauwila Street, Room 301
Honolulu, Hawaii 96813

SUBJECT: ENVIRONMENTAL IMPACT STATEMENT
HALE POHAKU MID-ELEVATION MASTER PLAN

Staff has reviewed the subject document and offers comments on the following paragraphs:

Pages 42-43, Paragraph 5.2 Security and Safety
Page 81, Paragraph 7.2 Health and Safety
Page 93, Last paragraph
Page 98, First paragraph

We reiterate as with the EIS Preparation Notice that the nearest police facility is located in Hilo, approximately thirty-four miles from Hale Pohaku.

In view of the fact that it is envisioned that the volume of vehicular traffic, visitors, hunters and skiers will be increased with the establishment of this facility, it is also anticipated that traffic accidents and crimes will also increase in this area.

Because of the distance involved, response time for patrol units can be an hour or longer.

Therefore, we concur with and further encourage the training of DLNR and ski patrol personnel to regulate and enforce vehicular movement and anti-litter regulations to ensure the safety and well-being of the visitor.

We also suggest that due consideration be given for the prevention of burglaries and thefts from the facility in architectural designs and plans.

Thank you for allowing us to comment on your master plan .

MARTIN K. L. KAAUA
DEPUTY CHIEF OF POLICE
ACTING CHIEF OF POLICE

WC:esp

cc: Department of Land & Natural Resources

Encl: EIS

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
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FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February 1980

Mr. Martin K.L. Kaaua
Acting Chief of Police
County of Hawaii
Police Department
349 Kapiolani Street
Hilo, Hawaii 96720

ENVIRONMENTAL IMPACT STATEMENT
HALE POHAKU MID-ELEVATION MASTER PLAN

Dear Mr. Kaaua:

Thank you for reviewing and commenting on the subject EIS. We share your concern for the safety and well-being of the visitors and residents at Hale Pohaku. We will monitor the situation carefully and reevaluate our management policies for the area if it appears that additional controls are necessary. We will also recommend to the architect that consideration be given to the prevention of burglaries and thefts in the architectural designs for the project.

We appreciate your taking the time to review the EIS and would appreciate any additional suggestions that you might have to offer concerning safety and security at Hale Pohaku.

Yours very truly,

DEPARTMENT OF LAND AND NATURAL RESOURCES

Susumu Ono
Chairman of the Board

CONSERVATION COUNCIL FOR HAWAII

State Board
P. O. Box 2923 - Honolulu, Hawaii 96802

Oahu Chapter
P. O. Box 2923 - Honolulu, Hawaii 96802

Hawaii Island Chapter
P. O. Box 1222
Hilo, HI 96720

December 6, 1979

COMMENTS ON EIS FOR HALE POHAKU MID-ELEVATION FACILITIES MASTER PLAN

The Hawaii Island Chapter, Conservation Council for Hawaii supports the staff recommendation for development of the Mid-elevation Facility on the present site at Hale Pohaku, to include not more than the proposed 7 acres in the project area (Figure 5).

We also support the establishment of a State Park and information center adjacent and makai, to encompass not more than the suggested 8 acres in future maximum development (Figure 5).

In the total aspect of Mauna Kea and the critical habitat of the palila, these 15 acres are a tiny segment. Application of the constraints on construction and landscaping (pp. 99-101) is unlikely to result in a net negative impact on the birds compared to present conditions of disturbance at the site.

Overall, the decision of June 6, 1979 (pp. 68-69) for elimination of feral sheep from the palila habitat is a highly significant turning point. In the absence of sheep, predictably the vegetation of Mauna Kea will again thrive and, in time, the management objective for recovery of the palila will have been achieved. The palila will no longer be an endangered species.

Hence, the Mid-level Facility and Park will be an increasingly acceptable and reasonable use of the mountain as a base for research and recreation. Hale Pohaku remains as a single most desirable and suitable location for these needs.

It is encouraging to observe that a manned information station will be established. We see this as an especially important control on access to the summit area, a means for education of the visiting public, and a deterrent to vandalism and other forms of damage. The patrol at the Park should be extended to the upper slopes to include especially the Mauna Kea Ice Age Natural Area Reserve.

Additionally, restriction of passage on the summit road to 4-wheel drive vehicles is a recommended simple matter related to public safety, whether the road is paved or remains unpaved. There is a precedent in Hawaii County for such restriction under an ordinance governing traffic on the road into Waipio Valley. Regulation for Mauna Kea could be patterned easily after this ordinance.

We commend the Department for a well-reasoned and effective Master Plan for the Hale Pohaku area.

