William P. Kenoi
Mayor

Clayton S. Honma
Director

Kenneth J. Van Bergen
Deputy Director

County of Hawai`i

DEPARTMENT OF PARKS AND RECREATION
101 Pauahi Street, Suite 6 • Hilo, Hawai'i 96720
(808) 961-8311 • Fax (808) 961-8411

June 16, 2015

Jessica Wooley, Director
Office of Environmental Quality Control
235 South Beretania Street, Suite 702
Honolulu HI 96813

Dear Ms. Wooley:

Subject: Draft Environmental Assessment for Mauna Kea Recreation Area Improvements, TMK (3rd.) 4-4-016:003 (por.), Hāmākua, Island of Hawai'i

The County of Hawai'i, Department of Parks and Recreation, has prepared the draft environmental assessment for the subject project and anticipates a Finding of No Significant Impact (FONSI) determination. Please publish notice of availability for the EA for this project in the next available edition of the Environmental Notice. We have enclosed the following:

- One paper copy of the Draft EA;
- A CD containing the .pdf file for the EA and a WORD file with the OEQC Environmental Notice Publication Form; and
- A hardcopy of the OEQC publication form

Please contact James Komata at 961-8311 if you have any questions.

Sincerely,

Clayton Honma, Director
County of Hawai'i, Department of Parks and Recreation

Attach: As noted above

Cc: (w/o attach) Ron Terry, Ph.D, Project Environmental Consultant

AGENCY ACTIONS
SECTION 343-5(B), HRS
PUBLICATION FORM (FEBRUARY 2013 REVISION)

Project Name Mauna Kea Recreation Area Improvements
Island: Hawai‘i
District: Hāmākua
TMK: (3rd) 4-4-016:003 (por.)
Permits:

National Pollutant Discharge Elimination System Permit (State DOH)
Conservation District Use Permit (State DLNR)
Grading and Grubbing Permits (County DPW)
Building Permits and Plan Approval (County DPW and Planning)
Chapter 6e, HRS, determination from State Historic Preservation Division on historic property effects
Disability and Communication Access Board (DCAB) plan review and approval
Consistency with Section 6(f)(3) of the Land and Water Conservation Fund Act approval from DLNR Division of State Parks

Proposing/Determination Agency:

County of Hawai‘i
Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, Hawai‘i 96720
James Komata, 961-8311

Consultant:

Geometrician Associates
PO Box 396
Hilo HI 96721
Ron Terry Ph. (808) 969-7090 rterry@hawaii.rr.com

Status (check one only):

_**x**_DEA-AFNSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of DEA, a completed OEQC publication form, along with an electronic word processing summary and a PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day comment period ensues upon publication in the periodic bulletin.
___FEA-FONSI	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and a PDF copy (send both summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__FEA-EISPN	Submit the proposing agency notice of determination/transmittal on agency letterhead, a hard copy of the FEA, an OEQC publication form, along with an electronic word processing summary and PDF copy (you may send both summary and PDF to oeqchawaii@doh.hawaii.gov); a 30-day consultation period ensues upon publication in the periodic bulletin.
__Act 172-12 EISPN	Submit the proposing agency notice of determination on agency letterhead, an OEQC publication form, and an electronic word processing summary (you may send the summary to oeqchawaii@doh.hawaii.gov). NO environmental assessment is required and a 30-day consultation period upon publication in the periodic bulletin.
__DEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the DEIS, a completed OEQC publication form,

	a distribution list, along with an electronic word processing summary and PDF copy of the DEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); a 45-day comment period ensues upon publication in the periodic bulletin.
__FEIS	The proposing agency simultaneously transmits to both the OEQC and the accepting authority, a hard copy of the FEIS, a completed OEQC publication form, a distribution list, along with an electronic word processing summary and PDF copy of the FEIS (you may send both the summary and PDF to oeqchawaii@doh.hawaii.gov); no comment period ensues upon publication in the periodic bulletin.
__ Section 11-200-23 Determination	The accepting authority simultaneously transmits its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS to both OEQC and the proposing agency. No comment period ensues upon publication in the periodic bulletin.
__Section 11-200-27 Determination	The accepting authority simultaneously transmits its notice to both the proposing agency and the OEQC that it has reviewed (pursuant to Section 11-200-27, HAR) the previously accepted FEIS and determines that a supplemental EIS is not required. No EA is required and no comment period ensues upon publication in the periodic bulletin.
__Withdrawal (explain)	

Summary The project would improve the water system, recreational cabins, access, parking, landscaping, park amenities and security/ maintenance facilities of the Mauna Kea Recreation Area. Despite the high demand for recreational cabins, the Island of Hawai'i has limited options. The cool climate, sunny skies, and proximity to hunting, hiking and astronomy made the site popular for the half a century it was a park under the jurisdiction of the DLNR. A lack of funding and maintenance led to eventual closure to general public use. Through an intergovernmental agreement, the County has taken over maintenance and management. Although the Pohakuloa area has a rich history, the continual demolition and reconstruction of structures of various eras means that no historic properties are present or will be affected by the proposed action. No endangered plant species are present in any part of the park that will be affected by the proposed activities. Several wide-ranging endangered vertebrates will be protected by construction-phase and operational precautions and management practices. Erosion and sedimentation impacts will be avoided through BMPs implemented as parts of several permits. Cultural uses on the mostly developed site will not be affected by the action and cultural practices and hunting in the region will benefit from the improved facilities.

Mauna Kea Recreation Area Improvements

Draft Environmental Assessment

TMK (3rd) 4-4-016:003 (por.)
Hāmākua District, Hawai‘i Island, State of Hawai‘i

July 2015

Prepared for:
County of Hawai‘i
Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, Hawai‘i 96720

Mauna Kea Recreation Area Improvements

Draft Environmental Assessment

TMK (3rd) 4-4-016:003 (por.)
Hāmākua District, Hawai‘i Island, State of Hawai‘i

PROPOSING/
APPROVING AGENCY:

County of Hawai‘i
Department of Parks and Recreation
101 Pauahi Street, Suite 6
Hilo, Hawai‘i 96720

CONSULTANT:

Geometrician Associates LLC
P.O. Box 396
Hilo Hawai‘i 96721

CLASS OF ACTION:

Use of State and County Land and County Funds

This document is prepared pursuant to:
The Hawai‘i Environmental Protection Act,
Chapter 343, Hawai‘i Revised Statutes (HRS), and
Title 11, Chapter 200, Hawai‘i Department of Health Administrative Rules (HAR).

[this page intentionally left blank]

TABLE OF CONTENTS

SUMMARY OF THE PROPOSED ACTION, ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The County of Hawai‘i Department of Parks and Recreation proposes a project to improve the potable and non-potable water systems, recreational cabins, access, parking, landscaping, park amenities and security and maintenance facilities of the Mauna Kea Recreation Area (MKRA).

Despite the high demand among both residents and visitors for the unique experience of recreational cabins, particularly among families, the Island of Hawai‘i has limited options. The cool climate, sunny skies, and proximity to hunting, hiking and astronomy attractions of Mauna Kea has made the site a popular and well used destination for half a century, when it was known as Mauna Kea State Park and was under the jurisdiction of the Department of Land and Natural Resources, Division of State Parks. Over the last fifteen years the facilities have suffered from a lack of funding and maintenance and eventually they had to be closed to general public use. Through an agreement formulated between the County and the State DLNR, the County has taken over maintenance and management, with the goal of once again providing a high altitude recreational site that serves diverse recreational needs in a safe, efficient, environmentally appropriate and equitable manner.

Although the Pohakuloa area has a rich history, the continual demolition and reconstruction of structures of various eras means that no historic properties are present or will be affected by the proposed action. No endangered plant species are present in any part of the park that will be affected by the proposed activities. Several wide-ranging endangered vertebrates will be protected by construction-phase and operational precautions and management practices. Erosion and sedimentation impacts will be avoided through best management practices implemented as parts of several permits. Cultural uses on the mostly developed site will not be affected by the action and cultural practices and hunting in the region will benefit from the improved facilities.

PART 1: PROJECT DESCRIPTION, PURPOSE AND NEED AND ENVIRONMENTAL ASSESSMENT PROCESS

1.1 Project Description and Location

The County of Hawai‘i Department of Parks and Recreation (P&R) proposes to improve facilities at the Mauna Kea Recreation Area (MKRA) on the Island of Hawai‘i (the “Proposed Action”) (Figures 1-4). The County of Hawai‘i has a license from the landowner, the State of Hawai‘i, to develop and maintain the MKRA. The project has the following elements:

- Optimize and upgrade the potable and non-potable water filling, storage and distribution system, including installing a new potable water tank near the existing pump station, new chlorination and pressurization systems, and new waterlines in various locations. The continuing use of non-potable water from the existing system will save energy and funds that would otherwise be expended to haul water from Hilo in tanker trucks.
- Restore all buildings to a condition suitable for public use, including roofs, interior and exterior surfaces, floors and wainscoting, plumbing and electrical service, doors and, windows, and appliances. No major changes will be done to the floor plans; basically, the units will be refurbished. Most cabins will receive painting, plumbing fixtures, flooring and new siding.
- Provide new paved parking areas at each individual cabin sufficiently sized for two vehicles.
- Develop a new keying system for the entire park that accommodates County operation and control, which would include cabin rentals to the public, security access by the contracted security company, and allowable site access by other government entities with interest in property.
- Develop a maintenance baseyard area at the former caretaker’s cottage and storage building and fence the perimeter, with a paved area for parking of County vehicles and employee vehicles.
- Construct shallow drywells throughout the site where drainage improvements are required.
- Fumigate all buildings to kill insects and vermin; clean buildings of any signs of prior infestation; and seal exterior joints and conditions to prevent unwanted re-infestation.
- Connect the internal park road from the cabins area to the mess hall area to form a looped roadway. An extension from the cabins to the road on the west side of the property will be constructed, with a connection above the bunkhouse and mess hall.
- Fence the perimeter of the park with a 4-foot high hogwire fence to demarcate the park’s edge and keep vehicles from entering inappropriate areas.
- Harden the perimeter of all internal roads and parking areas to prevent unauthorized vehicular access to non-paved areas of the park.
- Provide for maintenance access via gates as necessary.
- Install new gates at internal park roads near the park entrance for use in securing the park after hours.
- Construct a paved, approximately 12-foot wide pathway for walking, jogging and bicycling use that circumnavigates the park, with ties-in to the roadways and park amenities.
- Re-pave and double the capacity of the parking area at the mess hall.
- Prepare and implement a minimal landscape plan for enhancing the aesthetics of the park utilizing site-appropriate native species that require minimal watering and care.
- Provide exterior lighting of all walkways and parking lots/areas and a few other selected areas, with solar powered LED site lighting.

Figure 1. USGS Location Map

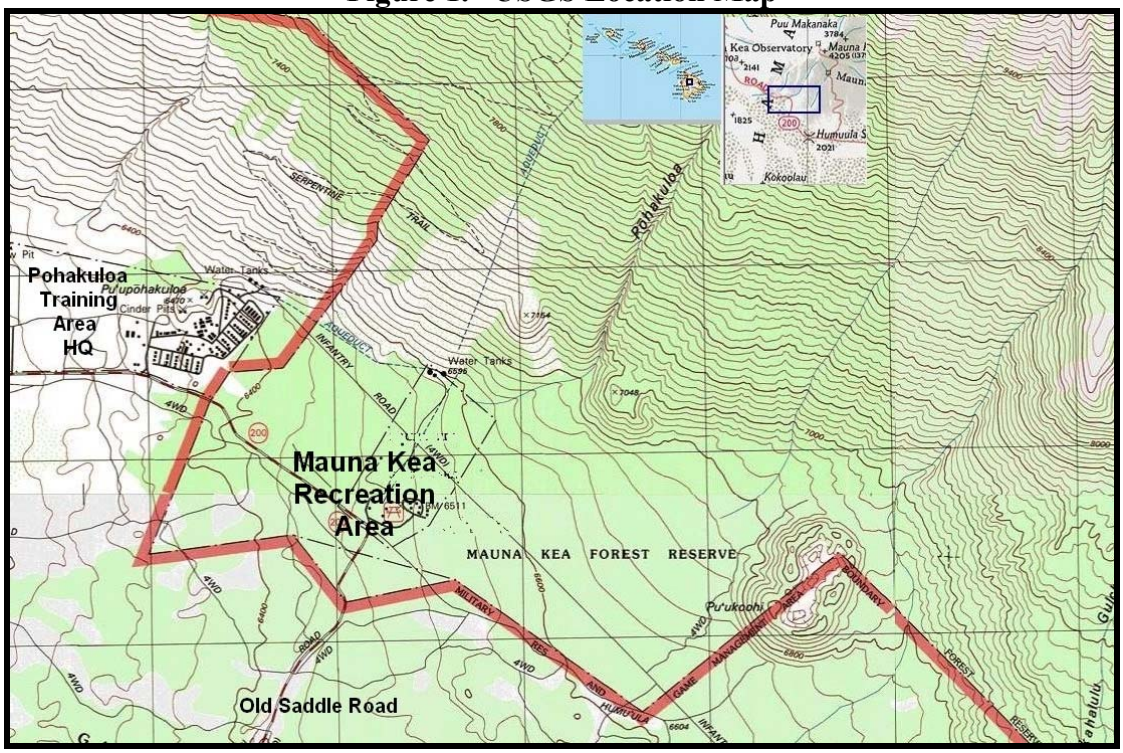


Figure 2. Aerial Image of Project Site

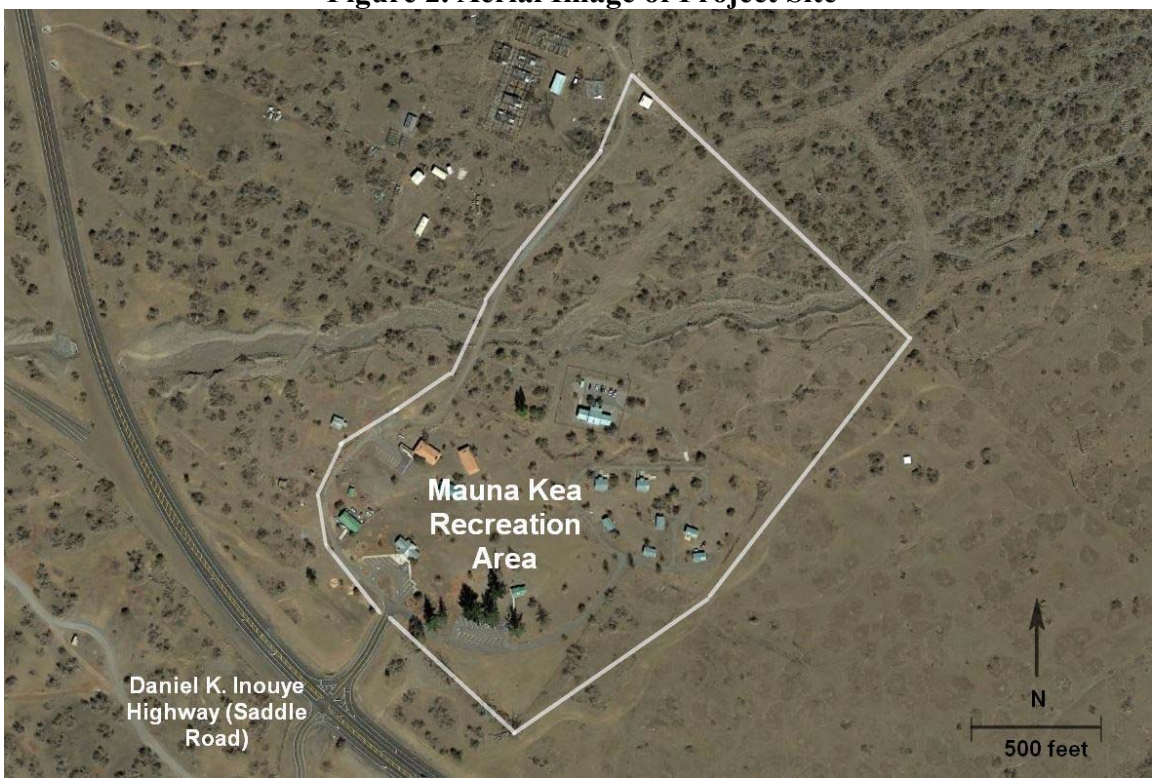
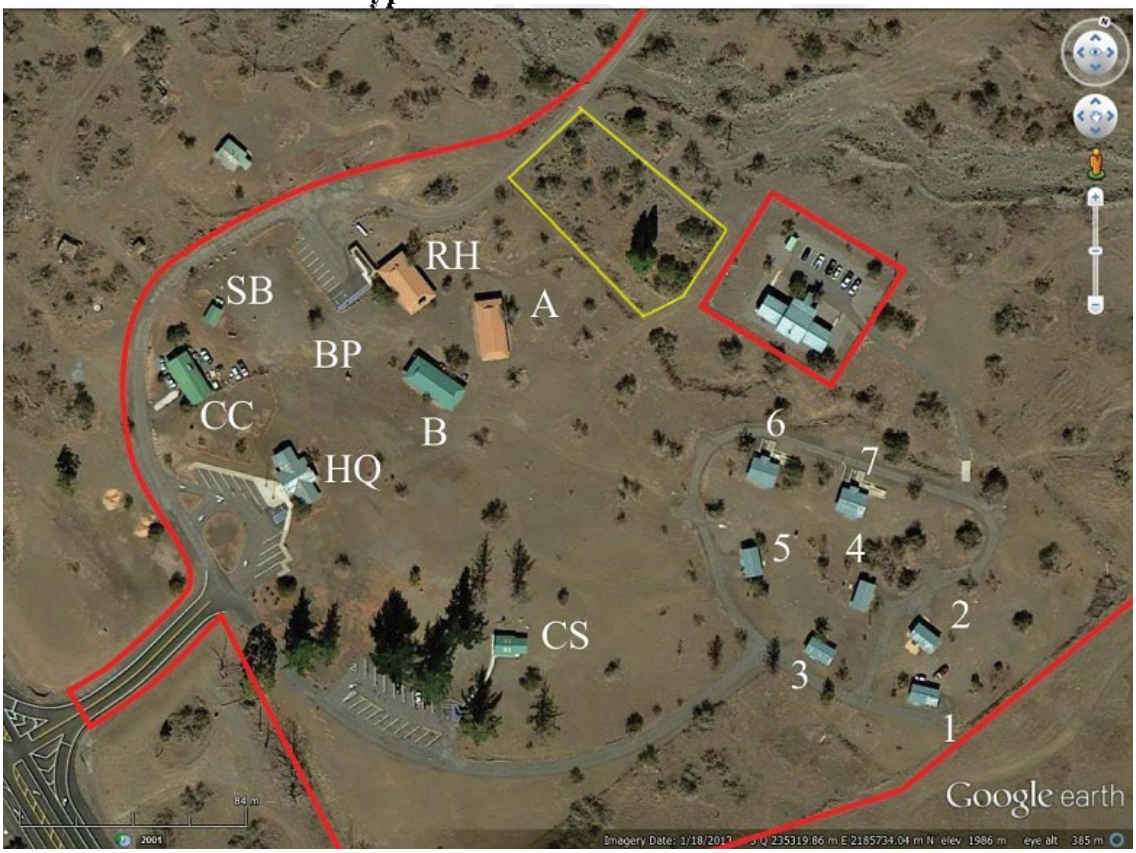


Figure 3. Project Site Photos

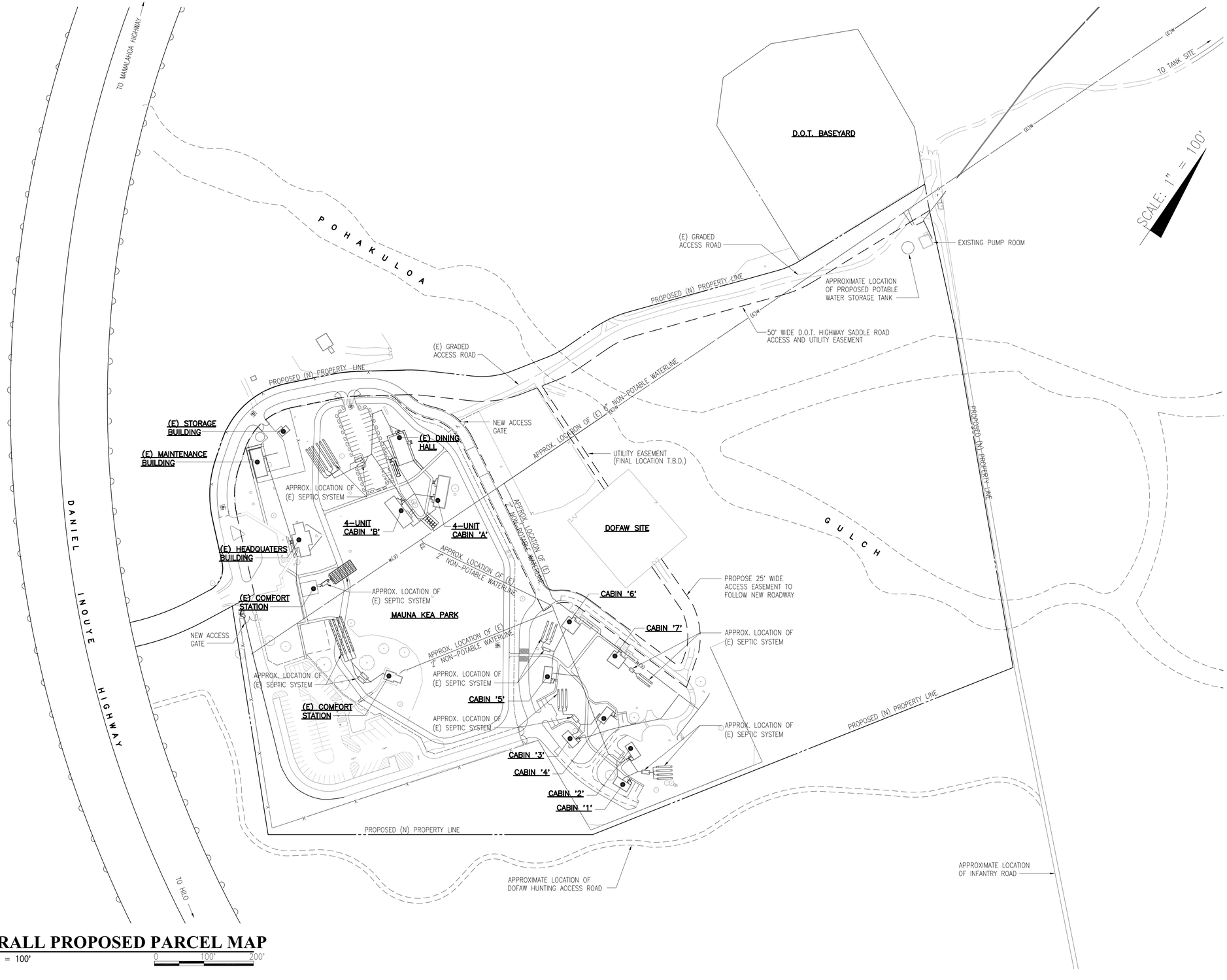
3a. Buildings From Main Parking Area ▲ ▼ 3b. Typical Undeveloped Area Vegetation

Figure 3. Project Site Photos

3c. Typical Cabins▲ ▼ 3d. Facilities



Key: CC= Caretaker's cabin, SB= Storage building, HQ= Headquarters , RH= Recreation/Dining Hall, BP=Booster pump; A&B= Group cabins, CS= comfort station, Numbers: Cabins; Yellow= arboretum, Red rect.= DOFAW facility (excluded)



A OVERALL PROPOSED PARCEL MAP

SCALE: 1" = 100'

0 100' 200'

SCALE: 1" = 40'

DOFAW SITE

GULCH

POHAKULOA

UTILITY EASEMENT
(FINAL LOCATION T.B.D.)

APPROX. LOCATION OF (E)
NON-POTABLE 6" WATERLINE

(E) GRADED
ACCESS ROAD

APPROX. LOCATION OF (E)
NON-POTABLE 2" WATERLINE

25' WIDE DOFAW
ACCESS EASEMENT

PROPOSED
ACCESS GATE

PROPOSED (N) ROAD BARRICADE

50' D.O.T. UTILITY
&ACCESS EASEMENT

12' WIDE
MULTI-USE PATH

APPROX. LOCATION OF (E)
NON-POTABLE 2" WATERLINE

PROPOSE SHALLOW
DRYWELL

APPROX. LOCATION OF (E)
NON-POTABLE 6" WATERLINE

PROPOSED (N) PROPERTY LINE

4-UNIT CABIN "A"

PROPOSED DOG
KENNELS

(E) DINING HALL

4-UNIT CABIN "B"

31 STALL PARKING LOT

APPROX. LOCATION
OF (E) SEPTIC
SYSTEM

12' WIDE
MULTI-USE PATH

PROPOSED (N) ROAD BARRICADE

PROPOSED (N) HOG WIRE FENCE

PROPOSED (N) PROPERTY LINE

APPROX. LOCATION OF
(E) SEPTIC SYSTEM

CABIN "7"

CABIN "6"

CABIN "4"

CABIN "2"

CABIN "1"

CABIN "5"

CABIN "3"

APPROX. LOCATION OF
(E) SEPTIC SYSTEM

APPROX. LOCATION OF
(E) SEPTIC SYSTEM

APPROX. LOCATION OF
(E) SEPTIC SYSTEM

(E) COMFORT
STATION

APPROX. LOCATION OF
(E) SEPTIC SYSTEM

(E) CESSPOOL TO BE
ABANDONED IN PLACE,
PER D.O.H. RULES AND
REGULATIONS

PROPOSE GREASE
INTERCEPTOR &
SEPTIC TANK

12' WIDE
MULTI-USE PATH

(E) STORAGE

(E) CESSPOOL TO BE
ABANDONED IN PLACE,
PER D.O.H. RULES AND
REGULATIONS

(E) HEADQUARTERS
BUILDING

(E) COMFORT
STATION

PROPOSE T.W.S.