P. Quentin Tomich

P. Quentin Tomich,
for the Executive Board
Hawaii Chapter

CC: President, CCH
Chairman, DLNR

State Affiliate of the National Wildlife Federation

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
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HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
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FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February 1980

Dr. P. Quentin Tomich
Conservation Council for Hawaii
P.O. Box 1222
Hilo, HI 96720

Dear Mr. Tomich:

Thank you and the Conservation Council very much for reviewing and commenting on the Environmental Impact Statement for the Hale Pohaku Mid-Elevation Facilities Master Plan. We appreciate your concern for the conservation of one of the Island of Hawaii's most important resources, Mauna Kea.

The Department will consider your comments concerning extending the patrol to the upper slopes and a permament regulation restricting access to the summit to 4-wheel drive vehicles. As stated in the EIS, " . . . if visitor traffic to Hale Pohaku and the summit becomes increasingly heavy, the Department may re-evaluate its management, monitoring, and control programs for the area."

Your participation in the review process for the subject EIS is appreciated. Be assured that the project architect will be instructed to follow the plan carefully when designing the facilities.

Yours very truly,

DEPARTMENT OF LAND AND NATURAL RESOURCES

Susumu Ono
Chairman of the Board

For the Protection of Hawaii's Native Wildlife

HAWAII AUDUBON SOCIETY

P.O. BOX 22832
HONOLULU, HAWAII 96822

P. O. Box 275
Volcano, Hawaii 96785

December 6, 1979

Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

and

Dept. of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

Re: Comments on the Draft EIS for the HALE POHAKU MID-ELEVATION MASTER PLAN

It is the position of the Hawaii Audubon Society that Hale Pohaku is an unsuitable site for a permanent mid-level facility to accomodate astronomy personnel who work at the summit of Mauna Kea since major development at that location is likely to have a harmful impact on the critical habitat of the endangered Palila. In addition, urban expansion at that site would encroach further on the threatened mamane forest ecosystem -- unique to Mauna Kea -- and its rare and/or endangered components of birds, plants and invertebrates.

The Society recommends the selection of the Hawaiian Homes Commission (HHC) site at 8,000 feet elevation for the astronomers' acclimatization station, immediately below the forest reserve fenceline and outside of Palila critical habitat. This site, adjacent to the Mauna Kea Access Road, has long been in grazing use, and the negative impact on the natural environment from development of 5-10 acres at this location will be significantly less than at Hale Pohaku.

The visitor information post, restrooms and ranger station would also be appropriate at the HHC site, close to the road and separated from the astronomers' facility. Then the old stone buildings at Hale Pohaku State Park could be restored for the primary use of Hawaii residents with 4-wheel drive vehicles as an unimproved picnic and rest stop. Focusing on a wilderness experience, the amenities of water, flush toilets and electricity would not be provided.

Specific comments on the draft EIS text:

MAUNA KEA PLAN: MANAGEMENT AREAS

The map (fig. 4, p. 10) has several inaccuracies:

1) "Astronomical Research Area" - These three extensive swaths within the bounds of the Science Reserve Management Area apparently are derived from Institute for Astronomy planning documents. They have no official status in the Mauna Kea Plan or in State leases or subleases and should be replaced by site designations of the six existing telescopes.

2) "Special Natural Area" - (also fig. 8, p. 71) This is the Mauna Kea Ice Age Natural Area Reserve, but it shows a disjunct block -- obviously Pu'u Pohaku -- separated from the main body of the reserve. The Mauna Kea Plan specifically lists Pu'u Pohaku as an integral part of the natural area but contains no map. The natural area map in the DLNR study, "A Plan for Mauna Kea," May 1976 (p. 20) correctly connects Pu'u Pohaku with Pu'u Hau Kea and Lake Waiau. The lack of congruence calls for an explanation.

3) "Palila Critical Habitat" - The delineation in inaccurate. The map and habitat description in the Federal Register notice (August 11, 1977) define a mamane forest belt encircling the mountain to 10,000 feet elevation, including two small parcels outside the forest reserve on the west and on the southeast.

4) "Hawaiian Homelands" - The map incorrectly shows this ownership as extending on the east to within the State-owned forest reserve.

5) "Military Area" - The Pohakuloa Training Area covers much more territory on Mauna Kea than the map indicates.

INFORMATION/INTERPRETIVE STATION (pp. 17-18)

This station will be a welcome opportunity to interpret the singular geological, biological and archeological resources of the mountain. Here residents can take pride in their natural heritage through illustration of the processes of nature in volcano building, the ice ages, the island -adapted plant and animal life that evolved here, and the ancient Hawaiian gentle use of montane resources.