APPROX. LOCATION OF (E)
NON-POTABLE WATERLINE

(E) MAINTENANCE
BUILDING

PROPOSE SHALLOW
DRYWELL

10,000 GALLON
FIRE PROTECTION
TANK

PROPOSED (N) ROAD BARRICADE

PROPOSED (N) ROAD BARRICADE

PROPOSED
ACCESS GATE

PROPOSED (N) HOG WIRE FENCE

TO DANIEL INOUYE
HIGHWAY

APPROXIMATE LOCATION
OF DOFAW HUNTING
ACCESS ROAD

LEGEND

NEW PAVEMENT
2" A.C. / 4" A.B. /
6" SUB-BASE

NEW CONCRETE

CONCRETE PAVEMENT

A OVERALL SITE PLAN

Figure 4 is an overall Site Plan that illustrates the location and extent of the principal elements. It should be noted that there are several facilities and activities within the boundary of the area shown on the Site Plans that are managed by other entities. The State Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) has a compound to assist them in managing the forest reserves and hunting units in the Saddle. A fenced arboretum with a short nature trail loop is present in the center of the MKRA, which has been maintained to promote the growth of native plants. Although within the boundaries of the MKRA, it has been developed and managed by private parties (principally the Boy Scouts) through a prior agreement with DLNR State Parks and DOFAW, and P&R will allow them to continue to manage it, if they so choose.

1.2 Purpose and Need

Despite the high demand among both residents and visitors for the unique experience of recreational cabins, particularly among families, the Island of Hawai‘i has limited options. Currently, there are public cabins accessible by paved roads at Hapuna Beach State Park, on the shoreline in South Kohala; at Kalopa State Park, in the lower forest region of windward Hāmākua; and at Na Makani Paio, in the koa forests at 4,000 feet in elevation at Hawai‘i Volcanoes National Park. For many decades, Mauna Kea State Park served as the only conveniently accessible high altitude site with a number of family cabins. With its cool climate, sunny skies, and proximity to hunting, hiking and astronomy attractions of Mauna Kea, it was popular and well used.

Over the last fifteen years under the DLNR, the facilities have suffered from a lack of funding and maintenance, and eventually they had to be closed to general public use. Through an agreement formulated between the County of Hawai‘i and the DLNR, the County has taken over maintenance and management, with the goal of once again providing a high altitude recreational site that serves diverse recreational needs in a safe, efficient, environmentally appropriate and equitable manner.

1.3 Environmental Assessment Process

This Environmental Assessment (EA) is being conducted in accordance with Chapter 343 of the Hawai‘i Revised Statutes. This law, along with its implementing regulations, Title 11, Chapter 200, of the Hawai‘i Administrative Rules, is the basis for the environmental impact process in the State of Hawai‘i. According to Chapter 343, an EA is prepared to determine impacts associated with an action, to develop mitigation measures for adverse impacts, and to determine whether any of the impacts are significant according to thirteen specific criteria. Part 4 of this document states the anticipated finding that no significant impacts are expected to occur; Part 5 lists each criterion and presents the preliminary findings for each made by the Hawai‘i County Department of Parks and Recreation, the proposing and approving agency. If, after considering comments to the Draft EA, the approving agency concludes that no significant impacts would be expected to occur, then the agency will issue a Finding of No Significant Impact (FONSI), and the action will be permitted to proceed to necessary permits and approvals. If the agency concludes that significant impacts are expected to occur as a result of the Proposed Action, then an Environmental Impact Statement (EIS) will be prepared.

1.4 Public Involvement and Agency Coordination

The following agencies and organizations were consulted by letter during development of the Environmental Assessment.

State:

- Department of Health, Environmental Health Administration
- Department of Land and Natural Resources
- Department of Transportation, Highways Division
- Office of Hawaiian Affairs

County:

- Civil Defense Agency
- County Council
- Department of Public Works
- Fire Department
- Planning Department
- Police Department

Other:

- Sierra Club
- Commander, Pohakuloa Training Area
- U.S. Fish and Wildlife Service
- Hawai‘i County Game Management Commission

Responses received are contained in Appendix 1a. In addition, several individuals who had been involved with the Boy Scouts' development of the native plant arboretum were consulted by telephone.

1.5 Cost and Schedule

The project's cost, which is being funded by the County of Hawai‘i, is currently estimated at $2 million. If permits and approvals are granted in a timely manner, construction should begin on most of the improvements in October 2015 and will be complete by March 2016. Some features will be added gradually after that date.

PART 2: ALTERNATIVES

2.1 Alternative Locations or Strategies

The Mauna Kea Recreation Area was first developed as a Civilian Conservation Corps (CCC) camp in the 1930s, followed by facilities of the Territory of Hawai‘i Department of Fish and Game, and finally establishment as a park in 1954. During and after this period, many other uses have become established in the Saddle region, including military (Pohakuloa Training Area), grazing and pastoral (Department of Hawaiian Home Lands), and hunting/Forest Reserve/conservation (Mauna Kea Forest Reserve and Mauna Loa Forest Reserve). Restrictive land use and conservation overlays including the State Land Use Conservation District and Palila Critical Habitat have also been imposed in the lands surrounding the park. Given this context, there are no alternative sites in the region that could support the uses that exist at MKRA, and the County of Hawai‘i is unaware of any alternative sites. No known properties have the particular advantages of the proposed site, which include County control (pending), history of a park purpose, road access, and electrical and water utilities. Therefore, no alternative sites have been advanced in this Environmental Assessment.

In terms of alternative strategies, the County and State governments could choose to dedicate the land to alternate uses. Potentially, there is a wide variety of uses that would match surrounding activities, including military training, reforestation, grazing or astronomical base camps, among others. At this time, the County and State have not received requests for any transfer of the property for other uses. Given the high demand for a continuation and improvement of the use for which the property has been put for over 80 years, there are no alternative land use strategies that are necessary, prudent or reasonable.

2.3 No Action Alternative

Under the No Action Alternative, the County of Hawai‘i would not undertake the planned improvements, Various other previously planned improvements to provide facilities for the growing cross-island traveling public, including a comfort station, parking and a playground, are in various stages of construction and would be completed. The benefits provided by an improved Mauna Kea Recreation Area park in terms of open space, cabin camping, onsite recreation and public health would not occur. But the No Action Alternative would also avoid disturbing the ground surface and vegetation any further, and taxpayer funds could be used for alternate recreational facilities. The No Action Alternative provides a useful baseline for assessing the impacts of the proposed project.

PART 3: ENVIRONMENTAL SETTING, IMPACTS AND MITIGATION MEASURES

Basic Geographic Setting

The location for the Proposed Action is referred to throughout this EA as the *project site*. The term *project area* is used to describe the general environs of the Saddle, including the south central slope of Mauna Kea.

The project site is an approximately 32-acre portion of a State of Hawai‘i property identified by TMK (3) 4-4-016:003 that is already in recreational use as the Mauna Kea Recreation Area (see Figures 1-4). It is bordered by a roughly 200-foot wide strip of land adjacent to the Daniel K. Inouye Highway on the south, the access road to Mauna Kea Forest Reserve on the west, an unpaved DLNR Forest Reserve road also called Infantry Road to the north, and an unpaved road on the east (see Figures 2d and 4 for boundaries).

3.1 Physical Environment

3.1.1 Climate, Geology, Soils and Geologic Hazards

Environmental Setting

The climate in the area is cool and dry, with an average annual rainfall of about 17 inches (Giambelluca et al 2013) and a mean annual temperature of approximately 57 degrees Fahrenheit (UH Hilo-Geography 1998). The project site is located at 6,500 feet above mean sea level on alluvium and colluvium associated with Holocene and Pleistocene geological processes (particularly glacial meltwater) on Mauna Kea (Wolfe and Morris 1996). Soil on the project site is classified by the U.S. Natural Resources Conservation Service (formerly Soil Conservation Service) as Alaone-Keekee complex, 2 to 6 percent slopes. This extremely stony, ashy, loamy, sandy soil is typically found on alluvial fans on the convex slopes at the base of mountains, with a parent material of volcanic ash over rocky sandy alluvium. Permeability is rapid, runoff is slow, and erosion hazard slight. It is not a soil of prime farmlands and has very severe limitations that make it very unsuited for cultivation, and restricts its use to mainly pasture and woodland or wildlife (U.S. Soil Conservation Service 1973).

The entire Big Island is subject to geologic hazards, especially lava flows and earthquakes. Volcanic hazard as assessed by the U.S. Geological Survey in this area on the southern flank of Mauna Kea is 8 on a scale of ascending risk 9 to 1 (Heliker 1990). Mauna Kea has erupted several times in the last 10,000 years, most recently about 4,500 years ago. This volcano is considered dormant but not extinct. Zone 8 includes the lower slopes of Mauna Kea. Most of this area has not been affected by lava flows for the past 10,000 years. It should be noted that the Daniel K. Inouye Highway that accesses the MKRA traverses areas of substantially greater volcanic risk from Mauna Loa eruptions, where there have been several lava flows within the last 100 years.

In terms of seismic risk, the entire Island of Hawai‘i is rated Zone 4 Seismic Hazard (*Uniform Building Code, 1997 Edition*, Figure 16-2). Zone 4 areas are at risk from major earthquake damage, especially to

structures that are poorly designed or built, as the 6.7-magnitude quake of October 15, 2006, demonstrated. The project site is relatively flat, with no surrounding steep slopes, and does not appear to be subject to subsidence, landslides or other forms of mass wasting.

Impacts and Mitigation Measures

Geologic conditions impose no significant constraints on the Proposed Action, and the improvements at this existing recreation area are not imprudent to undertake. Most of the surface of Hawai‘i Island is subject to eventual lava inundation, and any recreational facilities outside of the northern third of the island face risk on human time scales. Given the long-standing need for recreation in the area, and the value that County residents place on this recreation, the County has determined that it is sensible to expand and improve its facilities here. Project design will take the seismic setting into account, and no mitigation measures are expected to be required.

3.1.2 Drainage, Water Features and Water Quality

Existing Environment

The nearest mapped surface water body is Pohakuloa Gulch, which borders the MKRA to the west. This flashy stream is within a former floodplain of a melting glacier on Mauna Kea, about 10,000 years ago. The current channel runs about eight feet below the plain and generally has enough capacity to accommodate flow, which is now derived from rainfall on the slopes of Mauna Kea.

The Flood Insurance Rate Maps (FIRM) geographical database maintained by the Hawai‘i State DLNR Engineering Division show that the project site itself not mapped, and is therefore classified within Flood Zone X, outside of the 100-year or 500-year floodplain (http://gis.hawaiinfip.org/fhat/).

Impacts and Mitigation Measures

The project involves landclearing, grading and construction activities associated with new park roadways, walkways, waterlines, utility lines, fencing, parking, a recreational trail and shallow drywells. Land disturbance would exceed one acre, and the project will thus require a National Pollutant Discharge Elimination System (NPDES) permit. Plans submitted as part of the application for the NPDES permit and a County grading permit will specify practices to minimize the potential for sedimentation, erosion and pollution of coastal waters. The County will ensure that its contractor shall perform all earthwork and grading in conformance with:

(a) “Storm Drainage Standards,” County of Hawai‘i, October, 1970, and as revised.
(b) Applicable standards and regulations of Chapter 27, “Flood Control,” of the Hawai‘i County Code.
(d) Applicable standards and regulations of Chapter 10, “Erosion and Sedimentation Control,” of the Hawai‘i County Code.
(e) Conditions of an NPDES permit, if required, and any additional best management practices required by the Board of Land and Natural Resources.

Best Management Practices will be developed as part of these permits, but are expected to include the following or similar practices:

- The total amount of land disturbance will be minimized. The construction contractor will be limited to the delineated construction work areas within the project site.
- The contractor will not allow any sediment to leave the site.
- Construction activities with the potential to produce polluted runoff will not be allowed during unusually heavy rains or storm conditions that might generate storm water runoff.
- Cleared areas will be replanted or otherwise stabilized to pre-existing levels as soon as possible.
- The contractor shall inform the Department of Public Works of the locations of the disposal and/or borrow site(s) required for this project when an application for a grading permit is made. The disposal and/or borrow site(s) must also fulfill the requirements of the Grading Ordinance.
- The contractor shall place and compact all loose material within its work areas to pre-existing conditions or better to prevent exacerbating erosion.

3.1.3 Flora, Fauna and Ecosystems

Existing Environment: Flora

A biological report based on a systematic walking survey over the course of three afternoons was prepared by biologists Ron Terry, Ph.D., and Patrick Hart, Ph.D., as part of the research for this EA. The survey included a slightly larger area that entirely includes the extent currently proposed for activities associated with the MKRA. The report is contained in full in Appendix 2 and summarized below.

The natural vegetation of this area of the saddle between Mauna Kea and Mauna Loa is *ʻĀweoweo (Chenopodium) Subalpine Shrubland* (per Gagne and Cuddihy 1990). In areas where it is still somewhat intact, it is variably invaded by a number of non-native plants. Most of the MKRA project site, however, is in the disturbed, artificial condition typical of active parks. Until the higher than average rainfall of 2014, the area was extremely desiccated. Since then, trees and shrubs have greened up and a wide variety of herbs, grasses and vines have proliferated, greatly increasing cover and biomass, as shown in the photographs in Figure 3. An "arboretum" with a short nature trail loop is present near the DOFAW facility (see Figure 2d). This area was fenced to exclude feral ungulate grazing and was planted with both common and rare native plants by Boy Scout troops as part of service projects.

Biologists identified a total of 54 plant species on the project site (see Table 1 of Appendix 2 for full list). Five of the plants were indigenous to the Hawaiian Islands (found in Hawaiʻi and elsewhere), and 14 endemic (found in Hawaiʻi and nowhere else). No naturally growing threatened or endangered plant species (USFWS 2015) were detected in the survey area. However, several rare or endangered plants were planted and are surviving in the fenced-off arboretum. Several of these plants are not thriving or have died, and not all plants could be identified. Discussions with volunteers who were involved in planting projects here indicate that several endangered species individuals were planted, but most have not survived.

The most interesting wild native plants observed were *Sicyos anunu*, or anunu, a striking and fairly uncommon cucumber family vine with prickly fruits, and *Bidens menziesii* var. *filiformis*, or koʻokoʻolau. These plants are found in the unused northeast portion of the site.

Existing Environment: Fauna

With the exception of Hawaiian hoary bats, all terrestrial mammals, reptiles and amphibians in Hawaiʻi are alien. No mammals were seen on the site, but familiarity with the area indicates that a larger variety of game mammals including feral sheep or mouflon (*Ovis aries* or *Ovis gmelini musimon*), goats (*Capra hircus*) and pigs (*Sus scrofa*) are often present in or near the MKRA. In addition, feral cats (*Felis catus*), pet dogs (*Canis f. familiaris*), small Indian mongooses (*Herpestes a. auropunctatus*), various species of rat (*Rattus* spp.) and European house mice (*Mus domesticus*) are also likely to be periodically present. None are of conservation concern and all are deleterious to native flora and fauna. No amphibians or reptiles were observed during our surveys; it is likely that few or perhaps even none are normally present.

The only native Hawaiian land mammal, the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), is also likely to be present in the area. The shrubby native vegetation of the site offers habitat for this endangered species, particularly in winter. The bat has been recorded in systematic studies throughout sub-montane forests from various sites within the Mauna Kea Forest Reserve and nearby at Bradshaw Army Airfield (Jacobs 1994; Gorresen et al 2013). All observations took place in full daylight, and therefore the lack of bat sightings does not signify an absence of bats.

Almost all birds seen in and around the area during the survey, which took place over approximately six hours on two separate mid-days, were wide-ranging aliens such as Common Myna (*Acridotheres tristis*), Eurasian Skylark (*Alauda arvensis*), and House Finch (*Carpodacus mexicanus*) (see Table 2 of Appendix 2 for full list). Two natives were observed, the migratory Golden Plover or Kolea (*Pluvialis fulva*) and the ʻAmakihi (*Hemignathus virens*). No threatened or endangered native birds were observed.

The Saddle region is well known for game hunting and particularly game bird hunting. A wide variety of non-native birds including francolins, turkeys, pheasants, and quail are present. In fact, one of the major uses of the MKRA is a staging area for hunting trips, and when hunting areas are open the parking lot is full of hunters.

Although only two fairly common native birds were identified during the survey, a number of other species could occasionally be present, some of them threatened or endangered, based on nearby sightings. In areas about 1,000 feet in elevation above the MKRA, key species include not only the ʻAmakihi (*Hemignathus virens virens*) but also ʻApapane (*Himatione sanguinea*), and the endemic *bryani* subspecies of Hawaiʻi ʻElepaio (*Chasiempis sandwichensis*). Iʻiwi (*Vestiaria coccinea*) may sometimes be present as they traverse the southern slopes of Mauna Kea between habitat areas. In August of 2014, the Center of Biological Diversity petitioned the Department of Interior to list the Iʻiwi as endangered.

The western slope of Mauna Kea is home to the endangered Palila (*Loxioides bailleui*), the lone surviving finch-billed honeycreeper found in the main Hawaiian Islands. While fossil evidence shows that the species was formerly widespread on multiple islands at all elevations (Olson and James 1982), historically the species has been restricted to the *māmane-naio* forests at high elevation on the Island of Hawai‘i. Over the 20th century, Palila disappeared from its historic range on Mauna Loa, Hualalai, and most of Mauna Kea, with the remaining population undergoing a steady decline over the past decade (Leonard et al. 2008, Camp and Banko 2012). Recent estimates indicate that about 2,200 Palila survive in degraded forest on the southwestern slope of Mauna Kea (Camp and Banko 2012). The Palila was listed by the U.S. Fish and Wildlife Service (USFWS) as endangered in 1967 (USFWS 1967) and critical habitat was designated in 1977 (USFWS 1977). The area designated as critical habitat encircles Mauna Kea from about 5,500 feet in elevation to 10,000 feet in elevation, encompassing an area of over 60,000 acres. Most of the Critical Habitat is unoccupied, including the land in the MKRA. There have been no recorded Palila sightings here in many decades, probably because of the lack of thick forests of māmane. At least 95 percent of the Palila population occurs within a core area of about 17,800 acres on the southwest slope from 6,500 feet in elevation to 9,500 feet in elevation. Protecting the remaining forest in this area from the threat of fire is critical for the short and long-term survival of the species. Habitat restoration is ongoing in the Ka‘ohe Mitigation Area, as well as at Pu‘u Mali on the north slope of Mauna Kea, both of which were created from the withdrawal of grazing leases as part of mitigation for the Saddle Road Improvements project (FHWA-CFLHD 1999).

Nēnē (*Branta sandvicensis*) is Hawai‘i’s endangered native goose. Because of a program of release at Hakalau Forest National Wildlife Refuge on the east slope of Mauna Kea, they are often seen foraging in the Saddle region. Nēnē nest in deep grass and can be vulnerable to disturbance during nesting. Although the generally dry habitat at MKRA is not ideal for Nēnē, they may be attracted during wetter periods when young grass shoots are available. During the biological survey, no Nēnē nests were observed. More problematic than discrete nesting that can be avoided by park caretakers is the potential for these friendly and fearless geese to become habituated to humans. People who feed Nēnē endanger the geese through unhealthy diets, vehicle interactions and predators.

Two other native bird species may also use the area, though neither is known definitively to breed at the MKRA. The Pueo, or Hawaiian Owl (*Asio flammeus sandwichensis*), is an endemic sub-species of the widely distributed Short-eared Owl. It is found in open habitat throughout the Big Island. The endangered ‘Io, or Hawaiian Hawk (*Buteo solitarius*), is commonly seen in forested areas of the Big Island, including various portions of the Saddle. These hawks forage widely on a variety of native and non-native birds as well as small, non-native mammals. Our team has observed Hawaiian Hawks on occasion as close to MKRA as Pu‘u La‘au and Pu‘u Huluhulu, roughly five miles west and east, respectively, and it is likely that the MKRA is within their foraging range. Hawaiian Hawks nest in tall trees, usually isolated from significant sources of disturbance. The low stature of the native naio-māmane forest precludes ‘Io nests in these species. The tall pine trees could conceivably offer a nesting site, but the general lack of suitable foraging habitat in the area makes it unlikely that Hawaiian Hawks nest in or directly adjacent to the MKRA.

Although not detected, it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*) and the threatened Newell’s Shearwater (*Puffinus auricularis newelli*) over-

fly the project area between the months of May and November. Hawaiian Petrels were formerly common on the Island of Hawai‘i. This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea, as well as at the mid-to-high elevations of Hualālai and in the Kohala Mountains. It has within recent historic times been reduced to relict breeding colonies in a few locations. Hawaiian Petrels were first listed as an endangered species by the USFWS in 1967 and by the State of Hawai‘i in 1973. Newell's Shearwaters were also once common on the Island of Hawai‘i. This species breeds on Kaua‘i, Hawai‘i, and Moloka‘i. Newell's Shearwater populations have dropped precipitously since the 1880s (Banko 1980, Day et al., 2003). This pelagic species usually nests in burrows excavated under thick vegetation, especially *uluhe* (*Dicranopteris linearis*) fern. Newell's Shearwater was listed as a threatened species by the USFWS in 1975 and by the State of Hawai‘i in 1973. Recent night recordings at Pohakuloa Training Area indicate that the Band-rumped Storm Petrel (*Oceanodroma castro*), listed as endangered by the State of Hawai‘i, overflies the Pohakuloa area. Little is currently known about its nesting habits in the area.

Impacts and Mitigation Measures

The largest threats to native flora and fauna in the Saddle region are invasive species and fire. Much of the flora of the area is now non-native, with weeds such as *Erodium cicutarium*, *Heterotheca grandiflora*, and *Senecio madagascarensis* making up a large proportion of the herbaceous cover and biomass. Although the biological survey did not include invertebrates, studies in Pohakuloa Training Area and in the Mauna Kea Forest Reserve indicate that native invertebrates associated with native plants are present at the MKRA (FHWA-CFLHD 1999). Native invertebrates are highly susceptible to predation or competition by invasive species, particularly ants. *Linepithema humile*, or the Argentine ant, is a particular threat to many species of endemic arthropods as well as seeds and nectar and is a serious threat to native flora and fauna (Cole et al. 1992; Wetterer et al. 1998; Krushelnycky et al. 2005; Aldrich 2005). When the County began investigating the condition of the buildings, it was determined that the poisonous spiders black widow (*Lactodectrus mactans*) and brown recluse (*Loxosceles reclusa*) were both present, a situation the County has initially begun to remediate and plans to vigorously pursue.

Fire has ravaged much of northwest Hawai‘i, including portions of the Mauna Kea Forest Reserve. Maps of wildfires from 1954-2005 compiled by the Hawai‘i Wildfire Management Organization show that most of the non-bare lava surface between Waimea and Pu‘uwa‘awa‘a has burned, much of it multiple times (HWMO 2007). Dangerous wildfires have affected the southern part of Mauna Kea as recently as 2003, when a large fire burned in the Ka‘ohe GMA, and October 2011, when 1,200 acres burned east of Mauna Kea State Park and Saddle Road had to be closed. What makes fire potentially devastating here is the value of the intact *māmane/naio* forest habitat, especially upslope and to the west, which is the last refuge of the critically endangered Palila.

In response to early consultation, the U.S. Fish and Wildlife Service (USFWS) provided a letter of December 19, 2014, listing endangered species that are potentially present in the area, which identified the same species that were identified in the biological survey. The USFWS also provided a list of avoidance and minimization measures that could assist in reducing or avoiding impacts to listed species (see Appendix 1a for letter). The mitigation measures below reflect input received from this letter.

- To avoid impacts to Hawaiian hoary bats, there will be no clearing of woody vegetation taller than 15 feet during the bat pupping season, which runs from June 1 through September 15 each year. To avoid entanglement of Hawaiian hoary bats in barbed wire, no barbed wire will be used in fencing.
- In order to avoid impacts to the Nēnē, prior to construction, all on-site project personnel will be apprised that Nēnē may be in the vicinity. If a Nēnē appears with 100 feet of ongoing work, all activity will be temporarily suspended until the animal leaves the area of its own accord. Construction personnel will be informed that feeding of Nēnē is forbidden, as it may attract Nēnē to the MKRA and nearby roads where they will be at greater risk of injury from motor vehicles. On an ongoing basis, P&R will develop signage in consultation with Hawai‘i Volcanoes National Park to effectively educate visitors about the deleterious effects of feeding Nēnē.
- All lighting installed for park safety will be required to be shielded in conformance with the Hawai‘i County Outdoor Lighting Ordinance to reduce the risk that seabirds may be attracted to and then disoriented by the lighting. Additionally, there will be no nighttime construction work and no need for construction lighting.
- Contract conditions will require all construction activity to take precautions to prevent fire ignition during construction of the improvements. No construction vehicles will be allowed to park in areas vegetated with ignitable material, such as dry grass or shrubs; instead, the contractor will identify areas covered with pavement, dirt, or gravel for parking. On an ongoing basis, the new fence will greatly assist in keeping visitor vehicles outside fuel rich areas that could spark fires.
- P&R will implement an inspection/verification system to minimize the possibility of invasive species being imported to the site on construction material or imported fill.
- Operationally, P&R intends to adopt and implement a rapid response invasive species protocol in cooperation with the Big Island Invasive Species Council (BIISC), coupled with regular and frequent inspection for invasive plant and animal species conducted by qualified park personnel or cooperating agencies. As a first step toward this long-term goal, P&R will meet with BIISC and assess practical measures that can be incorporated in the inspection and response protocol.
- Those parts of the MKRA that are not used actively will be managed to maintain natural, native vegetation. An abundant natural seed source exists that can provide the basis for this. Human management can be restricted to removing some (not necessarily all) non-native species, limited planting of certain species, and intervention with irrigation or watering if absolutely necessary during extreme droughts. In addition, the non-profit groups that have constructed and managed the native species arboretum will be encouraged and allowed to continue this activity, if they so desire, as it has been useful in educating the public about native species.

3.1.4 Air Quality, Noise, and Scenic Resources

Environmental Setting

Air pollution in East Hawai‘i is minimal, and is mainly derived from volcanic emissions of sulfur dioxide, which convert into particulate sulfate and produce a volcanic haze (vog) that occasionally blankets parts of the island. Persistent trade winds and the elevation of 6,500 feet above sea level keep the project area relatively free of vog for most of the year.

Noise on the project site is generally low, derived mainly from passing motor vehicles on the Daniel K. Inouye Highway and park maintenance activities. Hunting in surrounding areas and military training at PTA also contribute periodic noise, which may be short in duration but loud.

As illustrated by photographs in Figure 3, the project area is highly scenic, with foreground views of *māmane-naio* forest and background views of Mauna Kea, Mauna Loa, and Hualālai volcanoes.

Impacts and Mitigation Measures

The Proposed Action would not measurably affect air quality, noise levels or scenic sites. Increased use of the park would slightly raise noise levels, but to a degree that is expected within a recreational area used for camping and consistent with regional uses, which include agency baseyards, military training, hunting and highways. The ongoing and planned covering of dust-prone areas with gravel and pavement would reduce existing dust problems. Exhaust emission from park-destined vehicular traffic should not create a noticeable increase of air pollutants to the immediate vicinity. The improvements are being designed to take advantage of existing views and insert the minimum number and size of structures into the environment consistent with improving the overall recreational experience. Landscaping with native plants will gradually be undertaken.

3.1.5 Hazardous Materials, Toxic Substances and Hazardous Conditions

Environmental Setting, Impacts and Mitigation Measures

As most of the structures on the site that are proposed for renovation date from the 1960s and 1970s, there is a potential for certain hazardous materials to be present, including arsenic from ceiling materials such as canec, lead from paint, and asbestos from insulation or fireproofing. As unmitigated renovation could expose workers and the site to these materials, they must be assessed and appropriate protocols put in place to minimize the potential for contamination in conformance with State and federal laws and regulations. A hazardous materials assessment is currently underway to ensure that all renovation and material disposal is implemented properly.

Based on onsite inspection and the lack of any known former uses that would tend to leave materials of concern on the property, it is presumed, but not ascertained, that aside from potential issues related to structures, the project site contains no hazardous materials or toxic substances and exhibits no other hazardous conditions.

If previously unidentified hazardous substances or petroleum products are found on the project site that indicate an existing release, a past release, or a material threat of a release of any hazardous substance or petroleum products, work will cease at that location and appropriate regulatory or resource personnel will be contacted.

In addition to the measures related to water quality detailed in Section 3.1.3, in order to ensure to minimize the possibility for spills of hazardous materials, the applicants propose the following conditions:

- Unused materials and excess fill will be removed and disposed of at an authorized waste disposal site.
- The County will explicitly require that during construction, emergency spill treatment, storage, and disposal of all hazardous materials must meet all State and County requirements.
- The County will require the contractor will be asked to adhere to "Good Housekeeping" for all appropriate substances, with the following instructions:
    - Onsite storage of the minimum practical quantity of hazardous materials necessary to complete the job;
    - Fuel storage and use will be conducted to prevent leaks, spills or fires;
    - Products will be kept in their original containers unless unresealable, and original labels and safety data will be retained;
    - Disposal of surplus will follow manufacturer's recommendation and adhere to all regulations;
    - Manufacturers' instructions for proper use and disposal will be strictly followed;
    - Regular inspection by contractor to ensure proper use and disposal will be conducted;
    - Onsite vehicles and machinery will be monitored for leaks and receive regular maintenance to minimize leakage;
    - Construction materials, petroleum products, wastes, debris, and landscaping substances (herbicides, pesticides, and fertilizers) will be prevented from blowing, falling, flowing, washing, or leaching into the ocean
    - All spills will be cleaned up immediately after discovery, using proper materials that will be properly disposed of;
    - Regardless of size, spills of toxic or hazardous materials will be reported to the appropriate government agency;
    - Should spills occur, the spill prevention plan will be adjusted to include measures to prevent spills from re-occurring and for modified clean-up procedures.

3.2 Socioeconomic and Cultural

3.2.1 Socioeconomic Characteristics

The project would affect and benefit the entire County of Hawai‘i. Table 1 provides information on the socioeconomic characteristics of Hawai‘i County and three of its largest towns (all within 50 miles of the MKRA) from the U.S. 2010 Census of Population. No racial group is a majority. Those over 65 years old make up about 17 percent of the population, and those under 18 about 22 percent. Although there are many similarities between island communities, there are also differences. In Hilo, several segments of the population that typically exhibit disadvantaged measures of social welfare are disproportionately represented. Median family income is less than 65 percent that of the County as a whole. More than 15 percent of individuals have income below the poverty level, double the statewide rate. Similar patterns hold for households receiving welfare, food stamps, and disability payments. The socioeconomic pattern of the County in general and within specific communities indicates a need for public recreational facilities that are low-cost and accessible.

Impacts

The Proposed Action would provide benefit for recreational users by providing an area for camping and enjoying the amenities of the high-altitude areas of the island, including hunting, hiking and access to astronomy facilities. No adverse socioeconomic impacts are foreseen.

Table 1: Selected Socioeconomic Measures for Hawai‘i County Communities

	Waimea	Kailua	Hilo	Hawai‘i County
Population, 2010	9,212	11,975	43,263	185,079
Persons under 5 years, percent, 2013	6.8%	6.7%	6.0%	6.3%
Persons under 18 years, percent, 2013	27.5%	23.4%	21.3%	22.2%
Persons 65 years and over, percent, 2013	12.3%	12.4%	18.0%	16.8%
Female persons, percent, 2013	51.7%	49.8%	51.2%	49.9%
White alone, percent, 2013	31.2%	36.7%	17.6%	34.4%
Black or African American alone, percent, 2013	0.3%	0.4%	0.5%	0.8%
American Indian and Alaska Native alone, percent, 2013	0.2%	0.6%	0.3%	0.6%
Asian alone, percent, 2013	17.3%	18.1%	34.3%	22.1%
Native Hawaiian and Other Pacific Islander alone, percent, 2013	15.8%	15.2%	14.2%	12.7%
Two or More Races, percent, 2013	34.0%	25.2%	32.5%	29.5%
Hispanic or Latino, percent, 2013	9.0%	12.2%	10.4%	12.2%
White alone, not Hispanic or Latino, percent, 2013	29.4%	34.5%	15.9%	30.7%
Living in same house 1 year & over, percent, 2008-2012	91.4%	80.3%	85.0%	86.2%
Foreign born persons, percent, 2008-2012	9.8%	15.9%	8.0%	11.9%
Language other than English spoken at home, pct age 5+, 2008-2012	17.4%	25.2%	15.8%	19.4%
High school graduate or higher, percent of persons age 25+, 2008-2012	94.5%	87.8%	91.1%	90.6%
Bachelor's degree or higher, percent of persons age 25+, 2008-2012	29.0%	19.1%	29.8%	25.6%
Mean travel time to work (minutes), workers age 16+, 2008-2012	27.8	18.8	18.5	25.4
Homeownership rate, 2008-2012	63.0%	52.4%	63.6%	65.1%
Housing units in multi-unit structures, percent, 2008-2012	11.5%	47.9%	23.3%	20.2%
Median value of owner-occupied housing units, 2008-2012	$425,200	$373,600	$313,200	$326,900
Persons per household, 2008-2012	2.88	3.09	2.75	2.82
Per capita money income in past 12 months (2012 dollars), 2008-2012	$28,213	$25,985	$25,416	$24,882
Median household income, 2008-2012	$62,000	$60,965	$51,929	$52,098
Persons below poverty level, percent, 2008-2012	10.4%	12.2%	16.9%	17.0%

Source U.S. Census Bureau: State and County QuickFacts. Data derived from Population Estimates, American Community Survey, Census of Population and Housing. http://quickfacts.census.gov/qfd/states/15/1578500.html

3.2.2 Cultural Resources

The material in this section is taken from the background historical and cultural work that is part of archaeological and architectural assessment survey prepared specifically for the project by Robert Rechtman, Ph.D., and Ben Barna, Ph.D., of ASM Affiliates. The report is attached as Appendix 3 and is summarized in this and the following section. Most scholarly references have been removed for readability; interested readers may refer to the appendix.

Cultural and Historical Background

The project site is located in the saddle between Mauna Kea and Mauna Loa in Kaʻohe 4 Ahupuaʻa, in the general area sometimes referred to as Pōhakuloa. Kaʻohe 4 Ahupuaʻa is part of the inland portion of the district of Hāmākua, one of six traditional districts on Hawaiʻi Island. Although the boundaries of the Hāmākua District are strictly political, the lands encompassed possess a unique environment that played a large role in determining the boundaries and shaping its history from the time of Polynesian settlement to the modern day. Understanding this environment is important for understanding the history of the project site:

> Hāmākua district is a windward district in the truest sense. It has ca. 29 miles of shoreline, primarily focused on Mauna Kea's eastern slopes with exposed cliffs, rough seas, and narrow reef formations. Above the sea cliffs, the gentle slopes have a thick soil cover and abundant rainfall, and lush vegetation, with the upper slopes from 1,000-6,000 feet in an *ʻōhiʻa-koa* rain forest. The slopes are cut by deep (up to 300-foot), narrow stream gulches cloaked with *kukui* and pandanus. Yet Hāmākua is more than these slope and gulch lands. It also includes the extremely large, deep valleys of Waipiʻo and Waimanu which have cut over a millennia into the older Kohala Mountain, valleys which … dominated the history of the district and the island. Hāmākua also extended inland, encompassing the high elevation *māmane-naio* forests of Mauna Kea and the subalpine, oft snow-covered, summit itself. The district continued across the foggy and cold upland plateau or Saddle with its terrain a mixture of bare lava and soils, and with its vegetation a mixture of *ʻōhiʻa* and *māmane-naio* forests. This plateau had important nesting grounds of *ʻuʻau* and *nēnē*. And, Hāmākua virtually spanned the island-reaching to and looking down into the upper edges of Kona (Cordy 2000:21).

After the first Polynesians in Hawaiʻi arrived, they shaped and utilized the natural environment over generations to provide all they needed for sustenance and survival. In the process they created a uniquely Hawaiian culture that was wholly adapted to the environment. The brief generalized cultural sequence that follows below provides a time frame for the peopling of Hawaiʻi, the development of Hawaiian culture, the expansion and intensification of the Hawaiian population, and the resulting stresses on it from the earliest Polynesian settlers to the time of European Contact.

The generalized cultural sequence that follows is based on Kirch's (1985) model, and amended to include recent revisions offered by Kirch (2011). The initial settlement in Hawaiʻi is believed to have occurred from the southern Marquesas Islands somewhere around 1000 AD. This was a period of great exploitation

and environmental modification, when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment. Their ancient and ingrained philosophy of life tied them to their environment and kept order. Order was further assured by the conical clan principle of genealogical seniority. The Hawaiians brought from their homeland certain universal Polynesian customs: the major gods Kāne, Kū, and Lono; the *kapu* system of law and order; cities of refuge; the *ʻaumakua* concept; various epiphenomenal beliefs; and the concept of *mana*. Initial permanent settlements in the islands were established at sheltered bays with access to fresh water and marine resources. Communities shared extended familial relations and there was an occupational focus on the collection of marine resources. Over a period of several centuries the areas with the richest natural resources became populated and perhaps even crowded, and there was an increasing separation of the chiefly class from the common people. As the environment reached its maximum carrying capacity, the result was social stress, hostility, and war between neighboring groups. Soon, large areas of Hawaiʻi were controlled by a few powerful chiefs.

The Development Period brought about a uniquely Hawaiian culture. The portable artifacts found in archaeological sites of this period reflect not only an evolution of the traditional tools, but some distinctly Hawaiian inventions. The adze (*koʻi*) evolved from the typical Polynesian variations of plano-convex, trapezoidal, and reverse-triangular cross-section to a very standard Hawaiian rectangular quadrangular tanged adze. A few areas in Hawaiʻi produced quality basalt for adze production. The summit region of Mauna Kea, high above the project site, was a well-known adze quarry. The two-piece fishhook and the octopus-lure breadloaf sinker are Hawaiian inventions of this period, as are *ʻulu maika* stones and *lei niho palaoa*. The later was a status item worn by those of high rank, indicating a trend toward greater status differentiation.

The Expansion Period is characterized by the greatest social stratification, major socioeconomic changes, and intensive land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. The greatest population growth occurred during the Expansion Period. Subsistence patterns intensified as crop farming evolved into large irrigated field systems and expanded into the marginal dry land areas. The *loko* or fishpond aquaculture flourished during this period.

It was during the Expansion Period that a second major migration settled in Hawaiʻi, this time from Tahiti in the Society Islands. According to Kamakau (1976) the *kahuna* Pāʻao settled in the islands during the 13th century. Pāʻao was the keeper of the god Kuʻkaʻilimoku, and had fought bitterly with his older brother, the high priest Lonopele. After much tragedy on both sides, Pāʻao was expelled from his homeland by Lonopele. He prepared for a long voyage, and set out across the ocean in search of a new land. On board Pāʻao's canoes were thirty-eight men (*kānaka*), two stewards (*kānaka ʻāʻīpuʻupuʻu*), the chief Pilikaʻaiea (Pili) and his wife Hinaʻaukekele, Nāmauʻu o Malaia, the sister of Pāʻao, and the prophet Makuakaʻūmana. In 1866 Kamakau told the following story of their arrival in Hawaiʻi:

> Puna on Hawaiʻi Island was the first land reached by Pāʻao, and here in Puna he built his first heiau for his god Ahaʻula and named it Ahaʻula [Wahaʻula]. It was a luakini. From Puna, Pāʻao went on to land in Kohala, at Puʻuepa. He built a heiau there called Moʻokini, a luakini.

> It is thought that Pāʻao came to Hawaiʻi in the time of the aliʻi Laʻau because Pili ruled as moʻi after Laʻau. You will see Pili there in the line of succession, the moʻo kūʻauhau, of Hanalaʻanui. It was said that Hawaiʻi Island was without a chief, and so a chief was brought from Kahiki; this is according to chiefly genealogies. Hawaiʻi Island had been without a chief for a long time, and the chiefs of Hawaiʻi were aliʻi makaʻāinana or just commoners, makaʻāinana, during this time. (Kamakau 1991:100)
>
> . . . There were seventeen generations during which Hawaiʻi Island was without chiefs—some eight hundred years. . . . The lack of a high chief was the reason for seeking a chief in Kahiki, and that is perhaps how Pili became the chief of Hawaiʻi. He was a chief from Kahiki and became the ancestor of chiefs and people of Hawaiʻi Island. (Kamakau 1991:101-102)

The Pili line's initial ruling center was likely in Kohala, but some have suggested that Pili resided in and ruled from Waipiʻo Valley in the Hāmākua District. Ethnohistorical traditions (Fornander 1880) indicate that valley was associated with at least nine successive Pili line rulers of Hawaiʻi Island, from Kahaʻimoeleʻa to Umi (from roughly AD 1460 to 1620). Prior to the establishment of these Pili rulers, Waipiʻo was the residential base for powerful local rulers dating back to at least the A.D. 1200s.

The concept of the *ahupuaʻa* was established during the A.D. 1400s, adding another component to a society that was already well-stratified. This land unit became the equivalent of a local community, with its own social, economic, and political significance. *Ahupuaʻa* were ruled by *aliʻi ʻai ahupuaʻa* or lesser chiefs; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land, which was managed by a *konohiki*. *Ahupuaʻa* were usually wedge or pie-shaped, incorporating all of the eco-zones from the mountains to the sea and for several hundred yards beyond the shore, assuring a diverse subsistence resource base. Kaʻohe, however, is one of two large *ahupuaʻa* in eastern Hāmākua (the other being Pāʻahau) that were created above the upper gulches of the windward *ahupuaʻa* to manage special resources such as those found in the *māmane* forests and the high-altitude regions of Mauna Kea. The bulk of Kaʻohe encompasses these upland resources, and like its neighboring North Hilo *ahupuaʻa* of Humuʻula, it rises above its narrow coastal band, "engulfing all the other inland areas of Hāmākua—including the rest of Mauna Kea's upper slopes and its summit and all the Interior Plateau" (Cordy 1994:12). Curtis Lyons described the special relationship of native tenants of Kaʻohe to the mountain lands:

> The ordinary ahupuaa extends from half a mile into this [forest] belt Then there are larger ahupuaas which are wider in the open country than others, and on entering the woods expand laterally so as to cut off all the smaller ones, and extend toward the mountain till the emerge to the open interior country; not however to converge to a point at the tops of the respective mountains. Only a rare few reach those elevations, sweeping past the upper ends of all the others, and by virtue of some privilege in bird-catching, or some analogous right, taking the whole mountain to themselves…the whole main body of Mauna Kea belongs to one land from Hāmākua , vis., Kaohe, to whose owners belong the sole privilege of capturing the ʻuʻau, a mountain-inhabiting but sea-fishing bird (quoted in Maly and Maly 2005).

The *aliʻi* and the *makaʻāinana* (commoners) were not confined to the boundaries of the *ahupuaʻa*; when there was a perceived need, they also shared with their neighbor *ahupuaʻa ohana*. The *ahupuaʻa* were further divided into smaller sections such as the *ʻili, moʻoʻaina, paukuʻaina, kihapai, koele, hakuone*, and *kuakua*. The chiefs of these land units gave their allegiance to a territorial chief or *mōʻī* (king). *Heiau* building flourished during the Expansion Period as religion became more complex and embedded in a sociopolitical climate of territorial competition. Monumental architecture, such as *heiau*, "played a key role as visual markers of chiefly dominance" (Kirch 1990:206). Waipiʻo was one of the most important religious and chiefly centers on the Island of Hawaiʻi, and a number of large *heiau* were maintained in the valley throughout the Precontact Period.

Līloa and his son ʻUmi were two of the most renowned rulers of the Pili line. Both were from Hāmākua and had their ruling centers in Waipiʻo. ʻUmi, who is often credited with uniting the island of Hawaiʻi under one rule, had a chiefly father (Līloa) and a mother (Akahi) who was a commoner. Līloa met Akahi when he secretly left the valley to visit his other Hāmākua lands. As a young boy ʻUmi was raised in the countryside by his mother, but he soon moved to Waipiʻo to reside with his father and learn the chiefly ways. Waipiʻo remained a leading chiefly center until the end of ʻUmi's reign ca. 1620.

Kirch (1985) placed the beginning of the Proto-Historic Period during the rule of Lonoikamakahiki. This was a time marked by both political intensification and stress and continual conquest by the reigning *aliʻi*. Wars occurred regularly between intra-island and inter-island polities during this period. It was during this time of warfare that Kamehameha, who would eventually rise to power and unite all the Hawaiian Islands under one rule, was born in the District of North Kohala on the Island of Hawaiʻi. There is some controversy about the year of his birth, but Kamakau (1992:66–68) placed the birth event sometime between A.D. 1736 and 1758, most likely nearer to the later date. This period was one of continual conquest by the reigning *aliʻi*. In A.D. 1775 Kalaniʻōpuʻu and his forces, who had already conquered Hana in eastern Maui, raided and destroyed the neighboring Kaupō District, then launched several more raids on Molokaʻi, Lānaʻi, Kahoʻolawe, and parts of West Maui. It was at the battle of Kalaeokaʻilio that Kamehameha, a favorite of Kalaniʻōpuʻu, was first recognized as a great warrior and given the name of Paiʻea (hard-shelled crab) by the Maui chiefs and warriors.

Because of Mauna Kea's prominence in Hawaiʻi Island traditional beliefs, a substantial number of *moʻolelo* and other traditions of the mountain (and thus Kaʻohe Ahupuaʻa) were passed down from the Precontact Period. Previous studies have collected and summarized many of these accounts; in particular, Maly and Maly (2005) and Mitchell et al. (2012) presented a number of traditions relating to the saddle and summit regions of Mauna Kea. The following discussion of legendary accounts of Kaʻohe and the project site area focuses narrowly on the immediate vicinity of Pōhakuloa, taking the *ahupuaʻa* name of Kaʻohe as a point of departure to illustrate how Pōhakuloa is intimately connected to gods, heroes, and the greater landscape as conceived by Hawaiian culture.

Ahupuaʻa names often invoke history, legend, important people or resources found within them. The name "Kaʻohe" translates literally as "the bamboo" (Pukui et al. 1974:84-85). Unlike other lower-elevation places that share this name (e.g., an *ahupuaʻa* of the same name in South Kona), the bamboo to which the name refers is not meant to invoke vegetation, but rather is associated with the transportation of

water. Dr. Pualani Kanahele has elaborated on this meaning of Kaʻohe in the context of modern military activities at the U.S. Army Pohakuloa Training Area:

> … one of the earlier reasons for bamboo was to transport water. So what does that relationship, Kaʻohe, have to do with water? And so, the idea that part of the land may be producing a lot water…the tops of the mountains were important to the kupuna's because that's where the water would go into the earth, seep into the earth…and then come out. So, now they're bombing up there and that's detrimental to our water source, higher source. (quoted in Meyer 2003:172-173)

The place name Pōhakuloa, which refers to this general area within Kaʻohe, translates literally as "long stone" (Pukui et al. 1974:186), and also refers to a deity of the forest lands that extended across Mauna Loa towards Mauna Kea. Pōhakuloa, the deity, was a form of the *akua* Kū, a lover of Poliʻahu, a patron of canoe makers, and in his human form an *ʻolohe* expert and woodworker. Pōhakuloa appears in "*Kaao Hooniua Puuwai no Ka-Miki*" (The Heart Stirring Story of Ka-Miki), published in *Ka Hoku O Hawaii* between 1914 and 1917. In the translation presented by Maly and Maly (2005:20-21), Pōhakuloa features prominently in an episode in which Ka-Miki and his companion Makaʻiole conquer the deity while travelling in the uplands of Puna. The two heroes stop to ask Pōhakuloa for directions, but end up goading him into conflict. Ka-Miki and Makaʻiole overcome Pōhakuloa and bind him. The deity surrenders to the two brothers and invites them to eat and drink *ʻawa.* This part of the story continues with Pōhakuloa's relatives seeking revenge on the two heroes, despite this reconciliation.

Pōhakuloa appears later in the Ka-Miki *moʻolelo*, both as a supernatural being and as a place name, in an episode involving the sacred waters of Kāne in Lake Waiau and Waihu Spring located near Pōhakuloa Gulch, about two miles *mauka* of the project site. Waihu Spring, located at about 9,760 feet above sea level, is not listed in Pukui et al.'s (1974) volume of place names. William Alexander (1892) was told that "[a] spring on the southern side of the mountain, called 'Wai Hu' is believed by the natives to be connected to [Lake Waiau]." In their version of the Ka-Miki story, Maly and Maly (2005:40-47) interpret the spring's name as "Wai" for water and "hū" for rising, swelling, or overflowing, and they attribute the spring's creation to the exploits of Ka-Miki and Makaʻiole. In preparation for an epic journey around Hawaiʻi Island, Ka-Miki and Maka-ʻiole train in various contest skills under the tutelage of their ancestress Ka-uhule-nui-hihi-kolo-i-uka (Ka-uhule). When they complete their training, Ka-uhule instructs them to fetch water and *ʻawa* so they can commemorate the occasion. The water they are to fetch is the sacred water of Kāne in Lake Waiau atop Mauna Kea, but the water is guarded by Poliʻahu (to whom the two heroes are also related), her companion Lilinoe, and their ward Ka-piko-o-Waiau. The water is kept below the ledge of a platform called Pōhakuakāne overlooking Pōhakuloa (the place). Ka-Miki and Maka-ʻiole set out on this mission, carrying with them a *kānoa* (*ʻawa* bowl) named Hōkūʻula and a *mauʻu ʻawa* (strainer) named Ka-lau-o-ke-Kāhuli obtained from another ancestress named Laniku'i-a-mamao-loa. Arriving at Pōhakuakāne under cover of mists, Ka-Miki ladles water into his *ʻawa* bowl. Two guardians of the waters of Kāne (also named Pōhakuakāne and Pōhakuloa), see the water rippling and overflowing from Ka-Miki's ladle and investigate. Ka-miki escapes through the mists, leaving only the overflowing waters from which the name Ka-wai-hū-a-Kāne ("Waters of Kāne overflowing") is given to the spring. Ka-Miki joins his brother around Mauna Kea at Holoholokū on the Waikōloa plain. Near Puʻu Keʻe, the wind goddess, Wai-kō-loa causes some of the sacred water to spill

from Ka-Miki's *ʻawa* bowl, and the spilled water creates a spring. The new spring draws the attention of Pōhakuakāne, who fetches (*kiʻi*) the water, giving the spring its name, "Wai-kiʻi." Pōhakuakāne then takes this water back to the plain of Pōhakuloa, digs into ground, and places the water at the location known today as Waihu Spring**.**

Captain James Cook landed in the Hawaiian Islands on January 18, 1778. Ten months later, on a return trip to Hawaiian waters, Kalaniʻōpuʻu, who was at war with Kahekili, visited Cook on board the *Resolution* off the East coast of Maui. Kamehameha observed this meeting, but chose not to participate. The following January (1779), Cook and Kalaniʻōpuʻu met again in Kealakekua Bay and exchanged gifts. In February, Cook set sail intending to leave the Hawaiian Islands; however, a severe storm off the Kohala coast damaged a mast and he was forced to return to Kealakekua. Cook's return occurred at an inopportune time, and this misfortune cost him his life.