Station visitors can learn of the remarkable natural qualities of Mauna Kea that have national significance -- from the mamane forest, to the alpine region, to the high-altitude aeolian ecosystem, and to the crest that has been singled out as "the most majestic expression of shield volcanism in the Hawaiian Archipelago, if not in the world." (US Dept. of Interior, Dec. 1972) These are the riches of Mauna Kea that have earned its special ranking as a National Natural Landmark.

The proposed "small telescope" (p. 18) housed in an observatory building at the visitor station would be an unseemly intrusion in an area of exceptional natural beauty.

UH MID-ELEVATION FACILITIES

Accomodations for 59 people and 57 bath units in the astronomers' dormitory (p. 23) building appears to be excessive in light of the Mauna Kea Plan's mandate (p. 7) that the facility is "for necessary research personnel for the summit;" that the facility"is based on the need for altitude acclimatization for astronomical research staff;" and that "development . . . will . . . remain at a level in accordance with minimum research . . . needs."

It does not seem necessary for support employees who work at mid-level and have no need for physiological acclimation to also reside there. Fifty-nine live-in people divides out to almost 15 for each of the four major telescopes. Would 59 of the research staff be traveling daily to the summit to work? Such a large number of living units could become an invitation for families and guests to vacation there.

The proposed and extensive "research support and common areas" (p. 24) amounting to 22,000 sq. ft. of floor space -- not counting the maintenance area -- also raises the question whether these are minimum research needs. For example, is a computer necessary at this facility when each of the major observatories at the summit has one and others are located at base support facilities in Waimea and Hilo, as well as at the Institute on the Manoa campus?

LITTER

Persistent attention to keeping human use areas free of litter can't be overemphasized (p. 30). Even now a summit worker could fill several garbage bags with the large pieces of construction trash and smaller litter lying around the observatories or resting on the sides of cinder cones and along roadways.

Those who have seen and photographed the shocking clutter of haphazard structures in disrepair and the degrading litter at the "Science City" site on the summit of Haleakala are apprehensive of a similar fate for Mauna Kea.

LANDSCAPING

In getting young mamane for landscaping (p. 41), special care is required to insure that the seed source is the immediate vicinity of the planting site. The botanical survey reports (p. 54; B-8) that a proposed endangered form of mamane was identified at Hale Pohaku sites: Sophora chrysophylla subsp. circularis var. circularis. Eleven taxa of S. chrysophylla that are endemic to Hawaii Island are listed in St. John (List of Flowering Plants in Hawaii, 1973). To retain the integrity of the gene pool of the Hale Pohaku form of mamane, it is essential that seedlings from other Mauna Kea localities are not planted there because of the risk of man-induced hybridization.

THE REGION

Mauna Kea has far more than 19 cinder cones (p. 44). Jerome K. Kilmartin, who mapped the upper slopes in the mid-1920s, reported in the Explorer's Journal, "Na Mea O Mauna Kea (Things about Mauna Kea)," March 1974, that there are 108 cinder cones above 6,500 feet elevation.

Scientific field research should be added to the list of "popular uses of the mountain" (p. 45). A number of entomologists, botanists, ornithologists and naturalists periodically spend full days investigating the biota of Mauna Kea.

The acreage given (p. 45) for the critical habitat of the Palila, "over 100,000 acres," appears to be far off the mark. The Federal Register notice is silent on the size. An indication of a far lesser acreage is the fact that the State-owned Mauna Kea Forest Reserve which extends from the summit to the lower pasture fences is 82,600 acres, but the critical habitat is a band around the mountain roughly between 7,000-10,000 feet elevation. So all of the forest reserve land between 10,000 feet and the summit at nearly 14,000 feet is not critical habitat.

GEOLOGY

More recent findings on aspects of the geological history (p. 47) of Mauna Kea are available in Stephen C. Porter et al., "Chronology of Hawaiian Glaciations," Science, 7 Jan. 1977. Porter finds that the most recent Mauna Kea volcanic eruption was close to 4,500 years ago in the south rift zone, roughly parallel to the Mauna Kea Access Road, and that the last glacial ice cap disappeared from the summit about 10,000 years ago.

MAMMALS

As a major plaintiff in the federal court Palila suit, the Sierra Club name should be inserted in the list of plaintiffs following Palila (p. 68).

In more recent court action in this case (p. 69), on November 14, 1979 Judge King ordered the defendants to implement their plan for eradication of feral sheep and goats from Palila critical habitat over a 24-month period, to be accomplished by July 31, 1981.

ADVERSE ENVIRONMENTAL EFFECTS (p. 117)

The negative long-term impact of encroaching urban facilities on the critical habitat of species threatened with extinction must be addressed in this section. We are dealing here with a beleaguered forest ecosystem that exists nowhere outside of Mauna Kea.