Around A.D. 1780 Kalaniʻōpuʻu proclaimed that his son Kiwalao would be his successor, and he gave the guardianship of the war god Kūʻkāʻilimoku to Kamehameha. Many chiefs, concerned about their land claims, which Kiwalao did not seem to honor, preferred Kamehameha as the next ruler. Encouraged by these chiefs Kamehameha usurped Kiwalao's authority during a sacrificial ritual in Kaʻū. He then withdrew to his home district of Kohala where he farmed the land, growing taro and sweet potatoes. After Kalaniʻōpuʻu died in A.D. 1782 civil war broke out, Kiwalao was killed, and Kamehameha became the ruler of Hawaiʻi Island. The wars between Maui and Hawaiʻi continued until A.D. 1795. Several battles were fought in the Hāmākua District during this period, and many of the religious structures in Waipiʻo Valley were destroyed.

In 1793-1794 Captain George Vancouver, who had previously visited Hawaiʻi with Cook in 1778-1779, returned leading his own expedition. It was on this voyage that Vancouver first introduced cattle to the Island of Hawaiʻi, giving 17 head to King Kamehameha as a gift. Kamehameha placed a *kapu* on the cattle, and they were driven to the upland plain of Waimea to increase and multiply. Inevitably, some escaped and made their way to the mountain lands of Kaʻohe, where they would later play an important role in land use for much of the nineteenth and early twentieth centuries.

Demographic trends during the early Contact period indicate population reduction in some areas, due to war and disease, yet increase in others, with relatively little change in material culture. There was a continued trend toward craft and status specialization, intensification of agriculture, *aliʻi* controlled aquaculture, upland residential sites, and the enhancement of traditional oral history. The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks, although Western influence was already altering the cultural fabric of the Islands. Foreigners had introduced the concept of trade for profit, and by the end of the 1700s, Hawaiʻi saw the beginnings of a market system economy. This marked the end of the Proto-Historic Period and the end of an era of uniquely Hawaiian culture.

Hawaiʻi's culture and economy continued to change drastically as capitalism and industry established a firm foothold during the Historic Period. The sandalwood (*Santalum ellipticum*) trade, established by Euro-Americans in 1790 and turned into a viable commercial enterprise by 1805, was flourishing by 1810. This added to the breakdown of the traditional subsistence system, as farmers and fishermen were ordered to spend most of their time logging, resulting in food shortages and famine that led to population

decline. Kamehameha did manage to maintain some control over the trade. Evidence of sandalwood harvesting in the Saddle region includes sandalwood bundles recorded archaeologically in a lava tube in the western PTA near the North Kona-Hāmākua border.

By 1796 Kamehameha, with the aid of foreign weapons and advisors, had conquered all of the island kingdoms except Kauaʻi. In 1810, when Kaumualiʻi of Kauaʻi gave his allegiance to Kamehameha, the Hawaiian Islands were unified under a single rule. Kamehameha would go on to rule the islands for another nine years. He and his high chiefs participated in foreign trade, but continued to enforce the rigid *kapu* system.

Kamehameha died in 1819 at Kamakahonu in Kailua-Kona. With the passing of Kamehameha, his heir Liholiho was given the name of Kamehameha II. Kaʻahumanu, the favorite wife of Kamehameha, announced the last commands of Kamehameha I:

> O heavenly one! I speak to you the commands of your grandfather. Here are the chiefs; here are the people of your ancestors; here are your guns; here are your lands. But we two shall share the rule over the land. Liholiho consented and became ruling chief over the government (Kamakau 1992: 220).

Following the death of a prominent chief, it was customary to remove all of the regular *kapu* that maintained social order and the separation of men and women and elite and commoner. Thus, following Kamehameha's death a period of *ʻai noa* (free eating) was observed along with the relaxation of other traditional *kapu*. It was for the new ruler and *kahuna* to re-establish *kapu* and restore social order, but at this point in history traditional customs changed.

With an indefinite period of free-eating and the lack of the reinstatement of other *kapu* extending from Hawaiʻi to Kauaʻi, and the arrival of the Christian missionaries shortly thereafter, the traditional religion had been officially replaced by Christianity within a year following the death of Kamehameha I. By December of 1819 Kamehameha II had sent edicts throughout the kingdom renouncing the ancient state religion, ordering the destruction of the *heiau* images, and ordering that the *heiau* structures be destroyed or abandoned and left to deteriorate. He did, however, allow the personal family religion, the ʻ*aumakua* worship, to continue. With the end of the *kapu* system changes in the social and economic patterns began to affect the lives of the common people. Liholiho moved his court to Oʻahu, lessening the burden of resource procurement for the chiefly class on the residents of Hawaiʻi Island. Some of the work of the commoners shifted from subsistence agriculture to the production of foods and goods that they could trade with early Western visitors. Introduced foods often grown for trade included yams, coffee, melons, Irish potatoes, Indian corn, beans, figs, oranges, guavas, and grapes.

In October of 1819, seventeen Protestant missionaries had set sail from Boston to Hawaiʻi. They arrived in Kailua-Kona on March 30, 1820 to a society with a religious void to fill. Many of the *aliʻi,* who were already exposed to western material culture, welcomed the opportunity to become educated in a western style and adopt their dress and religion. Soon they were rewarding their teachers with land and positions in the Hawaiian government. During this period, the sandalwood trade was wreaking havoc on the

commoners, who were weakening with the heavy work, exposure, and famine just to fill the coffers of the *ali‘i* who were no longer under any traditional constraints.

Another early industry with ties to the mountain lands in Ka‘ohe grew out of Captain Vancouver’s gift of cattle to Kamehameha I. By the time of Kamehameha’s death in 1819, the monarchy allowed a few men to hunt the feral cattle that had spread around Hawai‘i Island. These individuals, known as “bullock hunters,” were mostly foreigners working individually to provide salted beef for native-owned vessels. Like sandalwood, the major impetus for bullock hunting was the export of raw materials, in this case, the hides and tallow of Hawai‘i’s cattle to leather goods factories in New England. In the early 1830s, a few *vaqueros* who perfected methods of capturing wild cattle on horseback in Alta California began working for the Hawaiian monarchy. The Spanish style of hunting wild cattle avoided the use of guns and was more efficient than killing and skinning cattle in the mountain uplands where they roamed. Hawaiian cowboys, trained by the *vaqueros*, appropriated and adapted much of their equipment, including the braided lariat, broad winged and hooded stirrups (*tapaderos*), and highly adorned saddles with large horns, to conditions in Hawai‘i. Bullock hunting continued in the mountain lands through the next decade, when dramatic changes in Hawai‘i’s land tenure system to spur the development of ranching into Ka‘ohe.

By the mid-nineteenth century, the ever-growing population of Westerners in Hawai‘i forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership. In 1848 the *Māhele ‘Āina* became the vehicle for determining ownership of native lands. This change in land tenure was promoted primarily by the missionaries and Western businessmen in the island kingdom. Generally these individuals were hesitant to enter business deals on leasehold land. The *Māhele* (division) defined the land interests of Kamehameha III (the King), the high-ranking chiefs, and the *konohiki*. The *Māhele* placed all lands in the Kingdom of Hawai‘i in one of three categories: (1) Crown Lands (for the occupant of the throne); (2) Government Lands; and (3) *Konohiki* Lands. The chiefs and *konohiki* were required to present their claims to the Land Commission to receive awards for lands provided to them by Kamehameha III. They were also required to provide commutations to the government in order to receive royal patents on their awards. The lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This process expedited the work of the Land Commission. As a result of the *Māhele*, Ka‘ohe was awarded to Victoria Kamamalu, who immediately relinquished it to Kamehameha III (*Buke Māhele* 1848:5-6). He in turn transferred the *ahupua‘a* to the inventory of Government Lands (*Buke Māhele* 1848:191). Until 1891, the entirety of the mountain lands in Ka‘ohe was managed by the government as a single parcel. Beginning in that year with Lease No. 451 to the Humu‘ula Sheep Station, Ka‘ohe was divided into sections (e.g., Ka‘ohe 1-5) and bid out as separate parcels (see records cited Maly and Maly 2005).

All lands awarded during the *Māhele* were subject to the rights of the native tenants therein; those individuals who lived on the land and worked it for their subsistence and the welfare of the chiefs. Native tenants could claim, and acquire title to, *kuleana* parcels that they actively lived on or farmed at the time of the *Māhele*. The Kuleana Act of December 21, 1849 provided the framework by which native tenants could apply for and receive fee-simple interest in their *kuleana* lands from the Land Commission. The Board of Commissioners oversaw the program and administered the lands as Land Commission Awards (LCAw.). Not all lands claimed were awarded. A review of the Waihona ‘Āina Database indicates that in Ka‘ohe, four native claims were registered in the windward, lower-elevation portion of the *ahupua‘a*, and

none in the saddle region. Only one lower-elevation claim was awarded, a 7-acre *ʻāpana* awarded to Koolau.

The activities of the *Māhele* ushered in changes in the traditional Hawaiian land tenure system that enabled foreigners to purchase lands which had previously been unavailable to them. While Kaʻohe was not for sale, the entirety of its mountain lands was leased to Francis Spencer in 1857. In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawaiʻi to legally set the boundaries of the *ahupuaʻa* that were awarded during the *Māhele*. Subsequently, in 1874, the Commissioners of Boundaries was authorized to certify the boundaries for lands brought before them. The primary informants for the boundary descriptions were old native residents of the lands, many of whom had also been claimants for *kuleana* during the *Māhele*. Because Kaʻohe was Government land, it was not surveyed explicitly by the Boundary Commission; rather, the surveys of the surrounding *ahupuaʻa* of Humuʻula and Keauhou established the Kaʻohe boundaries.

The arid saddle region has been an important transportation corridor since Precontact times. *Nā ala hele*, the Precontact system of trails, included routes in Kaʻohe connecting Waimea to Hilo, Waimea to Kona, and Kaʻū to the Kona-Waimea trail. Archaeological traces of trails in the saddle region have been elusive. While one trail (SIHP Site 19528) between Kaʻū and the Waimea-Kona trail has been associated with ʻUmi-a-Līloa's road to Waimea, most other Precontact routes have not been identified. In general, the actual alignments of any of these routes remain conjectural due to several factors. Historic Period livestock trails and wagon roads may have been built on top of Precontact trail alignments, effectively obliterating the older expressions of those routes. Lava flows have probably covered other sections of trails. In other cases, routes over easily-traversed *pāhoehoe* or grasslands may have been very simply marked with cairns or other landmarks which subsequently collapsed.

The route of the Saddle Road is probably the approximate route of the Precontact trail from Waimea to Kalaiʻehā and Puʻu ʻŌʻō, which was used through the first half of the nineteenth century. In a letter dated May 6, 1850, Titus Coan reported that a highway was "being brought from Kailua to Hilo across the centre of the island" (quoted in Maly and Maly 2005:141). It appears that even by the late 1850s, the road across the Saddle region was anything but well-developed. In a series of letters published in the *Pacific Commercial Advertiser* during July of 1859, a writer using the *nom de plume* "Hualalai" describes his journey from Waimea to Hilo across the saddle region, and equates the condition of the trail between Waikiʻi and Kalaiʻehā as "made of equal parts of broken bottles and slag from a blacksmith's forge." (quoted in Maly and Maly 2004:146-147). His party spent the night at Pōhakuloa Gulch (likely directly above the project site), which he described a "beautiful spot" with luxuriant grass, *māmane* trees, and plentiful wild hogs and cattle, but no water. The next day they continued on to Kalaiʻehā along fifteen or twenty miles across the rolling alluvial fans at the foot of Mauna Kea.

Improvements to the route across the saddle region began shortly after "Hualalai's" visit. S. C. Wiltse was contracted in 1862 to survey a route that would connect Waimea with Hilo via Waikiʻi and Kalaiʻehā (Maly and Maly 2003:118). The map produced by Wiltse during his survey was submitted in a draft form (S.C. Wiltse to F. W. Hutchinson, August 2, 1869, quoted in Maly and Maly 2002:120) and this draft became Registered Map 528. The road that was built closely followed Wiltse's plan from between Waikiʻi and Kalaiʻehā, and the primary use of this road was related to livestock ranching until World War

II. This road became known as the Waimea-Humuʻula Wagon Road, and in the saddle region it extended from Puʻu Keʻekeʻe to Pōhakuloa before running north of ʻŌmakōʻili to Kalaiʻehā. In 1943, construction of the Saddle Road by the US Army obliterated the wagon road between Puʻu Keʻekeʻe and the MKRA. Construction of the Daniel K. Inouye Highway near the MKRA's entrance in 2006 widened and realigned the route through the Pōhakuloa area.

As a few individuals and companies involved in the hide and tallow trade began to acquire private herds in the mid to late 1800s, bullock hunting in Hawaiʻi began to give way to livestock ranching. In Kaʻohe, ranching proper began in 1859, when Francis Spencer of Waimea and his business partner Robert Janion of Liverpool, England, obtained leases on grazing lands in Kaʻohe and Humuʻula. Their partnership evolved into the Waimea Grazing and Agricultural Company (WGAC) with Janion and W.L. Green of Honolulu as sole stockholders. By 1871, the company was doing poorly, and Janion and Green sold out to a Dr. Robert M. Kibbin of Honolulu in 1871. On June 5, 1871, John Parker II outbid the WGAC for the lease on Kaʻohe when it came up for renewal. When the lease came up for renewal again in September, 1891, Kaʻohe 4 was leased (Government Lease 451) to the Humuʻula Sheep Station Company (HSSC), which had succeeded the WGAC in Humuʻula in 1876.

A sketch drawn from the summit of Puʻu Io by surveyor E.D. Baldwin in 1890 provides a glimpse of the Pōhakuloa area at this time in (see Figure 14 in Appendix 3). His drawing depicts a mostly empty plain below Pōhakuloa Gulch and the location of Waihu spring high on Mauna Kea's slope. It was in this seemingly barren landscape that the HSSC operated its Pōhakuloa substation. In April of 1892, HSSC manager August Haneberg recorded in his journal that Eben Low and his men were catching wild cattle at Pōhakuloa; the cattle were probably drawn to the springs near the gulch. Later that summer, Haneberg had a ranch employee named Kauwe find Waihu spring and "put a flag up there" (quoted in Maly and Maly 2005:419). It was probably shortly after this date that Houpokāne and Waihu springs were tapped to provide water for the HSSC's livestock. A corral and several stone walls near Houpokāne Spring were recorded by McCoy (1984), and the ranch was probably using these in the 1890s.

The presence of the springs did not escape the notice of the HSSC's rival, Parker Ranch. One of A. W. Carter's early projects as manager of Parker Ranch was to increase the amount of water available in the Kaʻohe lands around Puʻu Keʻekeʻe in the lower Waikiʻi and Keʻāmuku region. In 1900, he sent C.H. Kluegel and former ranch manager, Paul Jarrett, to the springs above the MKRA. Kluegel reported in a letter dated July 14, 1900, that "it is disappointing to find so little water in the three springs on the south slope of Mauna Kea. With an abundant supply at that elevation a large dry area could be supplied with water" and goes on to describe the improvements made at the spring by the HSSC:

> On the Southerly slope of Mauna Kea there are three springs. Waihu is the lowest. Its elevation is 8900 feet. A ¾ inch pipe 2 miles long now conveys the water to Pohakuloa, a station on the road to Kaleieha.
> The flow of this spring is 1730 gallons in 24 hours.
> The second spring is at an elevation of 9800 feet. The flow is 2900 gallons in 24 hours.
> The third spring, called Kahoupokani [Ka Houpo Kane], is at an elevation of 10,500 feet.
> The flow is 4300 gallons in 24 hours.
> The total flow of the three springs is 8930 gallons in 24 hours.

> A portion of this amount is now required in the near vicinity, and more may be required hereafter. Much trouble has been caused in the present pipe by freezing and bursting. This has been remedied to some extent by covering the pipe with earth. This would be difficult to do between the lower and the upper springs as there is only rock and no earth at hand while the protection is more needed. Even at this time we found ice at the second spring. The distance from the springs to the lower paddock at Waikii is about 16 miles… (Parker Ranch/PPS Water File, quoted in Maly and Maly 2005:450).

In 1915, Samuel Parker, Jr., sold his interests in the Humuʻula Sheep Station to Parker Ranch, including the lease on Kaʻohe 4 (including the project site). Shortly afterward, A.W. Carter secured a new lease on Kaʻohe 4 to put the lease properly in the ranch's possession. In his lease application, he reported that water was being piped down to Pōhakuloa and stored in a tank (Maly and Maly 2005:441). For the next forty years, Parker Ranch used Kaʻohe 4 for its own sheep operations, despite temporarily losing the lease at auction in 1929. After the end of World War II, Parker Ranch began to negotiate with the U.S. Marine Corps to relocate some of their training areas from Lālāmilo. The new site, which would become the Pōhakuloa Training Area (PTA), included portions of Kaʻohe 4, but not the MKRA project site. In 1956 Kaʻohe 4 began to be withdrawn from Parker Ranch's leases, and in 1963 Parker Ranch ceased its sheep operations (Maly and Maly 2005:447).

While livestock ranching developed in the saddle area, concerns began to be raised about a noticeable retreat of the forests on Mauna Kea and Mauna Loa. The loss of forest acreage was attributed to unchecked grazing by feral sheep, goats, and cattle. Ranching leases during this period addressed these concerns by requiring fencing and disallowing the cutting of timber in the mountain lands (examples of these leases are reproduced in Maly and Maly 2005:384, 386. Feral animals continued to exacerbate the deforestation throughout the nineteenth century. Beginning with 1876, the government began take legal measures to protect the forest when King Kalākaua enacted an "Act for the Protection and Preservation of the Woods" (Hawaiʻi Laws Chapter XXX:39). This law authorized the Minister of the Interior to set apart lands to prevent damage to government lands, particularly forest lands and water resources. This act was followed in 1893 by the establishment of the Bureau of Agriculture and Forestry through an act of the Legislature and approved by Queen Liliʻuokalani. The Bureau was charged with preserving and rehabilitating forest lands as a means of fighting the effects of diminished rainfall that had been caused by deforestation. The Bureau was absorbed into the Board of Commissioners of Agriculture and Forestry in 1900, after which it began to study the affected forest lands in Kaʻohe and elsewhere in the islands. The Board recommended establishing a reserve in Kaʻohe in 1905 and 1906, which ultimately led to the establishment of the Mauna Kea Forest Reserve in 1909. The proposal for the reserve written by Superintendent of Forestry Ralph S. Hosmer noted that unlike the Hilo Forest Reserve (established in 1904) and others that were established to protect their respective watersheds, the purpose of the Mauna Kea reserve was to develop unproductive lands for commercial forestry (Maly and Maly 2005:548). The creation of the reserve removed a total of 66,600 acres of summit and adjacent lands from private leases. In 1937, additional portions of Humuʻula, Kaʻohe, and some privately held lands were added to the reserve, increasing its area to 88,108 acres.

Conservation in the Mauna Kea Forest Reserve received a major boost in funding and manpower during the 1930s when the Civilian Conservation Corps (CCC), one of several New Deal programs begun in

1933, was established in the Territory. While the first 57 CCC enrollees on Hawai‘i Island began working in 1934, it was not until June of 1935 the first CCC camp was established (in Hawaii National Park – as Hawai‘i Volcanoes National Park was originally called), which housed 200 enrollees. Additional camps were also constructed around Mauna Kea Forest Reserve boundaries to house crews of CCC enrollees. At Pōhakuloa (within the MKRA project site), a camp was built in 1935, consisting of a cluster of buildings and tents, which were all removed by 1968. The camp was provided with a "continuous supply of pure water" from the springs above the camp (Bryan 1939, quoted in Maly and Maly 2005:257).

One of the major accomplishments of the CCC on Mauna Kea was the construction of over 60 miles of fence around the forest reserve to protect it from sheep. Another project undertaken by the CCC boys from Pōhakuloa involved reconstructing the trail from the Humu‘ula Sheep Station to summit *via* Halepōhaku and Lake Waiau (Maly and Maly 2005:257). The Pōhakuloa boys also fenced the new boundaries of the Mauna Kea Forest Reserve after its expansion in 1937, and hunted feral sheep (Maly and Maly 2005:241). The advent of World War II brought an end to the CCC program, as the remaining manpower and funding for the program were redirected toward the war effort. By July 1, 1942, all Territory of Hawai‘i camps were closed, transferred to the military, or abandoned.

After the end of the CCC programs and World War II, the CCC facilities at Pōhakuloa were primarily used for lodging by Territorial Division of Forestry and Fish and Game staff, sheep and bird hunters, and other members of the public. Visitors could "spend the night under piles of blankets…and start out before sunrise for the mountain ridges" (*Paradise of the Pacific* 1948:27). The accommodations were relatively spartan, and one visitor to Pōhakuloa around 1949 described them as having "the shape and color of a military camp. Wood-sided, canvas-topped tents were the best quarters, and barracks were available for big groups" (Johnston 1976:6). In 1954, the Division of Territorial Parks was created, and the former CCC facilities became part of Pohakuloa Park, also called "Pohakula Hunting Lodge". The division began a series of improvements that would eventually replace the existing CCC cabins with all new buildings. These are described in more detail in Section 3.2.3, below, in the context of architecture and historic properties.

Concurrent with these early additions to Park amenities, the State legislature directed a study to determine how the park should be developed further. Recommendations included changing the name from Pōhakuloa Park to the Mauna Kea State Recreation Area and replacing facilities with a more Hawaiian architectural style that had been developed by the State Parks Division. The new recommended facilities included a headquarters building to serve as visitor center, two pre-fabricated cottages, two cabins for group use, and central maintenance and service buildings. The report also recommended relocating the picnic area from south of Saddle Road, and building a new toilet building (both of which were completed before the report was submitted.) Around these new facilities, the report's authors suggested landscaping with "a major forest-type planting" and temperate climate fruit trees. As described in the context of architectural resources in Section 3.2.3, below, a number of these recommendations were implemented.

Existing Cultural Resources

The project site has been developed for many years for recreational purposes. All of the area proposed for uses is fully disturbed, and there are no resources or areas that afford gathering or similar uses. No

Hawaiian customary and traditional rights or practices known to be associated with the project site. Based on historical research, botanical reconnaissance and inquiries with potentially knowledgeable informants, it would appear that no known valuable natural, cultural or historical resources are present on the project site itself.

Cultural Resources: Impacts and Mitigation Measures

The Saddle area has a rich cultural history that reflects use of a unique environment for a variety of sustenance, ceremonial and transportation uses through several eras of history. The proposed refurbishment of the Mauna Kea Recreation Area will allow visitors and particularly residents the opportunity to enjoy and celebrate this heritage once again. The MKRA will offer a suitable and comfortable base for not only recreationalists but those engaged in gathering, hunting or other cultural activities in the Saddle area. The continuation and expansion of activities that promote native vegetation, including rare native species, provides cultural benefit.

In a letter in response to early consultation, the Office of Hawaiian Affairs transmitted a November 2014 resolution by the Association of Hawaiian Civic Clubs requesting that diversion of the waters from the springs in Pohakuloa Gulch by DLNR immediately cease, and that the Houpo o Kane springs complex be restored back to its original state until such time that an accounting is made (see Appendix 1a for letter and resolution). OHA requested that the continued use of water from these springs be considered under the analysis provided by the Hawai‘i Supreme Court in Ka Pa‘akai O Ka ‘Aina v. Land Use Commission, 94 Hawai‘i 31, 7 P.3d 1068 (2000). They also requested that several individuals be contacted regarding the project.

As discussed extensively in this section, the springs, which are located over two miles from the MKRA, were tapped by ranchers and various government agencies before 1900. They have been in continuous use since then for not only ranching but also conservation and public recreation uses. The County of Hawai‘i Department of Parks acknowledges that these springs are important cultural resources that are connected with the concept of the waters of Kane, as discussed above. However, the agency does not divert water from the springs and has no plans to alter any aspect of them; instead, it utilizes water from water tanks that are the storage component of a century-old non-potable water system that is used by a number of agencies, including DLNR’s Division of Forestry and Wildlife, the Division of State Parks, and the Division of Conservation and Resource Enforcement, as well as the U.S. Department of the Army. The stored water is important not only for various non-potable uses but also for the critical function of fighting brush fires in the native ecosystems that surround the area. P&R utilizes water from many water systems around the Island of Hawai‘i that ultimately derive their flow from waters that many might consider important for biological, cultural or other reasons. P&R is not responsible for assessing whether the water system that developed these sources is culturally appropriate, any more than any other water utility user on the island is responsible for doing so. The venue for addressing the use of these springs is the State Water Commission. If and when the Water Commission determines that some or all of the water that was diverted into pipelines over a century ago and now serves publicly beneficial uses should instead be allowed to seep into the ground on the slopes of Mauna Kea, the County of Hawai‘i will abide by the decision.

Notwithstanding the concerns of the Association of Hawaiian Civic Clubs, the County of Hawai‘i Department of Parks and Recreation does not believe that its actions will impact cultural activities or resources. Through the mechanism of the Draft EA, the agency invites consideration of this finding by various parties including the Office of Hawaiian Affairs, State Historic Preservation Division, the Association of Hawaiian Civic Clubs and several individuals recommended for consultation by OHA.

3.2.3 Archaeology and Historic Properties

An architectural and archaeological assessment survey of the property was conducted by ASM Affiliates, Inc. The study is attached as Appendix 3 and is summarized below and also in the previous section.