The botanist reported on mamane that "about 35 trees are on or very near the sites of the proposed buildings" (p. B-5). Yet the text says that only an estimated 3-10 trees will have to be removed to construct facilities (p. xv; 117; 144). Can this lack of agreement be clarified?

The range and viability of this form of mamane proposed for endangered status (Sophora chrysophylla subsp. circularis var. circularis) should be determined before any trees are destroyed. Attempts to transplant mature trees have dim survival prospects and the effort is not acceptable mitigation for the destruction of habitat.

ALTERNATIVE LOCATIONS - ACCLIMATIZATION SITE

No sure evidence, medical or otherwise, is presented to demonstrate that Hale Pohaku at 9,200 feet elevation is "the most suitable altitude for the purpose of acclimatization" (p. xi), in comparison with the HHC site at 8,000 feet elevation.

Indeed, there appears to be considerable latitude in the range of altitudes for physiological adjustment to decreasing oxygen. The text quotes Kuiper as suggesting 8,000-10,000 feet elevation (p. 123). Six letters to specialists in response to the Institute's inquiries on this subject (p. 134) that were published in the study, "A Plan for Mauna Kea," May 1976 (pp. 43-47), allow notable leeway in altitude range, if the Institute's stated preference for the Hale Pohaku site is discounted. Altitudes of 2.4-2.5 km, corresponding to 7,874-8,202 feet elevation -- equivalent to the HHC site -- seem to be within the effective range. Perhaps those letters should be published in the Final EIS to inform reviewers.

In the discussion on the availability of the HHC site, problems in obtaining a lease are anticipated (p. 131). However, since the Institute had previously started fruitful negotiations with the HHC and the rancher lessee in 1972-73 for a 40-acre parcel (according the the Draft EIS for the Proposed Mauna Kea Observatory Mid Elevation Facility, Jan. 1974, p. 1), prospects may be brighter now.

In no event can the HHC pasture be called an "undisturbed site" (p. 135) -- not after many decades of sheep and cattle grazing.

Naturalists and scientists such as botanists, geologists and entomologists are increasingly frequent visitors to the State Park site and should be added to the list of user groups (p. 136).

HALE POHAKU SITE

No mention is made in the list of disadvantages of this construction site (p. 145) of the documented presence (p. B-2;B-9) of two species of endemic mints, Stenogyne microphylla and S. rugosa, and a endemic Geranium (G. cuneatum var. holoeucum) that are either rare or proposed for endangered status. Their potential destruction should be considered.

A callous disregard for the value of native biota and the scientists who specialize in its study is displayed near the end of the text with the statement that "the importance of the astronomy work on Mauna Kea was felt to justify the taking of seven acres of marginal land from other uses and converting it to scientific use." (p. 150, emphasis added) Surely this error in assessing the biological value of the site and the prominence of the science of biology on Mauna Kea will be corrected in the Final EIS.

COMMITMENT OF RESOURCES

The Draft EIS mentions money, labor, construction materials and fuels as resource commitment, but it fails to address the most critical commitment of resources that this project proposes. That is, degradation or permanent loss of yet another chunk of the dwindling mamane forest ecosystem with its host of interdependent plant and animal life forms unique to this alpine region of Mauna Kea.

Thank you for the opportunity to review the draft document. We would appreciate a response to each of the points raised here.

Mae E. Mull

Mae E. Mull
Island of Hawaii Representative
Hawaii Audubon Society

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
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FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February 1980

Mrs. Mae E. Mull
Hawaii Island Representative
Hawaii Audubon Society
P.O. Box 275
Volcano, Hawaii 96785

Dear Mrs. Mull:

Thank you for commenting on the EIS for the Hale Pohaku Mid-Elevation Facility Master Plan. The location for the Astronomy's facilities was chosen after careful consideration of alternative sites in the Hale Pohaku area and elsewhere. Hale Pohaku was also specified as the location of these facilities in the Mauna Kea Plan, February 1977. The site layout presented in the plan was coordinated with the U.S. Fish and Wildlife Service, Office of Endangered Species, to minimize adverse impacts on the Palila and its critical habitat. Formal consultation between NASA and the U.S. Department of Interior, Fish and Wildlife Service was concluded on November 2, 1979.

In response to your specific comments:

MAUNA KEA PLAN: MANAGEMENT AREAS (Inaccuracies in Fig. 4, Pg. 10)

Comment: "'Astronomical Research Area' .... These three extensive swaths within the bounds of the Science Reserve Management Area apparently are derived from Institute for Astronomy planning documents. They have no official status in the Mauna Kea Plan or in State leases or subleases and should be replaced by site designations of the existing telescopes."