Context for Potential Presence of Historic Properties

The rich history of the region described in the previous section provides a background for the types of historic properties such as archaeological remains, trails, traditional cultural properties or architectural features that could be present in the project site.

Based on the location and the specific history of the project area land use, the results of the background research, and a review of archaeological work previously conducted in the general vicinity, the archaeological expectations for the project site study were limited. From oral traditions and ethnohistoric accounts, the area appears to have been used during Precontact times mainly as a travel corridor to the springs in Pōhakuloa Gulch and the Mauna Kea Adze Quarry (McCoy 1984), with the bulk of activities likely to leave archaeological traces conducted at elevations at least two thousand feet above the project site. Precontact and early Historic travelers in the Saddle region may have used trails along the current Saddle Road alignment, but previous archaeology and historic accounts have not positively identified the locations of these trails. Generally speaking, the Ke‘eke‘e loamy sands in and around the project site have an “extremely low” probability of containing Precontact cultural material, although it is possible that evidence of “casual prospecting” of boulders found on the alluvial aprons by Precontact visitors to Pōhakuloa might be present (Hammatt and Shideler 1991). Quinn (2007) also noted that evidence of non-camping, transient activities undertaken during ascents up Mauna Kea via Pōhakuloa Gulch may have once been present at the project site. This evidence was very likely disturbed by more recent development activities such as development and use of PTA, construction and improvements of the Saddle Road, and post-World War II activities at the MKRA. A recent archaeological inventory survey adjacent to and partially overlapping the project site (Bautista et al. 2012) recorded no Precontact sites.

As the fieldwork portion of the archaeological survey commenced, it appeared that the potential for archaeological remains of twentieth-century historic properties was also small due to the long history of building, demolishing and removing structures on the MKRA site. The transformation of the Pōhakuloa CCC camp into the Pōhakuloa Park and later Mauna Kea State Recreation Area between 1961 and 1970 probably destroyed most, if not all, evidence of the CCC-era cabins and their use.

In order to frame the discussion of the potential for existing architectural historic properties, the following presents a history of construction and demolition on the site. As described above in Section 3.2.2, a series of uses within what is now the Mauna Kea Recreation Area erected and then disassembled and moved or

demolished a series of buildings. The Civilian Conservation Corps (CCC) occupation of the area involved a camp built in 1935 with a cluster of buildings and tents that included a recreation/dining hall, two bunkhouses, two cottages, seven cabins, and seven outbuildings. The camp was located in what is now the open space between the current Headquarters Building and the current Recreation/Dining Hall. After the end of the CCC programs and World War II, the CCC facilities at Pōhakuloa were primarily used for lodging by Territorial Division of Forestry and Fish and Game staff, sheep and bird hunters, and other members of the public. In 1954, the Division of Territorial Parks was created, and the former CCC facilities became part of Pohakuloa Park, also called "Pohakula Hunting Lodge". The division began a series of improvements that would eventually replace the existing CCC cabins with all new buildings. No physical evidence of the original CCC structures remain, as they were removed by 1968.

Many of the details of construction of the new buildings were recorded in the drawings created for each of the several phases of construction at Pohakuloa Park. Some of these drawings were drafted using reproductions of original drawings from the 1960s taped to the new sheets, and so provide images from "as-built" drawings of many of the park buildings. The first of these improvements was a picnic area south of the Saddle Road from CCC cabins. In 1961, major improvements to the Park began with the addition of new cabins. The first three cabins (illustrated in Figures 15 and 16 of Appendix 3), variously called the "Housekeeping," "Family," or "Vacation" cabins, were built northeast of the former CCC complex, followed by two more (Cabins 4 and 5) in the following year. These five identical cabins, built on post-and-pier foundations, were prefabricated cedar structures manufactured by Loxide Structures, Incorporated, of Tacoma, Washington. The cabins were roofed with cedar shakes (which were replaced with corrugated metal in 1989) and each included a Thurman brand pre-fabricated fireplace inside the main room. Each of these cabins is named after a native Hawaiian plant as illustrated by a wooden plaque near its door with the plant name. In 1963, the existing comfort station was built, using a combination of fir, pine, and hollow tile. The exterior of the building was faced with a lava rock veneer, and like the cabins had a cedar-shake roof (also replaced in 1989) with corrugated metal and plastic skylights. With the construction of the Comfort Station, the park's picnic area was relocated from south of Saddle Road to its present location.

Acting on a report developed in the early days of statehood, the State Parks Division made extensive changes to the recreation area's facilities and infrastructure between 1966 and 1970. In the first year of the project, two "Group Cabins", officially called "4-Unit Cabins A and B," with four bedrooms and bathrooms each were built north of the CCC recreation/dining hall, and a new, smaller Recreation and Dining Hall was added just to the west of the Group Cabins. The walls of these buildings were constructed on post-and-pier foundations with 1" x 8" vertical tongue-and-groove Douglas fir siding over horizontal 1" x 8" Douglas fir bevel siding, and like the Vacation Cabins, were topped with cedar-shake roofs. The Group Cabins had fireplace units in each of the bedrooms. Echoing the appearance of the comfort station's exterior walls, the Recreation/Dining Hall's chimney was clad in a lava-slab veneer. As with the earlier buildings. The dirt roads connecting the "Vacation Cabins" to the Saddle Road were also paved at this time.

As discussed previously, between 1968 and 1970, the old CCC buildings were demolished. They were replaced with three new buildings. Construction began with the addition of two parking lots on the western side of the recreation area and a paved road connecting them to the recreation area entrance.

Then, a new headquarters building, caretaker's cabin, and a storage building were constructed. Each of these were pre-fabricated by Pan-Abode Company in Washington State. The two "Family" cabins (now the ADA accessible cabins) were also built near the cluster of vacation cabins on the other side of the recreation area. These cabins, like the other new buildings, were prefabricated tongue-in-groove cedar kit cabins supplied by the Pan-Abode Company. During these periods of construction, landscaping, sprinklers, electrical connections, and amenities like picnic tables, open fireplaces, and water outlets in the new picnic area were also added.

Over the next four decades, the Division of State Parks maintained and upgraded the park facilities. Major renovations to the camp buildings involved a re-roofing project completed in 1991. During that project, the cedar shake roofs on all recreation area buildings were replaced with metal roofs, and fireplaces were removed from the cabins. A project completed in 2004 brought some of the buildings into compliance with the Americans with Disabilities Act of 1991. Ramps were added to the two Family Cabins, and renovations to their kitchens, bathrooms, and interior spaces involved adding an extension on the back of the cabins. Accessible facilities, built as a hollow tile addition, were also added to the Comfort Station. Ramps have also been added to the Recreation/Dining Hall and the Headquarters Buildings. Upgrades to the water and wastewater systems involved the addition of storage tanks above the camp (outside the project site) and connecting waterlines within the park. An upgrade of the recreation area's wastewater system in 2007 installed septic tanks and leach fields for recreation area cabins, the Comfort Station, and the Recreation/Dining Hall, which also received an ADA accessible ramp after that project was completed. As this EA was being prepared, roads and parking lots were being replaced.

Existing Historic Properties

Archaeological fieldwork under the direction of Robert Rechtman, Ph.D. was conducted on November 2, 2014, by Benjamin Barna, Ph.D., and Lauren Kepa'a, and again on January 20, 2015, by Dr. Barna. Fieldwork consisted of a pedestrian survey with 100 percent coverage of the project site. The survey crew walked in systematic sweeps paralleling the survey area boundaries with spacing between crew members of no more than 20 meters. Visibility of the ground surface was very good throughout the area. Mapping of the project site, including existing buildings and other structures (e.g., sidewalks and roads) was conducted by Engineering Partners. Buildings and structures within the MKRA were photographed and elevation and specific construction details were recorded as warranted. This study was undertaken in accordance with Hawai'i Administrative Rules 13§13–275, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawai'i Administrative Rules 13§13–276. Compliance with the above standards is sufficient for meeting the initial historic preservation review process requirements of both the Department of Land and Natural Resources and the County of Hawai'i Planning Department.

The conclusions of the survey are that no archaeological or architectural historic properties are present. Six architectural resources at the project site (Vacation Cabins 1-5 and the Comfort Station) have reached the 50-year age threshold to be considered as potential "historic properties" under HRS §6E-2. Review of the documented improvements to these buildings indicate significant alterations to the buildings during the last thirty years. As determined in consultation with the acting SHPD Architecture Branch Chief, none

of the historic buildings are significant. Given this assessment, the survey recommended "no historic properties affected" in accordance with HAR §13-275-6(e).

Impacts and Mitigation Measures

Given the lack of historic properties, the project would have no impact upon this category of resources. The archaeological and archaeological assessment survey was officially transmitted to the State Historic Preservation Division (SHPD) for review, comment and concurrence on xxx, 2015. The Final EA will report on this review.

In the unlikely event that archaeological resources or human remains are encountered during future development activities within the project site, contract specifications will require that work in the immediate area of the discovery shall be halted and DLNR-SHPD contacted as outlined in Hawai'i Administrative Rules 13§13-275-12.

3.3 Infrastructure

3.3.1 Utilities

Existing Facilities and Services and Impacts

Electrical power to the MKRA project site is supplied by Hawai'i Electric Light, a privately owned utility company regulated by the State Public Utilities Commission, via its island-wide distribution network. Telephone service is available from Hawaiian Telcom. The Proposed Action utilizes and modifies existing internal electrical and telephone infrastructure but will not have any effect on these utilities.

No municipal wastewater system is present in the area, and the site utilizes individual wastewater units, as shown in the Site Plan. No changes to the wastewater system are required.

Currently, potable water is hauled from Hilo by certified commercial potable water haulers, typically with a 5,000-gallon tank size, to small water tanks located adjacent to the HQ and existing comfort station. This supplies water for hand washing. Non-potable water is obtained from a long-standing water system that serves various users in the Pohakuloa area, including the MKRA, DOFAW, DOCARE, the U.S. Army and, in the future, the Department of Transportation baseyard. This water has been used by these agencies for animal watering, outside washing and cleaning, toilets and sinks, and irrigation. The source is a pipeline from Pohakuloa Springs that was originally installed over a century ago for ranching water needs. The water is stored in one 1.0 million gallon (MG) tank and two 0.5 MG tanks.

The project involves the following improvements to both the non-potable and potable water systems:

- Connect to the existing non-potable waterline in the vicinity of the pump house.
- Construct a new waterline to the pump house, which will be rebuilt and where a new pump with a hydro-pneumatic tank will be installed to help pressurize the water system.

- Install a new non-potable waterline distribution main to the main part of the MKRA that will allow connections of new building service laterals to existing buildings.
- Construct a new 25,000 to 50,000 gallon potable water tank adjacent to the pump house.
- Install a new in-fill line with a pump to allow commercial water haulers to fill the new potable water storage tank.
- Install a new chlorination and pressurization system. The system will inject chlorine into the water as it is being pumped into the storage tank. The water will then be directed into pump room where it will be pressurized via a new pump with a hydro-pneumatic tank. As the water leaves the pump room and flows towards the park site, a chlorine analyzer on the outlet waterline will determine if additional treatment of the water is needed. If additional chlorination is needed, the analyzer will send a signal to the chlorination system to inject more chlorine into the storage tank.
- Install a new potable waterline distribution main to the main part of the MKRA that will allow connections of new building service laterals to existing buildings.
- Install a new fire protection tank and standpipe.

A key element of the project is improving the reliability of the water system and restoring the level of recreational use at the MKRA as well as accommodate drive-by traffic from the Saddle Road.

3.3.2 Roadways and Traffic

Existing Facilities, Impacts and Mitigation Measures

The site is accessed via a two-lane driveway from the Daniel K. Inouye Highway, State Route (SR) 200 (see Figures 1-3). Left-turn and right-turn lanes off SR 200 already exist, and no modifications or improvements to access are necessary. Currently, most traffic in and out of the site is from passing motorists taking a bathroom break. Increased use of the site that will be enabled because of cabin refurbishment as well as modest visitor facility improvement will create additional traffic, but no more than existed prior to the cabins becoming dilapidated and unusable. No traffic impacts are expected. In a letter of November 24, 2014 (see Appendix 1a for full text), the Hawai‘i County Police Department stated that it did not anticipate any significant impact to traffic or other public safety concerns.

3.4 Secondary and Cumulative Impacts

The Proposed Action will not involve any secondary impacts, such as population changes or “side effects” on other public facilities.

Cumulative impacts result when implementation of several projects that individually have limited impacts combine to produce more severe impacts or conflicts in mitigation measures. The Proposed Action will have limited and temporary construction period impacts, including traffic.

A number of projects in the central part of the Island of Hawai‘i will or may be occurring over the next two to ten years. These include:

- The Thirty Meter Telescope northwest of the summit of Mauna Kea;

- Well drilling at Pohakuloa Training Area (PTA), likely near the cantonment area;
- Other potential infrastructure additions at PTA, although current U.S. Army plans at PTA and throughout the State of Hawai‘i are in flux and no details are available;
- The Saddle Road Extension from the current western terminus of the Daniel K. Inouye Highway to Queen Ka‘ahumanu Highway;
- Saddle Road Improvements from mile markers 5.5 to 11; and
- The Department of Hawaiian Home Lands ‘Aina Mauna Project, which will bring ecotourism to the vicinity of the Mauna Kea Access Road.

None of these projects is likely to cause direct impacts to land in the vicinity of the MKRA. However, during construction each would involve traffic on Hawai‘i Island highways, including the Daniel K. Inouye Highway, that could interact with traffic from MKRA improvements. It is unlikely, but possible, that it may be necessary to schedule construction at the MKRA to avoid conflict with other construction projects, particularly those that involve transport of large or heavy components, equipment or machinery. At this time, the schedules and even likelihoods of all these projects are somewhat uncertain, and it is not certain whether there will be any actual potential for adverse traffic interaction. Prior to MKRA construction, P&R will assess the status of other projects and determine the need for coordination.

Operationally, no adverse cumulative impacts are foreseen, although the ongoing growth in use of the Saddle area by visitors and residents that will continue to grow with features such as the Aina Mauna facilities points to a need for adequate restroom facilities at the MRKA .

3.5 Required Permits and Approvals

The following permits and approvals would be required:

- National Pollutant Discharge Elimination System Permit (State DOH)
- Conservation District Use Permit (State DLNR)
- Grading and Grubbing Permits (County DPW)
- Building Permits and Plan Approval (County DPW and Planning)
- Chapter 6e, HRS, determination from State Historic Preservation Division on historic property effects
- Disability and Communication Access Board (DCAB) plan review and approval
- Consistency with Section 6(f)(3) of the Land and Water Conservation Fund Act approval from DLNR Division of State Parks

3.6 Consistency with Government Plans and Policies

3.6.1 Hawai‘i State Plan

Adopted in 1978 and last revised in 1991 (Hawai‘i Revised Statutes, Chapter 226, as amended), the Plan establishes a set of themes, goals, objectives and policies that are meant to guide the State’s long-run growth and development activities. The three themes that express the basic purpose of the *Hawai‘i State*

Plan are individual and family self-sufficiency, social and economic mobility and community or social well-being. The Proposed Action would promote these goals by providing an appropriate site for additional recreational and educational opportunities for the project area, thereby enhancing quality-of-life and community and social well-being.

3.6.2 Hawai‘i County General Plan, CDP and Zoning

The *General Plan* for the County of Hawai‘i is a policy document expressing the broad goals and policies for the long-range development of the Island of Hawai‘i. The plan was adopted by ordinance in 1989 and revised in 2005 (Hawai‘i County Department of Planning). The *General Plan* itself is organized into thirteen elements, with policies, objectives, standards, and principles for each. There are also discussions of the specific applicability of each element to the nine judicial districts comprising the County of Hawai‘i. Most relevant to the proposed project are the following Goal and Policies, and Courses of Action of particular chapters of the General Plan:

HISTORIC SITES

6.2 GOALS

(a) Protect, restore, and enhance the sites, buildings, and objects of significant historical and cultural importance to Hawai‘i.

(b) Appropriate access to significant historic sites, buildings, and objects of public interest should be made available.

Discussion: The Proposed Action has involved appropriate inventory survey to determine the presence and significance of historic sites and the appropriate treatment to ensure no adverse effects to significant historic sites. Therefore the action satisfies relevant goals, policies, and courses of action for historic sites in Hawai‘i County.

NATURAL BEAUTY

7.2 GOALS

(a) Protect, preserve and enhance the quality of areas endowed with natural beauty, including the quality of coastal scenic resources.

(b) Protect scenic vistas and view planes from becoming obstructed.

(c) Maximize opportunities for present and future generations to appreciate and enjoy natural and scenic beauty.

7.3 POLICIES

(a) Increase public pedestrian access opportunities to scenic places and vistas.

(d) Access easement to public or private lands that have natural or scenic value shall be provided or acquired for the public.

(i) Do not allow incompatible construction in areas of natural beauty.

Discussion: The Proposed Action involves improvement of a recreation area used by the public to enjoy the highly scenic high elevation areas of the Saddle region. It involves improvement of dilapidated facilities that will restore not only their appearance but also their function and utility. It would not degrade scenic areas or vantages and would not be inconsistent with the natural beauty of the area. Therefore the

action is consistent with relevant goals, policies, and courses of action of the Natural Beauty section of the Hawai‘i County General Plan.

NATURAL RESOURCES

8.2 GOALS

(a) Protect and conserve the natural resources from undue exploitation, encroachment and damage.

(b) Provide opportunities for recreational, economic, and educational needs without despoiling or endangering natural resources.

(c) Protect and promote the prudent use of Hawaii's unique, fragile, and significant environmental and natural resources.

(e) Protect and effectively manage Hawaii's open space, watersheds, shoreline, and natural areas.

8.3 POLICIES

(b) Encourage a program of collection and dissemination of basic data concerning natural resources.

(h) Encourage public and private agencies to manage the natural resources in a manner that avoids or minimizes adverse effects on the environment and depletion of energy and natural resources to the fullest extent.

(i) Encourage an overall conservation ethic in the use of Hawaii's resources by protecting, preserving, and conserving the critical and significant natural resources of the County of Hawaii.

(u) Ensure that activities authorized or funded by the County do not damage important natural resources.

Discussion: The project does not involve destruction of natural resources and is consistent with the goals, standards and policies of the Natural Resources chapter of the Hawai‘i County General Plan.

RECREATION

12.2 GOALS

(a) Provide a wide variety of recreational opportunities for the residents and visitors of the County.

(b) Maintain the natural beauty of recreation areas.

(c) Provide a diversity of environments for active and passive pursuits.

12.3 POLICIES

(a) Strive to equitably allocate facility-based parks among the districts relative to population, with public input to determine the locations and types of facilities.

(c) Recreational facilities shall reflect the natural, historic, and cultural character of the area.

(d) The use of land adjoining recreation areas shall be compatible with community values, physical resources, and recreation potential.

(g) Facilities for compatible multiple uses shall be provided.

(h) Provide facilities and a broad recreational program for all age groups, with special considerations for the handicapped, the elderly, and young children.

(i) Coordinate recreational programs and facilities with governmental and private agencies and organizations. Innovative ideas for improving recreational facilities and opportunities shall be considered.

(j) Develop local citizen leadership and participation in recreation planning, maintenance, and programming.

(s) Consider alternative sources of funding for recreational facilities.

12.4 STANDARDS

(f) Parks for General Use:

• Centered around a major natural asset, such as a sandy beach, a prime forest, or a volcanic feature and includes historic sites whenever feasible.
• Designed to accommodate users from throughout the County.
• Beach parks provide opportunities for swimming/sunbathing, surfing, camping, fishing, boating, nature study, and other pastimes. Every section of the island should be adequately served. Facilities depend on size and intensity of use but should include: restrooms with showers; picnic facilities; a defined tent camping area when allowed; drinking water; adequate parking; pavilions of various sizes; and lifeguard facilities.
• Wilderness and wildland areas are remote from population centers and have limited access by jeep, hiking, biking, or horseback.
• Facilities include: trails and unimproved roads; designated hunting and fishing areas; designated conservation areas for nature study and other passive activities; and wilderness camp sites.

The General Plan notes on Page 12-14 that: "Two wildland State parks provide facilities for hiking, picnicking, camping and hunting. Cabins are available for overnight use. Mauna Kea State Recreation Area is 20 acres in size and located in the saddle between Mauna Kea and Mauna Loa. From this park, there is a hiking trail to the summit of Mauna Kea. During the winter months, the summit of Mauna Kea provides opportunities for skiing and other snow sports."

Discussion: The Proposed Action represents an improvement to recreational facilities that will promote use and enjoyment of high elevation areas for residents and visitors in a manner that fulfills and is consistent with all recreational goals, policies, objectives and standards.

The *Hawai'i County General Plan Land Use Pattern Allocation Guide (LUPAG)*. The LUPAG map component of the *General Plan* is a graphic representation of the Plan's goals, policies, and standards as well as of the physical relationship between land uses. It also establishes the basic urban and non-urban form for areas within the planned public and cultural facilities, public utilities and safety features, and transportation corridors. According to the General Plan Land Use Pattern Allocation Guide Map, it is a designated Conservation Area – "Forest and water reserves, natural and scientific preserves, areas in active management for conservation purposes, areas to be kept in a largely natural state, with minimal facilities consistent with open space uses, such as picnic pavilions and comfort stations, and lands within the State Land Use Conservation District."

Hāmākua Community Development Plan. The project site is located in the Hāmākua Community Development Plan (CDP) planning area. However, this CDP has not yet been adopted and is currently in the planning process. According to elements available for review http://www.hawaiicountycdp.info/hamakua-cdp/draft-hamakua-cdp-documents), the Hāmākua CDP noted the importance of resource management documents concerning the high elevation parts of Hāmākua, including The Nature Conservancy's 1998 *Hawaiian High Islands Ecoregion Plan*; DLNR's 2008 *Mauna Kea Watershed Management Plan* and 2012 *Rain Follows the Forest Plan*; and various other soil conservation and ecological plans. The County's plans to improve the recreational resources is highly

consistent with recreational goals cited in the current planning document, and not inconsistent with any aspect of the plan to date.

Hawai'i County Zoning and SMA. There is no County zoning for SLU designated Conservation lands. The property is not situated within the County's Special Management Area (SMA).

3.6.3 Hawai'i State Land Use Law

All land in the State of Hawai'i is classified into one of four land use categories – Urban, Rural, Agricultural, or Conservation – by the State Land Use Commission, pursuant to Chapter 205, HRS. The property is in the State Land Use Conservation District, Resource subzone. The Proposed Action of continuing use the project site for a park is consistent with intended uses for this Land Use District, with appropriate approvals. According to a letter from the DLNR Office of Conservation and Coastal Lands (OCCL) of January 29, 2015 (see Appendix 1a for full text):

> "The OCCL notes that the project area is located within the Conservation District Resource subzone. As the MKRA was established around the 1930's, prior to the advent of the Conservation State Land Use District, the MKRA is considered a nonconforming use. Based on the preliminary list of proposed projects, we anticipate that the project will require a Departmental Conservation District Use Permit (CDUP) pursuant to Hawai'i Administrative Rules (HAR) 13-5-22, P-8 STRUCTURES AND LAND USES, EXISTING (C-1), Moderate alteration of existing structures, facilities, uses, and equipment."

This Draft EA is part of the process that will help determine the appropriate permitting path for the project. The Final EA will report on the review by DLNR-OCCL.

3.6.4 U.S. Department of Interior Land and Water Conservation Fund Requirements

When it was still designated the Mauna Kea State Park, the site received funding under Section 6(f)(3) of the Land and Water Conservation Fund Act, which is administered by the U.S. Department of the Interior, National Park Service. This funding included provisions that the park was to remain open to the public for outdoor recreation in perpetuity. As the State of Hawai'i's administrator of the LWCF Program, DLNR Division of State Parks is required to be consulted on any future development plans for lands that received such funds, to insure compliance with the Section 6(f)(3) requirements. It is the intent of P&R to continue uses that are in keeping with these provisions, and P&R is consulting with DLNR Division of State Parks to ensure compliance.

PART 4: DETERMINATION

Based on the information to this point, the Hawai‘i County Department of Parks and Recreation expects to determine that the proposed project will not significantly alter the environment. It is therefore anticipated that an Environmental Impact Statement is not warranted and that the Department will issue a Finding of No Significant Impact (FONSI). A final determination will be made by the Hawai‘i County Department of Parks and Recreation, in consultation with the Hawai‘i State Department of Land and Natural Resources, after consideration of comments on the Draft EA.

PART 5: FINDINGS AND REASONS

Chapter 11-200-12, Hawai‘i Administrative Rules, outlines those factors agencies must consider when determining whether an Action has significant effects:

1. *The proposed project will not involve an irrevocable commitment or loss or destruction of any natural or cultural resources.* No valuable natural or cultural resources would be committed or lost by the project, which would not involve adverse impacts to significant historic sites or native species or habitat.
2. *The proposed project will not curtail the range of beneficial uses of the environment.* The Proposed Action expands and in no way curtails beneficial uses of the environment.
3. *The proposed project will not conflict with the State's long-term environmental policies*. The State’s long-term environmental policies are set forth in Chapter 344, HRS. The broad goals of this policy are to conserve natural resources and enhance the quality of life. The Proposed Action is minor, environmentally beneficial, and fulfills aspects of these policies calling for an improved social environment. It is thus consistent with all elements of the State’s long-term environmental policies.
4. *The proposed project will not substantially affect the economic or social welfare of the community or State.* The Proposed Action will benefit the social welfare of the community and State by allowing for use of the property for public benefit.
5. *The proposed project does not substantially affect public health in any detrimental way.* The Proposed Action will promote public health through provision of recreational opportunities.
6. *The proposed project will not involve substantial secondary impacts, such as population changes or effects on public facilities*. No secondary effects are expected to result from the Proposed Action, which would not induce in-migration or affect public facilities.
7. *The proposed project will not involve a substantial degradation of environmental quality*. The Proposed Action is minor and environmentally benign, and would thus not contribute to environmental degradation with adherence to Best Management Practices.
8. *The proposed project will not substantially affect any rare, threatened or endangered species of flora or fauna or habitat.* The project site supports both native and non-native vegetation, but no rare, threatened or endangered species of flora or fauna would be affected, given project mitigation to avoid effects to wide-ranging endangered vertebrate species.
9. *The proposed project is not one which is individually limited but cumulatively may have considerable effect upon the environment or involves a commitment for larger actions.* The Proposed Action is not related to other activities in the region in such a way as to produce adverse cumulative effects or involve a commitment for larger actions.

10. *The proposed project will not detrimentally affect air or water quality or ambient noise levels.* Slight increases in noise and effects to air quality will occur, primarily during construction, but below levels that would require mitigation. No sensitive receptors for air quality or noise impacts are present.
11. *The project does not affect nor would it likely to be damaged as a result of being located in an environmentally sensitive area such as a flood plain, tsunami zone, erosion-prone area, geologically hazardous land, estuary, fresh water, or coastal area.* Although the project site is in an area with volcanic and seismic risk, the entire Island of Hawai‘i shares this risk, and the project is not imprudent to undertake.
12. *The project will not substantially affect scenic vistas and viewplanes identified in county or state plans or studies.* The Proposed Action would not adversely impact any scenic sites or viewplanes.
13. *The project will not require substantial energy consumption*. The Proposed Action involves only minor use of energy. The continuing use of non-potable water from the existing system will save energy that would otherwise be expended to haul water from Hilo in tanker trucks.

For the reasons above, the Proposed Action would not have any significant effect in the context of Chapter 343, Hawai‘i Revised Statues and section 11-200-12 of the State Administrative Rules.

REFERENCES

Alexander, W. 1892. The Ascent of Mauna Kea. *Pacific Commercial Advertiser*, September 14. Page 1.

Banko, W. E. 1980. "Population Histories – Species Accounts Seabirds: Newell's Shearwater (ʻAʻo)." Cooperative National Park Resources Studies Unit, University of Hawaiʻi at Manoa, Department of Botany, Technical Report #5A.

Bautista, O., S. Wilkinson, A Mitchell, and H. Hammatt. 2012. *Archaeological Inventory Survey for the Baseyard at the Mauna Kea State Recreation Area, Kaʻohe Ahupuaʻa, Hāmākua District, Hawaiʻi Island TMK: [3] 4-4-016:003*. Prepared for R.M. Towill.

Bryan, L. 1938. "CCC on the Island of Hawaii." *Paradise of the Pacific* 50(5):15.

_____. 1939. "Lake Waiau of Hawaii." *Paradise of the Pacific* 51(2):11.

Camp, R. J. and P. C. Banko. 2012. *Palila abundance estimates and trends*. Technical Report HCSU-033. Hawaii Cooperative Studies Unit, Hilo, HI.

Cole, F. R., A. C. Medeiros, L. L. Loope and W. W. Zuehlke. 1992. Effects of the Argentine Ant on Arthropod Fauna of Hawaiian High-Elevation Shrubland. *Ecology* 73(4): 1313-1322.

Cordy, R. 1994. *A Regional Synthesis of Hāmākua District, Island of Hawaiʻi.* Historic Preservation Division, Department of Land and Natural Resources, State of Hawaiʻi.

_____. 2000. *Exalted Sits the Chief: The Ancient History of Hawaiʻi Island*. Mutual Publishing, Honolulu Cuddihy L.W. and Stone C.P. 1990. *Alteration of Native Hawaiian Vegetation*. Cooperative National Park Resources Studies Unit, University of Hawaiʻi, Honolulu.

Day, R. H., B. Cooper, and T. C. Telfer. 2003. *Decline of Townsend's (Newell's) Shearwaters (Puffinus auricularis newelli) on Kauai, Hawaii*. The Auk 120: 669-679.

Federal Highway Administration, Central Federal Lands Highway Division (FHWA-CFLHD). 1999. *Final Environmental Impact Statement, Saddle Road (State Route 200) Mamalahoa Highway (State Route 190) to Milepost 42*. Denver, CO.

Fornander, A. 1880. *An Account of the Polynesian Race*. Trubner: London.

_____. 1969. *An Account of the Polynesian Race: Its Origins and Migrations*. Tokyo: Charles E. Tuttle Co., Inc.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte, 2013: Online Rainfall Atlas of Hawaiʻi. *Bull. Amer. Meteor. Soc.*, doi: 10.1175/BAMS-D-11-00228.1.

Gagne, W., and L. Cuddihy. 1990. “Vegetation,” pp. 45-114 in W.L. Wagner, D.R. Herbst, and S.H. Sohmer, eds., *Manual of the Flowering Plants of Hawai‘i*. 2 vols. Honolulu: University of Hawai‘i Press.

Gorresen M.P., Bonaccorso F.J., Todd C.M., Montoya-Aiona K., and K. Brinck. 2013. *A Five-Year Study of Hawaiian Hoary Bat (Lasiurus Cinereus Semotus) Occupancy on the Island of Hawai‘i*. Hawai`i Cooperative Studies Unit Technical Report HCSU-041. Hawai`i National Park, HI.

Hammatt, H., and D. Shideler. 1991. *Archaeological Assessment and Sensitivity Map of the Pōhakuloa Training Area (PTA), Hawai‘i Island*. Prep. for Richard Sato and Associates. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

_____. 2001. *Archaeological Inventory Survey for the Proposed Pohakuloa Training Area Base Camp Master Plan and Bradshaw Army Airfield Improvements*. Prep. for Townscape, Inc. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Handy, E., and E. Handy (with M. Pukui). 1972.*Native Planters in Old Hawai‘i*. B.P. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu.

Hawai‘i County Planning Department. 2005. *The General Plan, County of Hawai‘i*. Hilo.

Hawaii Wildfire Management Organization (HWMO). 2007. *Community Wildfire Protection Plan for Northwest Hawaii Island.* With support from the Fire Management Program of Hawai‘i State Department of Land and Natural Resources, Division of Forestry and Wildlife.

Heliker, C. 1990. *Volcanic and Seismic Hazards on the Island of Hawai‘i.* Washington: U.S. GPO.

Jacobs. D. 1994. Distribution and Abundance of the Endangered Hawaiian Hoary Bat, *Lasiurus cinereus semotus*, on the Island of Hawai‘i. *Pacific Science* 48(2): 193-200.

Johnston, W. 1976. Winter Sports in Hawaii. *Hawaii Skier*. July:6-7.

Kamakau, S. 1976. The Works of the People of Old: Na hana a ka Po‘e Kahiko. *B.P. Bishop Museum Special Publication 61*. Bishop Museum Press, Honolulu.

_____. 1991. *Tales and Traditions of the People of Old*. Honolulu: Bishop Museum Press.

_____. 1992 (rev. ed). *Ruling Chiefs of Hawaii*. Honolulu: The Kamehameha Schools Press.

Kirch, P. 1984. *Evolution of the Polynesian Chiefdoms*. Cambridge, UK: Cambridge University Press..

_____. 1985. *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory.* Honolulu: University of Hawai‘i Press.

_____. 1990. Monumental Architecture and Power in Polynesian Chiefdoms: A Comparison of Tonga and Hawaii. *World Archaeology* 22(2).

_____. 2011. When did the Polynesians Settle Hawai‘i? A Review of 150 Years of Scholarly Inquiry and a Tentative Answer. *Hawaiian Archaeology* Vol. 12:3-26.

Krushelnycky, P. D., S. M. Joe, A. C. Medeiros, C. C. Daehler and L. L. Loope. 2005. The role of abiotic conditions in shaping the long-term patterns of a high-elevation Argentine ant invasion. Diversity and Distributions 11(4): 319-331.

Leonard, D. L., Jr., P. C. Banko, K. W. Brinck, C. Farmer, and R. J. Camp. 2008.”Recent surveys indicate rapid decline of Palila population.” *‘Elepaio* 68:27–30.

Maly, K., and O. Maly. 2005. *Mauna Kea-Ka Piko Kaulana O Ka ‘Āina (Mauna Kea-The Famous Summit of the Land):* A Collection of Native Traditions, Historical Accounts, and Oral History Interviews for: Mauna Kea, the Lands of Ka‘ohe, Humu‘ula, and the ‘Āina Mauna on the Island of Hawai‘i *Kumu Pono* Associates Study HiMK67-OMKM (033005b). Prep. for the Office of Mauna Kea Management (University of Hawai‘i-Hilo).

Meyer, A. 2003. *Ho‘oulu: Our Time of Becoming.* Honolulu: ‘Ai Pōhaku Press.

Mitchell, ‘A., M. Wheeler, and H. Hammatt. 2012. *A Cultural Impact Assessment for the Proposed Saddle Road Maintenance Base Yard at the Mauna Kea State Recreation Area, Ka‘ohe Ahupua‘a, District of Hāmākua, Island of Hawai‘*i. TMK: (3) 4-4-016:003. Prep. for R.M. Towill Corporation

McCoy, P. 1978. Draft, The B.P. Bishop Museum Mauna Kea Adze Quarry Project. On file, Historic Preservation Division, Department of Land and Natural Resources, State of Hawai‘i, Honolulu (H-60).

_____. 1984. *Archaeological Reconnaissance of Hopukani, Waihu, and Liloe Springs, Mauna Kea, Hawai‘i.* Prepared for U.S. Army Corps of Engineers. Bernice P. Bishop Museum, Honolulu, Hawai‘i.

Olson, S.L. and H.F. James. 1982. “Prodromus of the fossil avifauna of the Hawaiian Islands.” *Smithsonian Contributions to Zoology* 365:1-59.

Paradise of the Pacific. 1948. Hunting on the big island of Hawaii—Sheep, wild goats, and pigs by thousands create hunters’ paradise. *Paradise of the Pacific* May: 26-27.

Pukui, M.K., Elbert, S.H., and E.T. Mookini. 1976. *Place Names of Hawaii*. Honolulu: University of Hawai‘i Press.

Quinn, D. 2007. Request for Determination of “No Historic Properties Affected,” Wastewater System Improvements, Mauna Kea State Recreation Area Ka‘ohe, Hāmākua , Hawai‘i. TMK: (3) 4-4-014:003(por.). Memorandum on file at State Historic Preservation Division

U.S. Army Garrison, Hawaii, HQ. 2003. *Integrated Wildland Fire Management Plan Oahu and Pohakuloa Training Areas*. Prep. by the Center for Environmental Management of Military Lands, Fort Collins, Colorado.

U.S. Dept. of Commerce, Economics and Statistics Administration, Bureau of the Census, 2010, http://factfinder2.census.gov/.

U.S. Fish and Wildlife Service (USFWS). 1967. *Office of the Secretary; native fish and wildlife; endangered species; notices*. Federal Register 37(32):4001.

_____. 1977. *Determination of critical habitat for six endangered species*. Federal Register 42:40685-40690.

_____. 2015. *USFWS Threatened and Endangered Species System (TESS).* Washington: GPO. http://ecos.fws.gov/tess_public/.

U.S. Soil Conservation Service. 1973. *Soil Survey of Island of Hawai'i, State of Hawai'i.* Washington: U.S.D.A. Soil Conservation Service.

University of Hawai'i at Hilo, Dept. of Geography. 1998. *Atlas of Hawai'i.* 3rd ed. Honolulu: University of Hawai'i Press.

Wetterer, J. K., P. C. Banko, L. P. Laniawe, J. W. Slotterback and G. J. Brenner. 1998. Nonindigenous ants at high elevations on Mauna Kea, Hawaii. *Pacific Science* 52(3): 228-236.

Wolfe, E.W., and J. Morris. 1996. *Geologic Map of the Island of Hawai'i.* USGS Misc. Investigations Series Map i-2524-A. Washington, D.C.: U.S. Geological Survey.

Zimmerman, E. C. 1941. Argentine ants in Hawaii. *Proceedings of the Hawaiian Entomological Society* 11(1): 108.

Mauna Kea Recreation Area Improvements

Environmental Assessment

APPENDIX 1a
Comments in Response to Early Consultation

[This page intentionally left blank]

William P. Kenoi
Mayor

Harry S. Kubojiri
Police Chief

Paul K. Ferreira
Deputy Police Chief

County of Hawai`i

POLICE DEPARTMENT
349 Kapi'olani Street • Hilo, Hawai'i 96720-3998
(808) 935-3311 • Fax (808) 961-2389

November 24, 2014

Mr. Ron Terry, Principal
Geometrician Associates
P. O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

SUBJECT: EARLY CONSULTATION FOR ENVIRONMENTAL ASSESSMENT FOR MAUNA KEA RECREATION AREA IMPROVEMENTS BY HAWAII COUNTY DEPARTMENT OF PARKS AND RECREATION, TMK (3) 4-4-016:003 (POR.)

Staff, upon reviewing the provided documents, does not anticipate any significant impact to traffic and/or other public safety concerns.

Thank you for allowing us the opportunity to comment.

If you have any questions, please contact Major Randy Apele, Area I Operations Bureau, at 961-2341.

Sincerely,

HENRY J. TAVARES, JR.
ASSISTANT POLICE CHIEF
AREA I OPERATIONS BUREAU

RA:lli
140744

William P. Kenoi
Mayor

Darren J. Rosario
Fire Chief

Renwick J. Victorino
Deputy Fire Chief

County of Hawai'i
HAWAI'I FIRE DEPARTMENT
25 Aupuni Street • Room 2501 • Hilo, Hawai'i 96720
(808) 932-2900 • Fax (808) 932-2928

November 24, 2014

Mr. Ron Terry
Geometrician Associates, LLC
PO Box 396
Hilo, Hawai'i 96721

Dear Mr. Terry,

RE: Early Consultation for Draft Environmental Assessment for Mauna Kea Recreation Area Improvements by Hawaii County Department of Parks and Recreation
TMK (3) 4-4-016:003 (por.)

In regards to the above-mentioned Early Consultation for Draft Environmental Assessment, the following shall be in accordance:

NFPA 1, UNIFORM FIRE CODE, 2006 EDITION
Note: NFPA 1, Hawai'i State Fire Code with County amendments. County amendments are identified with a preceding "C~" of the reference code.

Chapter 18 Fire Department Access and Water Supply

18.1 General. Fire department access and water supplies shall comply with this chapter.

For occupancies of an especially hazardous nature, or where special hazards exist in addition to the normal hazard of the occupancy, or where access for fire apparatus is unduly difficult, or areas where there is an inadequate fire flow, or inadequate fire hydrant spacing, and the AHJ may require additional safeguards including, but not limited to, additional fire appliance units, more than one type of appliance, or special systems suitable for the protection of the hazard involved.

18.1.1 Plans.

18.1.1.1 Fire Apparatus Access. Plans for fire apparatus access roads shall be submitted to the fire department for review and approval prior to construction.

18.1.1.2 Fire Hydrant Systems. Plans and specifications for fire hydrant systems shall be submitted to the fire department for review and approval prior to construction.

C~ 18.1.1.2.1 Fire Hydrant use and Restrictions. No unauthorized person shall use or operate any Fire hydrant unless such person first secures permission or a permit from the owner or representative of the department, or company that owns or governs that water supply or system. Exception: Fire Department personnel conducting firefighting operations, hydrant testing, and/or maintenance, and the flushing and acceptance of hydrants witnessed by Fire Prevention Bureau personnel.

18.2 Fire Department Access.

18.2.1 Fire department access and fire department access roads shall be provided and maintained in accordance with Section 18.2.

18.2.2* Access to Structures or Areas.

18.2.2.1 Access Box(es). The AHJ shall have the authority to require an access box(es) to be installed in an accessible location where access to or within a structure or area is difficult because of security.

18.2.2.2 Access to Gated Subdivisions or Developments. The AHJ shall have the authority to require fire department access be provided to gated subdivisions or developments through the use of an approved device or system.

18.2.2.3 Access Maintenance. The owner or occupant of a structure or area, with required fire department access as specified in 18.2.2.1 or 18.2.2.2, shall notify the AHJ when the access is modified in a manner that could prevent fire department access.

18.2.3 Fire Department Access Roads. (*may be referred as FDAR)

18.2.3.1 Required Access.

18.2.3.1.1 Approved fire department access roads shall be provided for every facility, building, or portion of a building hereafter constructed or relocated.

18.2.3.1.2 Fire Department access roads shall consist of roadways, fire lanes, parking lots lanes, or a combination thereof.

18.2.3.1.3* When not more than two one- and two-family dwellings or private garages, carports, sheds, agricultural buildings, and detached buildings or structures 400ft^2 (37 m^2) or less are present, the requirements of 18.2.3.1 through 18.2.3.2.1 shall be permitted to be modified by the AHJ.

18.2.3.1.4 When fire department access roads cannot be installed due to location on property, topography, waterways, nonnegotiable grades, or other similar conditions, the AHJ shall be authorized to require additional fire protection features.

18.2.3.2 Access to Building.

18.2.3.2.1 A fire department access road shall extend to within in 50 ft (15 m) of at least one exterior door that can be opened from the outside that provides access to the interior of the building. Exception: 1 and 2 single-family dwellings.

18.2.3.2.1.1 When buildings are protected throughout with an approved automatic sprinkler system that is installed in accordance with NFPA 13, NFPA 13D, or NFPA 13R, the distance in 18.2.3.2.1 shall be permitted to be increased to 300 feet.

18.2.3.2.2 Fire department access roads shall be provided such that any portion of the facility or any portion of an exterior wall of the first story of the building is located not more than 150 ft (46 m) from fire department access roads as measured by an approved route around the exterior of the building or facility.

18.2.3.2.2.1 When buildings are protected throughout with an approved automatic sprinkler system that is installed in accordance with NFPA 13, NFPA 13D, or NFPA 13R, the distance in 18.2.3.2.2 shall be permitted to be increased to 450 ft (137 m).

18.2.3.3 Multiple Access Roads. More than one fire department access road shall be provided when it is determined by the AHJ that access by a single road could be impaired by vehicle congestion, condition of terrain, climatic conditions, or other factors that could limit access.

18.2.3.4 Specifications.

18.2.3.4.1 Dimensions.

C~ 18.2.3.4.1.1 FDAR shall have an unobstructed width of not less than 20ft with an approved turn around area if the FDAR exceeds 150 feet. **Exception:** FDAR for one and two family dwellings shall have an unobstructed width of not less than 15 feet, with an area of not less than 20 feet wide within 150 feet of the structure being protected. An approved turn around area shall be provided if the FDAR exceeds 250 feet.

C~ 18.2.3.4.1.2 FDAR shall have an unobstructed vertical clearance of not less then 13ft 6 in.

C~ 18.2.3.4.1.2.1 Vertical clearances may be increased or reduced by the AHJ, provided such increase or reduction does not impair access by the fire apparatus, and approved signs are installed and maintained indicating such approved changes.

18.2.3.4.1.2.2 Vertical clearances shall be increased when vertical clearances or widths are not adequate to accommodate fire apparatus.

C~ 18.2.3.4.2 Surface. Fire department access roads and bridges shall be designed and maintained to support the imposed loads (25 Tons) of the fire apparatus. Such FDAR and shall be comprised of an all-weather driving surface.

18.2.3.4.3 Turning Radius.

C~ 18.2.3.4.3.1 Fire department access roads shall have a minimum inside turning radius of 30 feet, and a minimum outside turning radius of 60 feet.

18.2.3.4.3.2 Turns in fire department access road shall maintain the minimum road width.

18.2.3.4.4 Dead Ends. Dead-end fire department access roads in excess of 150 ft (46 m) in length shall be provided with approved provisions for the fire apparatus to turn around.

18.2.3.4.5 Bridges.

18.2.3.4.5.1 When a bridge is required to be used as part of a fire department access road, it shall be constructed and maintained in accordance with county requirements.

18.2.3.4.5.2 The bridge shall be designed for a live load sufficient to carry the imposed loads of fire apparatus.

18.2.3.4.5.3 Vehicle load limits shall be posted at both entrances to bridges where required by the AHJ.

18.2.3.4.6 Grade.

C~ 18.2.3.4.6.1 The maximum gradient of a Fire department access road shall not exceed 12 percent for unpaved surfaces and 15 percent for paved surfaces. In areas of the FDAR where a Fire apparatus would connect to a Fire hydrant or Fire Department Connection, the maximum gradient of such area(s) shall not exceed 10 percent.

18.2.3.4.6.2* The angle of approach and departure for any means of fire department access road shall not exceed 1 ft drop in 20 ft (0.3 m drop in 6 m) or the design limitations of the fire apparatus of the fire department, and shall be subject to approval by the AHJ.

18.2.3.4.6.3 Fire department access roads connecting to roadways shall be provided with curb cuts extending at least 2 ft (0.61 m) beyond each edge of the fire lane.

18.2.3.4.7 Traffic Calming Devices. The design and use of traffic calming devices shall be approved the AHJ.

18.2.3.5 Marking of Fire Apparatus Access Road.

18.2.3.5.1 Where required by the AHJ, approved signs or other approved notices shall be provided and maintained to identify fire department access roads or to prohibit the obstruction thereof of both.

18.2.3.5.2 A marked fire apparatus access road shall also be known as a fire lane.

18.2.4* Obstruction and Control of Fire Department Access Road.

18.2.4.1 General.

18.2.4.1.1 The required width of a fire department access road shall not be obstructed in any manner, including by the parking of vehicles.

18.2.4.1.2 Minimum required widths and clearances established under 18.2.3.4 shall be maintained at all times.

18.2.4.1.3* Facilities and structures shall be maintained in a manner that does not impair or impede accessibility for fire department operations.

18.2.4.1.4 Entrances to fire departments access roads that have been closed with gates and barriers in accordance with 18.2.4.2.1 shall not be obstructed by parked vehicles.

18.2.4.2 Closure of Accessways.

18.2.4.2.1 The AHJ shall be authorized to require the installation and maintenance of gates or other approved barricades across roads, trails, or other accessways not including public streets, alleys, or highways.

18.2.4.2.2 Where required, gates and barricades shall be secured in an approved manner.

18.2.4.2.3 Roads, trails, and other accessways that have been closed and obstructed in the manner prescribed by 18.2.4.2.1 shall not be trespassed upon or used unless authorized by the owner and the AHJ.

18.2.4.2.4 Public officers acting within their scope of duty shall be permitted to access restricted property identified in 18.2.4.2.1.

18.2.4.2.5 Locks, gates, doors, barricades, chains, enclosures, signs, tags, or seals that have been installed by the fire department or by its order or under its control shall not be removed, unlocked, destroyed, tampered with, or otherwise vandalized in any manner.

18.3 Water Supplies and Fire Hydrants

18.3.1* A water supply approved by the county, capable of supplying the required fire flow for fire protection shall be provided to all premises upon which facilities or buildings, or portions thereof, are hereafter constructed, or moved into or within the county. When any portion of the facility or building is in excess of 150 feet (45 720 mm) from a water supply on a fire apparatus access road, as measured by an approved route around the exterior of the facility or building, on-site fire hydrants and mains capable of supplying the required fire flow shall be provided when required by the AHJ. For on-site fire hydrant requirements see section 18.3.3.

EXCEPTIONS:

1. When facilities or buildings, or portions thereof, are completely protected with an approved automatic fire sprinkler system the provisions of section 18.3.1 may be modified by the AHJ.
2. When water supply requirements cannot be installed due to topography or other conditions, the AHJ may require additional fire protection as specified in section 18.3.2 as amended in the code.
3. When there are not more than two dwellings, or two private garage, carports, sheds and agricultural. Occupancies, the requirements of section 18.3.1 may be modified by AHJ.

18.3.2* Where no adequate or reliable water distribution system exists, approved reservoirs, pressure tanks, elevated tanks, fire department tanker shuttles, or other approved systems capable of providing the required fire flow shall be permitted.

18.3.3* The location, number and type of fire hydrants connected to a water supply capable of delivering the required fire flow shall be provided on a fire apparatus access road on the site of the premises or both, in accordance with the appropriate county water requirements.

18.3.4 Fire Hydrants and connections to other approved water supplies shall be accessible to the fire department.

18.3.5 Private water supply systems shall be tested and maintained in accordance with NFPA 25 or county requirements as determined by the AHJ.

18.3.6 Where required by the AHJ, fire hydrants subject to vehicular damage shall be protected unless located within a public right of way.

18.3.7 The AHJ shall be notified whenever any fire hydrant is placed out of service or returned to service. Owners of private property required to have hydrants shall maintain hydrant records of approval, testing, and maintenance, in accordance with the respective county water requirements. Records shall be made available for review by the AHJ upon request.

C~ 18.3.8 Minimum water supply for buildings that do not meet the minimum County water standards:

Buildings up to 2000 square feet, shall have a minimum of 3,000 gallons of water available for Firefighting.

Buildings 2001- 3000 square feet, shall have a minimum of 6,000 gallons of water available for Firefighting.

Buildings, 3001- 6000 square feet, shall have a minimum of 12,000 gallons of water available for Firefighting.

Buildings, greater than 6000 square feet, shall meet the minimum County water and fire flow requirements.

Multiple story buildings shall multiply the square feet by the amount of stories when determining the minimum water supply.

Commercial buildings requiring a minimum fire flow of 2000gpm per the Department of Water standards shall double the minimum water supply reserved for firefighting.