Response: The swaths were shown on the base map used for the EIS which was from "a Plan For Mauna Kea", May 1976, page 20. They were meant as conceptual representations of the general astronomical area. For clarity, the swaths have been removed from Fig. 4 in the Revised EIS and only the boundary of the Science Reserve Management Area is shown.

1 February 1980

Comment: "'Special Natural Area' (also Fig. 8, page 71) ....This is the Mauna Kea Ice Age Natural Area Reserve, but it shows a disjunct block -- obviously Pu'u Pohaku, separated from the main body of the reserve. The Mauna Kea Plan specifically lists Pu'u Pohaku as an integral part of the natural area but contains no map. The natural area map in the DLNR study, "A Plan for Mauna Kea," May 1976 (page 20), correctly connects Pu'u Pohaku with Pu'u Hau Kea and Lake Waiau. The lack of congruence calls for an explanation."

Response: The map of the Natural Area Reserve on page 20 of "A Plan For Mauna Kea", May 1976, page 20, is out of date in this respect. The boundaries of the Mauna Kea Ice Age Natural Area Reserve, as approximated in Figures 4 and 8 of the EIS, were approved by the Board of Land and Natural Resources on November 9, 1978. Pu'u Pohaku is a satellite section of this reserve.

Comment: "'Palila Critical Habitat'.... The delineation is inaccurate. The map and habitat description in the Federal Register notice (August 11, 1977) defines a mamane forest belt encircling the mountain to the 10,000 feet elevation, including two small parcels outside the forest reserve on the west and on the southeast."

Response: The boundaries of the habitat were approximated from Figure 2 of the Palila Recovery Plan. They were not precise due to the small scale of the base map (1:125,000) and due to the fact that the amount of information displayed in Figure 4 precludes exact definition of boundaries. The area has been more accurately, although not precisely, delineated in the Revised EIS.

Comment: "'Hawaiian Homelands' .... The map incorrectly shows this ownership as extending on the east to within the State-owned forest reserve."

Comment: "'Military Area' .... The Pohakuloa Training Area covers much more territory on Mauna Kea than the map indicates."

Response: These areas are approximated and were included on the map merely to show locational relationships to Hale Pohaku. No attempt was made to present exact boundaries of these areas. Reference to the Hawaiian Homelands area has been deleted from Figure 4 in the Revised EIS.

INFORMATION/INTERPRETIVE STATION (pp. 17 - 18)

Comment: "The proposed 'small telescope' (page 18) housed in an observatory building at the visitor station would be an unseemly intrusion in an area of exceptional natural beauty."

Response: The type and variety of interpretive exhibits and activities to be included in the Information Station have not been specifically determined as yet. Those listed in the EIS are merely suggestions as to what various persons feel might be appropriate. The telescope was mentioned because several island of Hawaii citizen groups had commented to the Institute for Astronomy that such an attraction might be desirable.

UNIVERSITY OF HAWAII MID-ELEVATION FACILITIES

Comment: "Accommodations for 59 people and 57 bath units in the astronomers' dormitory building appears to be excessive in light of the Mauna Kea Plan's mandate that the facility is 'for necessary research personnel for the summit; ....' It does not seem necessary for support employees who work at the Mid-Level and have no need for physiological acclimation to also reside there."

Response: Astronomers and support services personnel are currently occupying 8100 square feet of floor area for dormitory purposes. The proposed dormitory building will encompass approximately 11,200 assignable square feet, an increase of 3,100 additonal square feet. (The size of a dormitory has been reduced since publication of the EIS.) By the time the new facility is completed, the day crew who work at the summit will also be required to reside at Hale Pohaku during their on-duty periods because they must also remain acclimatized.

Accommodations are being provided for Mauna Kea Support Services personnel who work long shifts (from 11 to 18 hours) at Hale Pohaku. (These personnel currently sleep in the large stone cabin during their on-duty days.) It is not acceptable to ask staff in this position to further extend their long workdays by requiring them to commute daily to and from work, over an hour's drive each way. The quality of the staff is important to the efficiency of the operation. In addition, certain of these personnel will be required to make periodic trips to the summit during their on-duty periods.

Comment: "Fifty-nine live-in people divides out to almost 15 for each of the four major telescopes. Would 59 of the research staff be traveling daily to the summit to work?"

Response: Approximately 52 research personnel will be traveling on a regular daily basis to the summit to work. The others will make occasional trips as required.

Comment: "The proposed and extensive 'research support and common areas' (page 24) .... amounting to 22,000 square feet of floor space, also raises the question whether these are minimum research needs. For example, is a computer necessary at this facility when each of the major observatories at the summit has one and others are located at base support facilities in Waimea and Hilo, as well as at the Institute on the Manoa campus?"

Response: The 22,000 square foot gross area for the research and common space, as stated in the EIS, was an error. These functions will encompass approximately 14,800 gross square feet or 9600 assignable square feet of floor area. Of the 9600 assignable square feet, approximately 5300 are for common areas such as kitchen and dining facilities, restrooms, etc. and about 4300 square feet will be used for research support.

The computer room, containing approximately 400 assignable square feet of floor area, will contain terminals for all four telescopes and not a major computer. These terminals will be used by research personnel who must remain acclimatized, to prepare for the next nights observations.

LITTER

Comment: "Persistent attention to keeping human use areas free of litter can't be over emphasized (page 30) ...."

Response: This is an excellent point and will be stressed in the development criteria and recommendations.

LANDSCAPING

Comment: "In getting young mamane for landscaping (page 41), special care is required to insure that the seed source is the immediate vicinity of the planting site. To retain the integrity of the gene pool of the Hale Pohaku form of mamane, it is essential that seedlings from other Mauna Kea localities are not planted there because of the risk of man-induced hybridization."

Response: To insure maximal reproduction of the limited gene pools of these species, propagules will be from trees being sacrificed in the project.

1 February 1980

THE REGION

Comment: "Mauna Kea has far more than 19 cinder cones (page 44)."

Response: The State of Hawaii Data Book, DPED, 1978, page 84, states that the summit of Mauna Kea includes "19 cones over 11,000 feet, five of them over 13,000". Portions of this explanation were inadvertently left out of the text. Reference to 19 cinder cones has been deleted in the Revised EIS.

Comment: "Scientific field research should be added to the list of 'popular uses of the mountain' (page 45)."

Response: The revised EIS adds this to popular uses of the mountain.

Comment: "The acreage given (page 45) for the critical habitat of the Palila, 'over 100,000 acres,' appears to be far off the mark."

Response: One hundred thousand acres is an error. The critical habitat is closer to 30,000 acres. The figure will be changed in the Revised EIS.

GEOLOGY

Comment: "More recent findings on aspects of the geological history (page 47) of Mauna Kea are available in Stephen C. Porter et al., "Chronology of Hawaiian Glaciations," Science, 7 January 1977. Porter finds that the most recent Mauna Kea volcanic eruption was close to 4,500 years ago in the south rift zone, roughly parallel to the Mauna Kea Access Road, and that the last glacial ice cap disappeared from the summit about 10,000 years ago."

Response: References to the most recent volcanic eruption and the last global ice cap have been deleted in the Revised EIS.

MAMMALS

Comment: "As a major plaintiff in the federal court Palila suit, the Sierra Club name should be inserted in the list of plaintiffs following Palila (page 68)."

Response: The Sierra Club was inadvertently omitted from the list of plaintiffs in the EIS. They will be included in the revised EIS.

Comment: "In more recent court action in this case (page 69), on November 14, 1979, Judge King ordered the defendents to implement their plan for eradication of feral sheep and goats from Palila critical habitat over a 24-month period, to be accomplished by July 31, 1981."

1 February 1980

Response: This decision was handed down subsequent to the publication of the EIS (November 8, 1979) and since the decision is being appealed by DLNR, no changes will be made in the revised EIS to reflect the November 1979 court action.

ADVERSE ENVIRONMENTAL EFFECTS (page 117)

Comment: "The negative long-term impact of encroaching urban facilities on the critical habitat of species threatened with extinction must be addressed in this section. We are dealing here with a beleaguered forest eco-system that exists nowhere outside of Mauna Kea."

Response: If additional facilities are required at the Mid-Level in the future, an environmental assessment and possibly an EIS will be required prior to their construction and prior to the awarding of a Conservation District Use Permit. In concluding its consultation with NASA, the U.S. Department of Interior, Fish and Wildlife Service stated that ... "The total area involved is not of such magnitude as to constitute a severe threat to the species or its critical habitat. The Hale Pohaku Mid-Level site is at the upper limits of the tree line where the mamane forest is sparse. The architect has been instructed to lay out the buildings in such a manner as to require a minimum removal of mamane trees. Possible disturbance to palila may be more than compensated for by reduction in feral sheep numbers in this portion of palila critical habitat through increased human activity and better access for hunting, and its beneficial effect on regeneration of mamane. It is, therefore, our opinion that NASA's participation in funding the use and operation (no construction) of the Mid-Level Facility at Hale Pohaku on Mauna Kea, Hawaii, is not likely to jeopardize the continued existence of the palila and its critical habitat."

Comment: "The botanist reported on mamane that 'about 35 trees are on or very near the sites of the proposed buildings (page B-5).' Yet the text says that only an estimated 3 to 10 trees will have to be removed to construct the facilities (p. xv; 117;144)."