Fire Department Connections (FDC) to alternative water supplies shall comply with 18.3.8 (1)-(6) of *this code.*

NOTE: In that water catchment systems are being used as a means of water supply for firefighting, such systems shall meet the following requirements:

(1) In that a single water tank is used for both domestic and firefighting water, the water for domestic use shall not be capable of being drawn from the water reserved for firefighting;

(2) Minimum pipe diameter sizes from the water supply to the Fire Department Connection (FDC) shall be as follows:
  (a) 4" for C900 PVC pipe;
  (b) 4" for C906 PE pipe;
  (c) 3" for ductile Iron;
  (d) 3' for galvanized steel.
(3) The Fire Department Connection (FDC) shall:
  (a) be made of galvanized steel;
  (b) have a gated valve with 2-1/2 inch, National Standard Thread male fitting and cap;
  (c) be located between 8 ft and 16 ft from the Fire department access. The location shall be approved by the AHJ;
  (d) not be located less than 24 inches, and no higher than 36 inches from finish grade, as measured from the center of the FDC orifice;
  (e) be secure and capable of withstanding drafting operations. Engineered stamped plans may be required;
  (f) not be located more than 150 feet of the most remote part, but not less than 20 feet, of the structure being protected;
  (g) also comply with section 13.1.3 and 18.2.3.4.6.1 of *this code;*
(4) Commercial buildings requiring a fire flow of 2000gpm shall be provided with a second FDC. Each FDC shall be independent of each other, with each FDC being capable of flowing 500gpm by engineered design standards. The second FDC shall be located in an area approved by the AHJ with the idea of multiple Fire apparatus' conducting drafting operations at once, in mind.
(5) Inspection and maintenance shall be in accordance to NFPA 25.
(6) The owner or lessee of the property shall be responsible for maintaining the water level, quality, and appurtenances of the system.

EXCEPTIONS TO SECTION 18.3.8:
(1) Agricultural buildings, storage sheds, and shade houses with no combustible or equipment storage.
(2) Buildings less than 800 square feet in size that meets the minimum Fire Department Access Road requirements.
(3) For one and two family dwellings, agricultural buildings, storage sheds, and detached garages 800 to 2000 square feet in size, and meets the minimum Fire Department Access Road requirements, the distance to the Fire Department Connection may be increased to 1000 feet.
(4) For one and two family dwellings, agricultural buildings, and storage sheds

greater than 2000square feet, but less than 3000 square feet and meets the minimum Fire Department Access Road requirements, the distance to the Fire Department Connection may be increased to 500 feet.

(5) For buildings with an approved automatic sprinkler system, the minimum water supply required may be modified.

If there are any questions regarding these requirements, please contact the Fire Prevention Bureau at (808) 932-2911.

DARREN J. ROSARIO
Fire Chief

RP/lc

-----Original Message-----
From: Peterson, Jacob A LTC USARMY IMCOM PACIFIC (US) [mailto:jacob.a.peterson6.mil@mail.mil]
Sent: Wednesday, November 26, 2014 3:23 PM
To: Ron Terry
Subject: RE: Mauna Kea Recreation Area EA early consultation letter (UNCLASSIFIED)

Classification: UNCLASSIFIED
Caveats: NONE

Ron,

Just spoke to my environmental staff about this. We have no initial concerns, but would like to see the draft EA whenever it is available. Once we receive it, we'll review it and I can give you a more firm response.

LTC Jake Peterson
Commander
USAG-Pohakuloa
email: jacob.a.peterson6.mil@mail.mil
office: (808) 969-2407
cel: (808) 228-6598

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

DIVISION OF STATE PARKS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

December 4, 2014

Ron Terry, Principal
Geometrician Associates, LLC
P.O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

We would like to receive a copy of the draft EA when it is available for public review.

Very truly yours,

Daniel S. Quinn, Administrator

William P. Kenoi
Mayor

Duane Kanuha
Director

Bobby Command
Deputy Director

West Hawai'i Office
74-5044 Ane Keohokalole Hwy
Kailua-Kona, Hawai'i 96740
Phone (808) 323-4770
Fax (808) 327-3563

County of Hawai'i
PLANNING DEPARTMENT

East Hawai'i Office
101 Pauahi Street, Suite 3
Hilo, Hawai'i 96720
Phone (808) 961-8288
Fax (808) 961-8742

December 19, 2014

Mr. Ron Terry
Geometrician Associates
P.O. Box 396
Hilo, HI 96721

Dear Mr. Terry:

SUBJECT: Pre-Consultation on Draft Environmental Assessment
Applicant: Hawai'i County Department of Parks & Recreation
Landowner: State of Hawaii
Project: Mauna Kea Recreation Area Improvements
Tax Map Key: (3) 4-4-016:Por. of 003, Hamakua, Hawai`i

This is to acknowledge receipt of your November 20, 2014 letter requesting our comments on the proposed Mauna Kea Recreation Area (MKRA) Improvements by the Hawai'i County Department of Parks and Recreation on a portion of the subject parcel.

The Department of Parks & Recreation proposes to improve the water system, recreational cabins, access and other features of the MKRA.

We have the following to offer regarding the subject parcel:

1. The State Land Use (SLU) designation is Conservation. The SLU Commission has jurisdiction over Conservation lands.

2. There is no County zoning for SLU designated Conservation lands.

3. According to the General Plan Land Use Pattern Allocation Guide Map, it is a designated Conservation Area – *"Forest and water reserves, natural and scientific preserves, areas in active management for conservation purposes, areas to be kept in a largely natural state, with minimal facilities consistent with open space uses, such as picnic pavilions and comfort stations, and lands within the State Land Use Conservation District".*

4. The project site is located in the Hāmākua Community Development Plan (CDP) planning area. However, this CDP has not yet been adopted and is currently in the planning process. Please check http://www.hawaiicountycdp.info/ and select Hāmākua

CDP and Draft Hāmākua CDP Documents, then First Draft "Preferred CDP" for information on elements available for review.

5. The project site is included in a designated Critical Habitat for threatened and endangered species for the Island of Hawai'i. Chapter 2 of the draft Hāmākua CDP, Critical Habitats & Threats to Native Vegetation lists critical plant habitat that have been identified in this area. For additional information on the list of species and related Federal Register documents for Hawai'i, go to the U.S. Fish & Wildlife Service website at http://criticalhabitat.fws.gov/crithab/; Click on By State/County; Choose a State: Hawai'i; Choose a County: Hawai'i; Click the ***list species*** button.

6. This parcel is not located in the County's Special Management Area. Therefore, Special Management Area rules and regulations are not applicable.

Thank you for the opportunity to provide preliminary comments on the proposed project. If you have questions, please feel free to contact Esther Imamura of our office at (808) 961-8139.

Sincerely,

DUANE KANUHA
Planning Director

ETI:cs
P:\Wpwin60\ETI\Eadraftpre-Consul\Terry Mauna Kea Rec Area-P&R 4-4-16-3.Rtf

United States Department of the Interior

FISH AND WILDLIFE SERVICE
Pacific Islands Fish and Wildlife Office
300 Ala Moana Boulevard, Room 3-122
Honolulu, Hawaii 96850

In Reply Refer To:
01EPIF00-2015-TA-0076

DEC 19 2014

Ron Terry
Geometrician Associates
Post Office Box 396
Hilo, Hawaii 96721

Subject: Technical Assistance for the Proposed Improvements to Mauna Kea State Recreation Area, Hawaii

Dear Mr. Terry:

The U.S. Fish and Wildlife Service (Service) received your correspondence on November 21, 2014, requesting our comments on the development of a draft Environmental Assessment (EA) for the proposed improvements to Mauna Kea State Recreation Area (MKSRA) by the Hawaii County Department of Parks and Recreation (P&R) on the island of Hawaii. The P&R proposes to improve the water system, recreational cabins, access and other features of the MKSRA located within TMK (3) 4-4-016:003 (por.). The areas of investigation in the draft EA will include but not be limited to the following: water quality assurance; wastewater treatment; flora, fauna, and ecosystems; traffic impacts; geology, soils, and hazards; flooding and drainage impacts; social, cultural and community impacts; historic sites; and economic impacts.

Based on information you provided and pertinent information in our files, including data compiled by the Hawaii Biodiversity and Mapping Project, there are five listed species in the vicinity of the project area: the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), Hawaiian goose (nene) (*Branta sandvicensis*), palila (*Loxioides bailleui*), and Hawaiian petrel (*Pterodroma phaeopygia sandwichensis*), and the threatened Newell's shearwater (*Puffinus auricularis newelli*). Designated critical habitat for palila is located adjacent to the MKSRA.

To aid in the drafting of your EA and to help you minimize potential impacts to listed species, we provide you with the following avoidance and minimization measures. Please note that implementation of these measures does not ensure that impacts to listed species can be avoided, and further coordination with the Service on compliance with the ESA may be required.

Hawaiian hoary bat

The Hawaiian hoary bat is known to occur across a broad range of habitats throughout the State of Hawaii. This bat roosts in both exotic and native woody vegetation and, while foraging, leaves young unattended in "nursery" trees and shrubs. If trees or shrubs suitable for bat roosting are cleared during the Hawaiian hoary bat breeding season (June 1 to September 15), there is a risk that young bats that cannot yet fly on their own could inadvertently be harmed or killed. As a result, the Service recommends that woody plants greater than 15 feet tall should not be removed or trimmed during the Hawaiian hoary bat breeding season. Additionally, Hawaiian hoary bats forage for insects from as low as three feet to higher than 500 feet above the ground. When barbed wire is used in fencing, Hawaiian hoary bats can become entangled. Therefore, we recommend that barbed wire not be used for fencing as part of this proposed action.

Nene

Nene are known to use habitats in the vicinity of the Saddle Road and the Pohakuloa Training Area. In order to avoid impacts to the nene, all on-site project personnel should be apprised that nene may be in the vicinity of the project. If a nene appears with 100 feet (30.5) meters of ongoing work, all activity should be temporarily suspended until the animal leaves the area of its own accord. Feeding of nene should be avoided as this may attract nene to the MKSRA and nearby roads where they will be at greater risk of injury from motor vehicles.

Palila

The palila is a finch-billed honeycreeper currently restricted to the high-elevation forests of Mauna Kea. The species is a food specialist, preferring green mamane (*Sophora chrysophylla*) seeds. The high-elevation mamane forest on Mauna Kea is prone to fire and there is a risk that fire ignited by construction activities on the MKSRA could carry into areas of palila critical habitat. Precautions should be taken to prevent fire ignition during construction and operation of the MKSRA including providing areas bare of vegetation (dirt, gravel, asphalt) to park construction and other vehicles to prevent possible fire ignition by hot catalytic converters.

Seabirds

Hawaiian petrels and Newell's shearwaters (collectively known as seabirds) may transit over the project area when flying between the ocean and upland breeding colonies. Seabird fatalities resulting from collisions with artificial structures that extend above the surrounding vegetation have been documented in Hawaii where high densities of transiting seabirds occur. In Hawaii, seabirds are attracted to lights and are known to collide with buildings, light poles, wires and other tall objects. Additionally, artificial lighting such as flood lighting or for construction work and site security, can adversely impact seabirds by causing disorientation which may result in collision with utility lines, buildings, fences and vehicles. Fledging seabirds are especially affected by artificial lighting and have a tendency to exhaust themselves while circling the light sources and become grounded. Too weak to fly, these birds become vulnerable to depredation by feral predators such as small Indian mongoose (*Herpestres auropunctatus*), cats (*Felis catus*), and dogs (*Canis familiaris*). We therefore recommend avoiding night work if possible. If night work must be conducted this should take place outside the sea bird fledging season (September 1 through December 1) and should utilize shielded lighting so the bulb is not visible at or above bulb-height.

General Comments

Hawaii's native ecosystems are heavily impacted by exotic invasive plants. Whenever possible we recommend using native plants for landscaping purposes. If native plants do not meet the landscaping objectives, we recommend choosing species that are thought to have a low risk of

becoming invasive. The following websites are good resources to use when choosing landscaping plants: Pacific Island Ecosystems at Risk (http://www.hear.org/Pier/), Hawaii-Pacific Weed Risk Assessment (http://www.botany.hawaii.edu/faculty/daehler/wra/full_table.asp), and Global Compendium of Weeds (www.hear.org/gcw).

The Service also recommends that a biosecurity assessment be incorporated into the Final Environmental Assessment to address the potential impacts of invasive species introduction due to the transport of construction-related materials and heavy vehicles in the action area during the construction phase of the proposed project.

Thank you for your efforts to conserve listed species and native habitats. Please contact Fish and Wildlife Biologist Jay Nelson (808-792-9441) if you have any questions or for further guidance.

Sincerely,

for

Michelle Bogardus
Geographic Team Leader
Maui nui and Hawaii Islands

STATE OF HAWAI'I
DEPARTMENT OF LAND AND NATURAL RESOURCES
OFFICE OF CONSERVATION AND COASTAL LANDS
POST OFFICE BOX 621
HONOLULU, HAWAII 96809

Ref: OCCL:LY

CORR: HA 15-96

JAN 29 2015

Mr. Ron Terry, Principal
Geometrician Associates, LLC
P.O. Box 396
Hilo, Hawai'i 96721

SUBJECT: Early Consultation for Environmental Assessment for Mauna Kea Recreation Area (MKRA) Improvements by Hawai'i County Department of Parks and Recreation
Mauna Kea, Hāmākua, Hawai'i
Tax Map Key (TMK): (3) 4-4-016:003 (por.)

Dear Mr. Hunter:

The Office of Conservation and Coastal Lands (OCCL) is in receipt of your request for comments on any especial environmental conditions or impacts related to the development to the MKRA.

According to the information you have provided, the preliminary list of projects proposed include the following:

- Installing new water pipelines;
- Installing drainage improvements;
- Constructing new paved parked areas near the cabins;
- Creating a new maintenance baseyard area at the location of the former caretaker's cottage as well as a storage building with a paved parking area for County vehicles and employees;
- Connecting the internal park road from the cabin area to the mess hall area to form a looped roadway;
- Hardening the perimeter of all internal roads and parking areas to prevent unauthorized vehicular access to non-paved areas of the park;
- Constructing a new paved pathway for walking, jogging, bicycling, etc.
- Repaving and doubling the capacity of the parking area near the mess hall;
- Restoring all buildings to a condition suitable for public use (primarily cosmetic work),
- Implementing a moderate landscaping plan; and
- Providing exterior lighting of all walkways and parking lots/areas with solar powered LED site lighting where appropriate.

The OCCL notes that the project area is located within the Conservation District Resource subzone. As the MKRA was established around the 1930's, prior to the advent of the Conservation State Land Use District, the MKRA is considered a nonconforming use. Based on the preliminary list of proposed projects, we anticipate that the project will require a Departmental Conservation District Use Permit (CDUP) pursuant to Hawai'i Administrative Rules (HAR) 13-5-22, P-8 STRUCTURES AND LAND USES, EXISTING (C-1), *Moderate alteration of existing structures, facilities, uses, and equipment.* Please note that this letter does not constitute the Department's final decision regarding the level of permitting required for the subject project. We reserve the right to change our decision dependent on the final project description presented to us by the County of Hawai'i and/or their consultant when they have submitted their Conservation District Use Application for our review and processing.

Should you have any questions regarding this correspondence, please contact Lauren Yasaka of our Office at (808) 587-0386.

Sincerely,

Samuel J. Lemmo, Administrator
Office of Conservation and Coastal Lands

C: HDLO
CoH, Planning Dept.
CoH, Dept. of Parks & Rec.

PHONE (808) 594-1888 FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
560 N. NIMITZ HWY., SUITE 200
HONOLULU, HAWAI'I 96817

HRD14/7321

December 30, 2014

Ron Terry, Principal
Geometrician Associates, LLC
PO Box 396
Hilo, HI 96721

Re: Early Consultation for the Environmental Assessment for Mauna Kea Recreation Area Improvements by Hawai'i County Department of Parks and Recreation
Ka'ohe Mauka Ahupua'a, Hāmākua Moku
TMK (3) 4-4-016:003 (por.)

Aloha Mr. Ron Terry:

The Office of Hawaiian Affairs (OHA) is in receipt of your November 20, 2014 letter requesting comments in preparation for the draft environmental assessment for the proposed Mauna Kea Recreation Area improvements by the Hawai'i County Department of Parks and Recreation.

OHA is aware that the Mauna Kea Recreation Area uses water from the three springs located on the southern flank on Mauna Kea: Hopukani, Waihu, and Līlīoe spring.[1] These springs are collectively known as Houpo-o-Kāne.[2] The Association of Hawaiian Civic Clubs passed Resolution 14-29 at their 2014 Convention discussing the cultural and religious significance of the three springs in question. We have enclosed the resolution for your convenience.

We ask that the continued use of water from these springs be considered under the analysis provided by the Hawai'i Supreme Court in Ka Pa'akai O Ka 'Aina v. Land Use Commission, 94 Hawai'i 31, 7 P.3d 1068 (2000):

[1] State Water Lease No. S-3853
[2] Resolution No. 14-29, Association of Hawaiian Civic Clubs (2014) (enacted)

- The state agency and its agencies are obligated to protect the reasonable exercise of customarily and traditionally exercised rights of Native Hawaiians to the extent feasible;
- Agencies are obligated to make an assessment, independent of the developer or applicant, of impacts on customary and traditional practices of Native Hawaiians; and
- The independent assessment must include these three factors, known as the Ka Pa'akai framework, (1) identify the scope of "cultural, historical, or natural resources" in petition area; (2) extent to which the resources will be affected/impaired; and (3) feasible actions by agency to protect them.[3]

Due to the cultural significance associated with the three springs we ask that the following individuals and organizations be contacted:

- Association of Hawaiian Civic Clubs
- Ka Lei Maile Ali'i Hawaiian Civic Club

  Cassina Waterman
  President
  qehcc@hotmail.com

  Lynette Cruz
  Immediate Past President
  palolo@hawaii.rr.com

Thank you for the opportunity to submit comments, and we look forward to reviewing the draft environmental assessment when completed. Should you have any questions, please contact Jeannin Jeremiah at 594-1790 or by email at jeanninj@oha.org.

'O wau iho nō me ka 'oia 'i'o,

Kamana'opono M. Crabbe, Ph.D.
Ka Pouhana, Chief Executive Officer

KC:jj

Enclosure – Association of Hawaiian Civic Clubs Resolution 14-29 (2014) (enacted)

[3] David M. Forman & Susan K. Serrano, Ho'ohana Aku, a Ho'ōla Aku: A Legal Primer for Traditional and Customary Rights in Hawai'i 17 (2012)

ASSOCIATION OF HAWAIIAN CIVIC CLUBS

A RESOLUTION
14 – 29

SUPPORTS AN IMMEDIATE ACCOUNTING OF THE DIVERSION OF THE SACRED WATERS OF HOUPO-O-KĀNE BY THE DEPARTMENT OF LAND AND NATURAL RESOURCES (DLNR)

WHEREAS, the Hawaiian people have honored the traditional pantheon of Gods and Goddesses of all of the Pae ʻĀina; and

WHEREAS, the people of Hawai`i Island in particular honor Pele; the four Goddesses of Mauna Kea, Poli`ahu Goddess of the snow and ice, Līlīnoe Goddess of the mist, Waiau Goddess of the lake and Houpo-o-Kāne of the spring complex; and

WHEREAS, Mauna Kea, also known as Mauna A Wākea, is considered to be the highest mountain in the entire Pacific Basin and when measured from the ocean floor, is considered to be the tallest mountain on earth; and

WHEREAS, Mauna Kea is considered by many Hawaiians and practitioners of Hawaiian culture to be the most sacred and religious site of the entire universe; and

WHEREAS, there are many gods *and* goddesses of the Hawaiian pantheon of deities who are associated with Mauna Kea, among them being Poli`ahu (the Snow Goddess), Līlīnoe (the Goddess of Mists), Waiau (the Goddess of Lake Waiau), Kūkahau'ula (Kū of the red-tinged snow) and Houpo-o-Kāne, also known as Kahoupokāne (the Breast, Chest or Bosom of Kāne); and

WHEREAS, Houpo-o-Kāne is one of the patron Goddesses of Mauna Kea famed for the battle between Pele and the four sister goddess of Mauna Kea; and

WHEREAS, the spring of Houpo-o-Kāne is the physical manifestation of this Goddess, and

WHEREAS, the waters of Houpo-o-Kāne are the sacred waters of Life, the waters of Kāne; and

WHEREAS, the waters of Houpo-o-Kāne have been completely diverted via 3" pvc and galvanized iron piping sometime between the years 2005 and 2013; and

WHEREAS, diversion of these waters has destroyed the native flora that had evolved in the Houpo-o-Kāne spring area since prehistoric times rendering it lifeless except for the invasive, exotic and toxic fireweed; and

WHEREAS, diversion of these waters has destroyed the native flora that had evolved in the Houpo-o-Kāne spring area since prehistoric times rendering it lifeless except for the invasive, exotic and toxic fireweed; and

WHEREAS, the water of Houpo-o-Kāne was a free flowing above and below ground stream that has been 100% diverted, which is a violation of federal water laws and may be a violation of the Mauna Kea Water Management Plan; and

WHEREAS, this diversion of water is a disruption of the natural above and below ground water stream of Southern Mauna Kea; and

WHEREAS, there has been no apparent public notice, no hearings, no environmental study, no cultural study performed; and

WHEREAS, a previous study stated that diversion of the entirety of the waters of the Houpo-o-Kāne springs complex would still be insufficient for the water needs of Pōhakuloa; and

WHEREAS, the U.S. military has indicated several years ago that they no longer use the waters of the Houpo-o-Kāne springs complex; and

WHEREAS, some other unknown entity is currently diverting this sacred water; and

WHEREAS, these sacred waters, if not further treated, are not potable; therefore can only be used to flush toilets and wash, adding insult to injury; and

WHEREAS, the Houpo-o-Kāne springs complex is apparently under the jurisdiction and supervision of the Department of Land and Natural Resources and the Water Commission; and

NOW, THEREFORE BE IT RESOLVED by the Association of Hawaiian Civic Clubs at its 55TH annual convention at Waikōloa, Hawai'i this 1st day of November 2014, that it supports an immediate accounting of the diversion of the sacred waters of Houpo-o-Kāne by the Dept. of Land and Natural Resources (DLNR); and

BE IT FURTHER RESOLVED, that DLNR's accounting includes all applicable federal and state laws, hearings, and procedures that were applied prior to the diversion, as well as considerations of cultural impact on that diversion; and

BE IT FURTHER RESOLVED, that this diversion immediately cease, and that the Houpo-o-Kāne springs complex be restored back to its original state until such time that an accounting is made; and

BE IT FURTHER RESOLVED, that a certified copy of this resolution be given to the Governor of Hawaii, State Senate President, State Speaker of the House, State Senate Committee on

Hawaiian Affairs, State House Committee on Hawaiian Affairs, Office of Hawaiian Affairs Chair of the Board of Trustees, All County Mayors, and the chair of the Department of Land and Natural Resources.

The undersigned hereby certifies that the foregoing Resolution was duly adopted on the 1st day of November 2014, at the 55th Annual Convention of the Association of Hawaiian Civic Clubs at Waikōloa, South Kohala, Hawai'i.

Soulee L.K.O. Stroud, President

Mauna Kea Recreation Area Improvements

Environmental Assessment

APPENDIX 2
Biological Report

[This page intentionally left blank]

Flora and Fauna Survey
Mauna Kea Recreation Area Improvements
TMK: (3rd) 4-4-016:003 (por.)
Hamakua District, Hawai‘i Island, State of Hawai‘i

By Ron Terry, Ph.D., and Patrick J. Hart, Ph.D.
Geometrician Associates, LLC
Prepared for Hawai‘i County Department of Parks and Recreation
May 2015

The Hawai‘i County Department of Parks and Recreation (P&R) proposes a project to improve the water system, recreational cabins, maintenance capabilities, security and access infrastructure, recreational amenities and other features of the Mauna Kea Recreation Area (MKRA) on the Island of Hawai‘i. Field surveys of biological resources were conducted by Ron Terry, Ph.D., and Patrick J. Hart, Ph.D, at several times between November 2014 and May 2015, the results of which are presented below.

Vegetation and Flora

The boundaries of the survey area are indicated on Figure 1. The survey covered a larger area than the area finally proposed by P&R for improvements in the current phase of work. The roughly 50-acre area was bounded by the Daniel K. Inouye Highway on the south, Pohakuloa Gulch and the Mauna Kea Forest Reserve/water tank access road on the west, Infantry Road on the Mauna Kea Forest Reserve boundary on the north, and an unnamed, unpaved road on the east.

Over the course of one afternoon, the survey area was systematically walked in zigzagging transects by both biologists. Two follow-up surveys were conducted within the next several months as the project area was refined by P&R. The total area was small enough and the vegetation open enough that virtually 100 percent coverage was possible.

The natural vegetation of this area of the saddle between Mauna Kea and Mauna Loa is *‘Āweoweo (Chenopodium) Subalpine Shrubland* (per Gagne and Cuddihy 1990). In areas where it is still somewhat intact, it is variably invaded by a number of non-native plants. Most of the MKRA project site, however, is within the highly disturbed, artificial condition typical of active parks. Until the higher than average rainfall of 2014 the area was extremely desiccated. Since then, trees and shrubs have greened up and a wide variety of herbs, grasses and vines have proliferated, greatly increasing cover and biomass. Figure 2 provides photographs of various portions of the survey area. A fenced arboretum with a short nature trail loop is present in the center of the MKRA, which has been maintained to promote the growth of native plants. Although within the boundaries of the MKRA, it has been managed by a private entity through a prior agreement with DLNR State Parks, and P&R will allow them to continue to manage it.

A total of 54 plant species were identified, with five indigenous to the Hawaiian Islands (found in Hawai‘i and elsewhere), and 14 endemic (found in Hawai‘i and nowhere else). All plant species observed during the survey are listed in Table 1 below. No naturally growing threatened or endangered plant species (USFWS 2015) were detected in the survey area. As denoted on the table entries, a number of native species, including some rare and endangered plants, were planted and are surviving in the fenced-off arboretum. Not all plants could be identified. Discussions with volunteers who were involved in planting projects here indicate that a number of endangered species individuals were planted, but most have not survived.