Response: The site plan which was used by the botanical consultant was an early conceptual plan. The proposed plan, as described in the EIS, is the one which was submitted to the U.S. Fish and Wildlife Service for its opinion as to the impact on the critical habitat of the Palila. The plan, which was completed after the botanical survey, was designed to avoid rare and possibly endangered plants and to minimize destruction of the mamane.

1 February 1980

Comment: "The range and viability of this form of mamane proposed for endangered status (Sophora chrysophylla subsp. circularis var. circularis) should be determined before any trees are destroyed. Attempts to transplant mature trees have dim survival prospects and the effort is not acceptable mitigation for the destruction of the habitat."

Response: Our botanical consultant did not indicate whether or not any of the form of mamane proposed for endangered status were located on or near the project site. He did state though, page B-9, that the "taxonomy of Sophora chrysophylla is not well understood and is subject to revision." A qualified horticulturist will be consulted to identify the forms of mamane that may be disturbed by construction prior to any site preparation activities and to advise the architect concerning transplanting and maintenance of "disturbed" native trees on the site.

ALTERNATIVE LOCATIONS - ACCLIMATIZATION SITE

Comment: "No sure evidence, medical or otherwise, is presented to demonstrate that Hale Pohaku, at 9,200 feet elevation is 'the most suitable altitude for the purpose of acclimatization' (p. xi), in comparison with the HHC site at 8,000 feet elevation. Indeed, there appears to be considerable latitude in the range of altitudes for physiological adjustment to decreasing oxygen. The text quotes Kuiper as suggesting 8,000 - 10,000 feet elevation (page 123)."

Response: The complete quote from Kuiper reads (page 123) "... operation (of observatories) around 14,000 to 18,000 feet is possible under strictly controlled conditions ... astronomers should be adapted a few days beforehand to 8,000 to 10,000 foot elevation at the base laboratory, and only persons admitted to high altitude who have passed a heart examination and stood up well at the 9,000 foot level." (emphasis ours) This would appear to imply that persons who are to work at the summit should spend time at the 9,000 foot elevation before being admitted to higher elevations

Comment: "Six letters to specialists in response to the Institute's inquiries on this subject (page 134) that were published in the study, 'A Plan for Mauna Kea', May 1976 (pages 43 - 47), allow notable leeway in altitude range, if the Institutes stated preference for the Hale Pohaku site is discounted. Altitudes of 2.4 - 2.5 km, corresponding to 7874 - 8202 feet elevation -- equivalent to the HHC site -- seem to be within this effective range. Perhaps these letters should be published in the Final EIS to inform reviewers."

1 February 1980

Response: Of the five letters published in 'A Plan for Mauna Kea', one suggested 2.4 meters as the lower range of suitability for acclimatization, three stated that 2.5 meters was the minimum altitude, and one did not state a minimum but concurred with 9,200 feet as being effective for this purpose. The HHC site ranges from 8,000 to 8,050 feet in elevation, below the 8,202 feet (2.5 m), minimum suggested by the majority of the respondents. As stated in the text of the EIS, page 134, paragraph 2, "The elevation of 8,000 feet is at the lower limit of the suitability range for acclimatization". Because of the high capital investment required for the facility, and because of the importance of acclimatization to effective operation of the telescopes at the summit, a margin of safety was required to insure that almost all personnel could achieve and maintain acclimatization. The letters will be appended to the Revised EIS.

Comment: "In the discussion on the availability of the HHC site, problems in obtaining a lease are anticipated (page 131). However, since the Institute had previously started fruitful negotiations with the HHC and the rancher leasee in 1972 - 73 for a 40-acre parcel, prospects may be brighter now."

Response: Information concerning the current procedures and status of Hawaiian Homelands leases, as stated on page 131, paragraph "k" of the text, was obtained from discussions with personnel from the Department of Hawaiian Homes Lands. A formal application to lease the land was not submitted because the Hale Pohaku site was selected as the location for the Mid-Elevation Facilities.

Comment: "In no event can the HHC pasture be called an 'undisturbed site' (page 135) not after many decades of sheep and cattle grazing."

Response: The term "undisturbed" in the context of the statement made in the text refers to the absence of any buildings on the site. Undeveloped would have been more accurate.

Comment: "Naturalists and scientists such as botanists, geologists and entomologists are increasingly frequent visitors to the State Park site and should be added to the list of user groups (page 136)."

Response: Page 136 describes the process used to evaluate alternative plans at Hale Pohaku. Since the process has been completed, it would be incorrect to add additional considerations.

1 February 1980

HALE POHAKU SITE

Comment: "No mention is made in the list of disadvantages of this construction site (page 145) of the documented presence (pages B-2; B-9) of two species of endemic mints, Stenogyne microphylla and S. rugosa, and a endemic Geranium (G. cuneatum var. holoeucum) that are either rare or proposed for endangered status. Their potential destruction should be considered."

Response: The preliminary evaluation of the site was made prior to the botantical survey. The site was rejected at that time as explained in part 4.5 evaluation (page 146). The site was re-evaluated after the publication of the Notice of Preparation in October, 1978. The last sentence of this paragraph states that "The positive and negative environmental impacts of this plan are discussed thoroughly in the Environmental Impacts section of this EIS." The Environmental Impacts section states that "These plants will either be fenced during construction so that they will not be disturbed or transplanted to other locations on the project site. Any of these species found growing in the park will be fenced and identified with signs." A qualified horticulturist will be consulted to advise the architect on means to minimize disturbance to rare plants.

Comment: "A callous disregard for the value of native biota and the scientists who specialize in its study is displayed near the end of the text with the statement that "the importance of the astronomy work on Mauna Kea was felt to justify the taking of seven acres of marginal land from other uses and converting it to scientific use." (page 150, emphasis added) Surely this error in assessing the biological value of the site and the prominence of the science of biology on Mauna Kea will be corrected in the Final EIS."

Response: There was no intentional slight to biologists in this statement. The biota of the area has been carefully described throughout the text. The sentence has been changed to read: "The importance of astronomy work on Mauna Kea was felt to justify the taking of three additional acres of land from other uses for this purpose."

COMMITMENT OF RESOURCES

Comment: "The Draft EIS mentions money, labor, construction materials and fuels as resource commitment, but it fails to address the most critical commitment of resources that this project proposes. That is, the degradation or permanent loss of yet another chunk of the dwindling mamane forest eco-system with its host of interdependent plant and animal life forms unique to this alpine regions of Mauna Kea."

1 February 1980

Response: It was felt that impact on the mamane forest and related eco-systems was sufficiently addressed in the text of the EIS. The last sentence of the paragraph which you refer to states that "Hale Pohaku will be a developed area, rather than wilderness, for as long as astronomy is a viable industry on Hawaii". The intent of this sentence was to convey the irretrievable commitment of various aspects of the "wilderness environment."

We hope we were able to satisfactorily respond to your concerns. The Department appreciates your continued interest in the project.

Very truly yours,

DEPARTMENT OF LAND AND NATURAL RESOURCES

Susumu Ono
Chairman of the Board

HAWAIIAN TELEPHONE COMPANY

P.O. BOX 2200 • HONOLULU, HAWAII 96841 • TELEPHONE (808) 537-7111 • CABLE: TELHAWAII

December 4, 1979

Office of Environmental Quality Control
550 Halekauwila Street
Honolulu, Hawaii 96813

Gentlemen:

Subject: Environmental Impact Statement
Hale-Pohaku Mid-Elevation Master Plan

We have reviewed the subject Environmental Impact Statement (EIS) and offer the following comments:

Paragraph 3.5 on page 37 indicates that future telephone and television requirements will be satisfied through a digital radio system. Our plans to service the mid-elevation facility with a digital radio have not changed but they do not include requirements for television. It will be necessary for us to modify our design if television service becomes a requirement. However, we do not foresee any significant modification to the size and method of mounting the microwave dish.

Thank you for giving us the opportunity to review and comment on this EIS. If there are any further questions, please call me at 546-3650.

Sincerely,

R. Mau

Richard Mau
Engineering and Construction
Staff Manager

cc: Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawaii 96809

GEORGE R. ARIYOSHI
GOVERNOR

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
P. O. BOX 621
HONOLULU, HAWAII 96809

DIVISIONS:
CONSERVATION AND RESOURCES ENFORCEMENT
CONVEYANCES
FISH AND GAME
FORESTRY
LAND MANAGEMENT
STATE PARKS
WATER AND LAND DEVELOPMENT

1 February 1980

Mr. Richard Mau, Staff Manager
Engineering and Construction
Hawaiian Telephone Company
P.O. Box 2200
Honolulu, Hawaii 96841

Dear Sir:

ENVIRONMENTAL IMPACT STATEMENT
HALE-POHAKU MID-ELEVATION MASTER PLAN

Thank you for reviewing and commenting on the subject Environmental Impact Statement (EIS). We appreciate the information clarifying the inclusion of television requirements with the digital radio system. This comment has been transmitted to the University of Hawaii for their consideration during the design phase of the project.

Very truly yours,

DEPARTMENT OF LAND AND NATURAL RESOURCES

Susumu Ono
Chairman of the Board