Figure 1
Aerial Image of Mauna Kea Recreation Area and Biological Survey Area

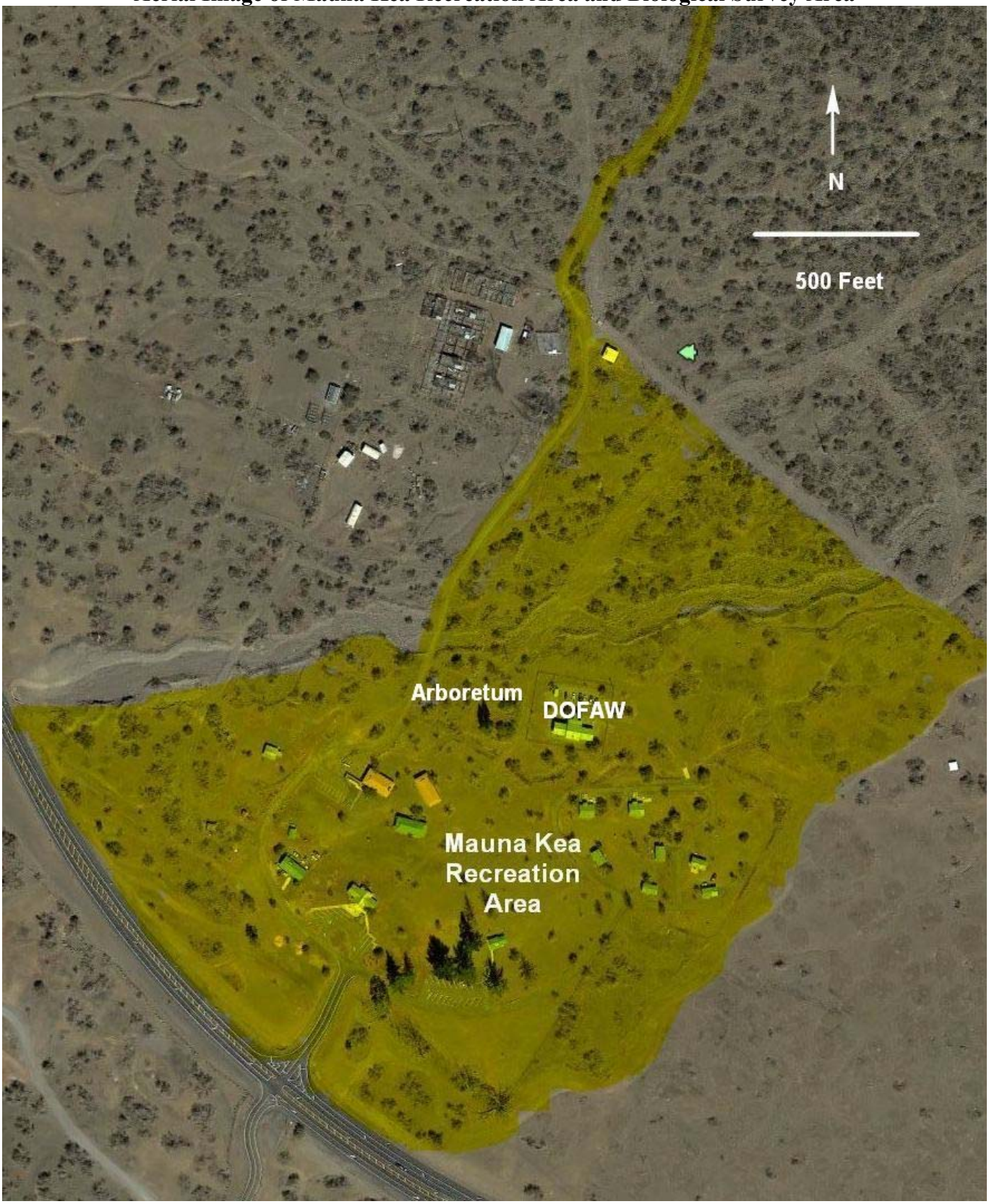


Figure 2. Survey Area Photographs

2a. Buildings From Main Parking Area ▲ ▼ 2b. Typical Unmanaged Area Vegetation

Figure 2. Survey Area Photographs

2c. Pohakuloa Gulch ▲ ▼ 2d. Area West of Pohakuloa Gulch

Table 1
Plant Species in Survey Area

Scientific name	Family	Common name	Status	Life Form
Acacia koa	Fabaceae	Koa	E*	Tree
Anthoxanthum odoratum	Poaceae	Sweet vernal grass	A	Grass
Argemone glauca	Papaveraceae	Puakala	E	Herb
Bidens alba	Asteraceae	Beggartick	A	Herb
Bidens menziesii var. *filiformis*	Asteraceae	Koʻokoʻolau	A	Herb
Bidens pilosa	Asteraceae	Beggartick	A	Herb
Brassica nigra	Brassicaceae	Black mustard	A	Herb
Bromus tectorum	Poaceae	Cheat grass	A	Grass
Buddleia asiatica	Buddleiaceae	Dogtail	A	Shrub
Cenchrus clandestinus	Poaceae	Kikuyu grass	A	Grass
Cenchrus setaceus	Poaceae	Fountain grass	A	Grass
Chenopodium murale	Amaranthaceae	Lamb's quarters	A	Herb
Chenopodium oahuense	Amaranthaceae	ʻĀweoweo	E	Shrub
Cynodon dactylon	Poaceae	Bermuda grass	A	Grass
Deschampsia nubigena	Poaceae	Hairgrass	E	Grass
Dicranopteris linearis	Gleicheniaceae	Uluhe	I	Fern
Dodonaea viscosa	Sapindaceae	ʻAʻaliʻi	I	Shrub
Dubautia sp.	Asteraceae	Dubautia	E	Shrub
Epilobium sp.	Onagraceae	Willow herb	A	Shrub
Eragrostis atropioides	Poaceae	Lovegrass	E	Grass
Erodium cicutarium	Geraniaceae	Pin clover	A	Herb
Heterotheca grandiflora	Asteraceae	Telegraph weed	A	Herb
Hibiscadelphus sp. (giffardianus?)	Malvaceae	Hau kuahiwi	E, End*	Tree
Holcus lanatus	Poaceae	Velvet grass	A	Grass
Hypochoeris radicata	Asteraceae	Hairy cat's ear	A	Herb
Lepidium bonariense	Brassicaceae	Pepperwort	A	Herb
Leptecophylla tameiameiae	Epacridaceae	Pukiawe	I	Shrub
Malva parviflora	Malvaceae	Cheese weed	A	Herb
Melinus minutiflora	Poaceae	Molasses grass	A	Grass
Metrosideros polymorpha	Myrtaceae	ʻOhiʻa	E*	Tree
Myoporum sandwicense	Myoporaceae	Naio	I	Tree
Opuntia ficus-indica	Cactaceae	Panini	A	Shrub
Osteomeles anthyllidifolia	Rosaceae	ʻUlei	I	Shrub
Pelargonium x hortorum	Geraniaceae	Geranium	A*	Shrub
Persicaria capitata	Polygonaceae	Pink head knotweed	A	Herb
Pinus radiata	Pinaceae	Monterey pine	A	Tree
Pinus sp.	Pinaceae	Pine	A	Tree
Pseudognaphalium sandwicensium	Asteraceae	ʻEnaʻena	E	Herb
Rhamnus californica	Rhamnaceae	Coffeeberry	A	Shrub
Rhynchelytrum repens	Poaceae	Natal red-top	A	Grass
Salsola tragus	Chenopodacieae	Tumbleweed	A	Shrub
Santalum paniculatum	Santalaceae	ʻIliahi	E*	Tree
Senecio madagascariensis	Asteraceae	Fireweed	A	Herb
Sicyos anunu	Cucurbitaceae	Anunu	E	Vine
Sophora chrysophylla	Fabaceae	Māmane	E	Tree
Stenogyne sessilis	Lamiaceae	None	E*	Vine
Tagetes minuta	Asteraceae	Southern cone marigold	A	Herb
Tetramolopium sp.	Asteraceae	None	E*	Herb

Trifolium arvense	Fabaceae	Rabbit foot clover	A	Herb
Verbascum thapsis	Scrophulariaceae	Mullein	A	Shrub
Verbena litoralis	Verbenaceae	ʻOwi	A	Herb
Verbesina encelioides	Asteraceae	Golden crown-beard	A	Herb
Wahlenbergia gracilis	Campanulaceae	Wahlenbergia	A	Herb
Wikstroemia hawaiiensis	Thymelaeaceae	ʻAkia	E*	Shrub

A=Alien, I=Indigenous, E=Endemic, END=Endangered; *Exclusively in cultivated state, some in exclosures

Table 2
Bird Species in Survey Area

Scientific Name	Common Name	Status
Acridotheres tristis	Common Myna	Alien Resident
Alauda arvensis	Eurasian skylark	Alien Resident
Callipepla californica	California Quail	Alien Resident
Carpodacus mexicanus	House Finch	Alien Resident
Hemignathus virens virens	Hawaiʻi ʻAmakihi	Native Resident
Lonchura cantans	African Silverbill	Alien Resident
Passer domesticus	House Sparrow	Alien Resident
Pluvialis fulva	Kolea	Indigenous Migrant
Pternistes erckelii	Erckel's Francolin	Alien Resident
Zosterops japonicus	Japanese White-Eye	Alien Resident

The most interesting wild native plants we observed were *Sicyos anunu*, or anunu, a striking and fairly uncommon cucumber family vine with prickly fruits, and *Bidens menziesii* var. *filiformis*, or koʻokoʻolau. These plants are found in the somewhat neglected and formerly dumped-on area in the northeast of the site.

Fauna

With the exception of Hawaiian hoary bats, all terrestrial mammals, reptiles and amphibians in Hawaiʻi are alien. No live mammals were seen on the site, but familiarity with the area indicates that a larger variety of game mammals including feral sheep or mouflon (*Ovis aries* or *Ovis gmelini musimon*), goats (*Capra hircus*) and pigs (*Sus scrofa*) are often present in or near the MKRA. In addition, feral cats (*Felis catus*), pet dogs (*Canis f. familiaris*), small Indian mongooses (*Herpestes a. auropunctatus*), various species of rat (*Rattus* spp.) and European house mice (*Mus domesticus*) could also be present. None are of conservation concern and all are deleterious to native flora and fauna. No amphibians or reptiles were observed during our surveys, and it is likely that few or perhaps even none are normally present.

The only native Hawaiian land mammal, the Hawaiian Hoary Bat (*Lasiurus cinereus semotus*), is also likely to be present in the area. The shrubby native vegetation of the site offers habitat for this endangered species, particularly in winter. The bat has been recorded in systematic studies throughout sub-montane forests from various sites within the Mauna Kea Forest Reserve and nearby at Bradshaw Army Airfield (Jacobs 1994; Gorresen et al 2013). All our observations took place in full daylight, and therefore the lack of bat sightings does not signify an absence of bats.

Almost all birds seen in and around the area during the survey, which took place over approximately seven hours on three separate mid-days or late afternoons, were wide-ranging aliens such as Common Myna (*Acridotheres tristis*), Eurasian Skylark (*Alauda arvensis*), and House Finch (*Carpodacus*

mexicanus) (see Table 2). Two natives were observed, the migratory Golden Plover or Kolea (*Pluvialis fulva*) and the ʻAmakihi (*Hemignathus virens*). No threatened or endangered native birds were observed.

The Saddle region is well known for game hunting, particularly game birds. A wide variety of non-native birds including francolins, turkeys, pheasants, and quail are present. In fact, one of the major uses of the MKRA is a staging area for hunting trips, and when hunting areas are open the parking lot is full of hunters.

Although only two fairly common native birds were identified during the survey, a number of others could occasionally be present, some of them threatened or endangered, based on nearby sightings. In areas about 1,000 feet in elevation above the MKRA, key species include not only the ʻAmakihi (*Hemignathus virens virens*) but also ʻApapane (*Himatione sanguinea*), and the endemic *bryani* subspecies of Hawaiʻi ʻElepaio (*Chasiempis sandwichensis*). Iʻiwi (*Vestiaria coccinea*) may sometimes be present as they traverse the southern slopes of Mauna Kea between habitat areas. In August of 2014, the Center of Biological Diversity petitioned the Department of Interior to list the Iʻiwi as endangered.

The western slope of Mauna Kea is home to the endangered Palila (*Loxioides bailleui*), the lone surviving finch-billed honeycreeper found in the main Hawaiian Islands. While fossil evidence shows that the species was formerly widespread on multiple islands at all elevations (Olson and James 1982), historically the species has been restricted to the *māmane-naio* forests at high elevation on the Island of Hawaiʻi. Over the 20th century, Palila disappeared from its historic range on Mauna Loa, Hualalai, and most of Mauna Kea, with the remaining population undergoing a steady decline over the past decade (Leonard et al. 2008, Camp and Banko 2012). Recent estimates indicate that about 2,200 Palila survive in degraded forest on the southwestern slope of Mauna Kea (Camp and Banko 2012). The Palila was listed by the U.S. Fish and Wildlife Service (USFWS) as endangered in 1967 (USFWS 1967) and critical habitat was designated in 1977 (USFWS 1977). The area designated as critical habitat encircles Mauna Kea from about 5,500 feet in elevation to 10,000 feet in elevation, encompassing an area of over 60,000 acres. Most of the Critical Habitat is unoccupied, including the land in the Mauna Kea Recreation Area, where there have been no recorded Palila sightings in many decades, probably because of the lack of thick forests of māmane. At least 95 percent of the Palila population occurs within a core area of about 17,800 acres on the southwest slope from 6,500 feet in elevation to 9,500 feet in elevation. Protecting the remaining forest in this area from the threat of fire is critical for the short and long-term survival of the species. Habitat restoration is ongoing in the Kaʻohe Mitigation Area, as well as at Puʻu Mali on the north slope of Mauna Kea, both of which were created from the withdrawal of grazing leases as part of mitigation for the Saddle Road Improvements project (FHWA-CFLHD 1999).

Nēnē (*Branta sandvicensis*) is Hawaiʻi's endangered native goose. Because of a program of release at Hakalau Forest National Wildlife Refuge on the east slope of Mauna Kea, they are often seen foraging in the Saddle region. Nēnē nest in deep grass and can be vulnerable to disturbance during nesting. Although the generally dry habitat at MKRA is not ideal for Nēnē, they may be attracted during wetter periods when young grass shoots are available. During the biological survey, no Nēnē nests were observed. More problematic than discrete nesting that can be avoided by park caretakers is the potential for these friendly and fearless geese to become habituated to humans. People who feed Nēnē endanger the geese through unhealthy diets, vehicle interactions and predators.

Two other native bird species may also use the area, though neither is known definitively to breed at the MKRA. The Pueo, or Hawaiian Owl (*Asio flammeus sandwichensis*), is an endemic sub-species of the widely distributed Short-eared Owl, and is found in open habitat throughout the Big Island. The endangered ʻIo, or Hawaiian Hawk (*Buteo solitarius*), is commonly seen in forested areas of the Big Island, including various portions of the Saddle. These hawks forage widely on a variety of native and

non-native birds as well as small, non-native mammals. Our team has observed Hawaiian Hawks on occasion as close to MKRA as Puʻu Laʻau and Puʻu Huluhulu, roughly five miles west and east, respectively, and it is likely that the MKRA is within their foraging range. Hawaiian Hawks nest in tall trees, usually isolated from significant sources of disturbance. The low stature of the native naio-māmane forest precludes ʻIo nests in these species. The tall pine trees could conceivably offer a nesting site, but the general lack of suitable foraging habitat in the area makes it unlikely that Hawaiian Hawks nest in or directly adjacent to the MKRA.

Although not detected, it is possible that small numbers of the endangered endemic Hawaiian Petrel (*Pterodroma sandwichensis*) and the threatened Newell's Shearwater (*Puffinus auricularis newelli*) over-fly the project area between the months of May and November. Hawaiian Petrels were formerly common on the Island of Hawaiʻi. This pelagic seabird reportedly nested in large numbers on the slopes of Mauna Loa and in the saddle area between Mauna Loa and Mauna Kea, as well as at the mid-to-high elevations of Hualālai and in the Kohala Mountains. It has within recent historic times been reduced to relict breeding colonies in a few locations. Hawaiian Petrels were first listed as an endangered species by the USFWS in 1967 and by the State of Hawaiʻi in 1973. Newell's Shearwaters were also once common on the Island of Hawaiʻi. This species breeds on Kauaʻi, Hawaiʻi, and Molokaʻi. Newell's Shearwater populations have dropped precipitously since the 1880s (Banko 1980, Day et al., 2003). This pelagic species usually nests in burrows excavated under thick vegetation, especially *uluhe* (*Dicranopteris linearis*) fern. Newell's Shearwater was listed as a threatened species by the USFWS in 1975 and by the State of Hawaiʻi in 1973.

Threats to Native Flora and Fauna

The largest threats to native flora and fauna in the Saddle region are invasive species and fire. Much of the flora of the area is now non-native, with weeds such as *Erodium cicutarium*, *Heterotheca grandiflora*, and *Senecio madagascarensis* making up a large proportion of the herbaceous cover and biomass. Although this study does not include invertebrates, and we are not aware of any systematic invertebrate studies for the park, studies in Pohakuloa Training Area and in the Mauna Kea Forest Reserve indicate that native invertebrates associated with native plants are present at the MKRA (FHWA-CFLHD 1999). Native invertebrates are highly susceptible to predation or competition by invasive species, particularly ants. *Linepithema humile*, or the Argentine ant, was first discovered in 1940 on Oʻahu (Zimmerman 1941) and has since spread to the other islands. It was reported from Mauna Kea State Park prior to the County of Hawaiʻi assuming control and may be still present; it is known to occur at similar elevations on other parts of Mauna Kea and on Haleakalā, Maui (Cole et al. 1992; Wetterer et al. 1998; Krushelnycky et al. 2005). The Argentine ant consumes many species of endemic arthropods as well as seeds and nectar and is a serious threat to native flora and fauna (Aldrich 2005). Some of its prey including noctuid moths and *Hylaeus* bees serve critical roles in pollination of rare subalpine plants such as the Haleakalā silversword. When the County began investigating the state of the buildings, it was determined that the poisonous spiders black widow (*Lactodectrus mactans*) and brown recluse (*Loxosceles reclusa*) were both present, a situation the County has initially begun to remediate and plans to vigorously pursue.

Fire has ravaged much of northwest Hawaiʻi, including portions of the Mauna Kea Forest Reserve. Maps of wildfires from 1954-2005 compiled by the Hawaiʻi Wildfire Management Organization show that most of the non-bare lava surface between Waimea and Puʻuwaʻawaʻa has burned, much of it multiple times (HWMO 2007). Dangerous wildfires have affected the southern part of Mauna Kea as recently as 2003, when a large fire burned in the Kaʻohe GMA, and October 2011, when 1,200 acres burned east of the Mauna Kea Recreation Area and Saddle Road had to be closed. What makes fire potentially devastating here is the value of the intact *māmane/naio* forest habitat, especially upslope and to the west, which is the last refuge of the critically endangered Palila.

Project Activities, Impacts and Mitigation Measures

At full build-out, the project would involve the following actions:

- Optimize and upgrade the potable and non-potable water filling, storage and distribution system, including installing a new potable water tank near the existing pump station, new chlorination and pressurization systems, and new waterlines in various locations. The continuing use of non-potable water from the existing system will save energy and funds that would otherwise be expended to haul water from Hilo in tanker trucks.
- Restore all buildings to a condition suitable for public use, including roofs, interior and exterior surfaces, floors and wainscoting, plumbing and electrical service, doors and, windows, and appliances. No major changes will be done to the floor plans; basically, the units will be refurbished. Most cabins will receive painting, plumbing fixtures, flooring and new siding.
- Provide new paved parking areas at each individual cabin sufficiently sized for two vehicles.
- Develop a new keying system for the entire park that accommodates County operation and control, which would include cabin rentals to the public, security access by the contracted security company, and allowable site access by other government entities with interest in property.
- Develop a maintenance baseyard area at the former caretaker's cottage and storage building and fence the perimeter, with a paved area for parking of County vehicles and employee vehicles.
- Construct shallow drywells throughout the site where drainage improvements are required.
- Fumigate all buildings to kill insects and vermin; clean buildings of any signs of prior infestation; and seal exterior joints and conditions to prevent unwanted re-infestation.
- Connect the internal park road from the cabins area to the mess hall area to form a looped roadway. An extension from the cabins to the road on the west side of the property will be constructed, with a connection above the bunkhouse and mess hall.
- Fence the perimeter of the park with a 4-foot high hogwire fence to demarcate the park's edge and keep vehicles from entering inappropriate areas.
- Harden the perimeter of all internal roads and parking areas to prevent unauthorized vehicular access to non-paved areas of the park.
- Provide for maintenance access via gates as necessary.
- Install new gates at internal park roads near the park entrance for use in securing the park after hours.
- Construct a paved, approximately 12-foot wide pathway for walking, jogging and bicycling use that circumnavigates the park, with ties-in to the roadways and park amenities.
- Re-pave and double the capacity of the parking area at the mess hall.
- Prepare and implement a minimal landscape plan for enhancing the aesthetics of the park utilizing site-appropriate native species that require minimal watering and care.
- Provide exterior lighting of all walkways and parking lots/areas and a few other selected areas, with solar powered LED site lighting.

In order to frame impacts to flora and fauna, it is important to note that the MKRA is land that has historically been used as a park, with existing cabins, administration buildings, restrooms, maintenance areas and baseyards, and open fields. From this perspective, given the lack of intact, sensitive native vegetation or threatened or endangered plant species, the renovation of the park and modest expansion of use areas for parking, walking, biking and maintenance would not likely generate direct botanical impacts on the park property itself. However, parks also focus users in the midst of sensitive areas that may be affected indirectly by park user activities. In the case of the MKRA, fire generated by park activities is a historical and ongoing concern, particularly for sensitive neighboring ecosystems. Similarly, invasive species that gain a foothold in the park could spread to other areas. Of particular concern are invasive ants that might be present in vehicles and in food and other materials that go in and out of the vehicles or campers and picnickers.

We believe that the following mitigation measures are appropriate to protect endangered species and/or to exercise the appropriate environmental stewardship of a park adjacent to wilderness areas, and we recommend their consideration:

- To minimize impacts to the endangered Hawaiian hoary bat, woody plants greater than 15 feet should not be removed or trimmed during the bat birthing and pup rearing season (June1 through September 15).
- Outdoor lighting has the potential to attract Hawaiian Petrels and Newell's Shearwaters, which may become disoriented by the lighting, resulting in birds being downed. To avoid the potential downing of Hawaiian Petrels and Newell's Shearwaters by their interaction with outdoor lighting, no construction or unshielded equipment maintenance lighting should be permitted after dark between the months of April and October. All permanent lighting should be shielded in conformance with Hawai'i County Outdoor Lighting Ordinance (Hawai'i County Code Chapter 9, Article 14), which requires shielding of exterior lights so as to lower the ambient glare caused by unshielded lighting.
- P&R should adopt and implement a rapid response invasive species protocol in cooperation with the Big Island Invasive Species Council (BIISC), coupled with regular and frequent inspection for invasive plant and animal species conducted by qualified park personnel or cooperating agencies. As a first step toward this long-term goal, P&R should meet with BIISC and assess practical measures that can be incorporated in the inspection and response protocol.
- Those parts of the site not necessary for park facilities should be managed to maintain natural, native vegetation. Based on our observations, an abundant natural seed source exists that can provide the basis for this. Human management can be restricted to removing some (not necessarily all) non-native species, limited planting of certain species, and intervention with irrigation or watering if absolutely necessary during extreme droughts. In addition, the non-profit groups that have constructed and managed the native species arboretum should be encouraged and allowed to continue this activity, if they so desire, as it has been useful in educating the public about native species.

REFERENCES

Banko, W. E. 1980. "Population Histories – Species Accounts Seabirds: Newell's Shearwater ('A'o)." Cooperative National Park Resources Studies Unit, University of Hawai'i at Manoa, Department of Botany, Technical Report #5A.

Camp, R. J. and P. C. Banko. 2012. *Palila abundance estimates and trends*. Technical Report HCSU-033. Hawaii Cooperative Studies Unit, Hilo, HI.

Cole, F. R., A. C. Medeiros, L. L. Loope and W. W. Zuehlke. 1992. Effects of the Argentine Ant on Arthropod Fauna of Hawaiian High-Elevation Shrubland. *Ecology* 73(4): 1313-1322

Cuddihy L.W. and Stone C.P. 1990. *Alteration of Native Hawaiian Vegetation*. Cooperative National Park Resources Studies Unit, University of Hawai'i, Honolulu.

Day, R. H., B. Cooper, and T. C. Telfer. 2003. *Decline of Townsend's (Newell's Shearwaters (Puffinus auricularis newelli) on Kauai, Hawaii*. The Auk 120: 669-679.

Gagne, W., and L. Cuddihy. 1990. "Vegetation," pp. 45-114 in W.L. Wagner, D.R. Herbst, and S.H. Sohmer, eds., *Manual of the Flowering Plants of Hawai'i*. 2 vols. Honolulu: University of Hawai'i Press.

Gorresen M.P., Bonaccorso F.J., Todd C.M., Montoya-Aiona K., and K. Brinck. 2013. *A Five-Year Study of Hawaiian Hoary Bat (Lasiurus Cinereus Semotus) Occupancy on the Island of Hawai'i*. Hawai`i Cooperative Studies Unit Technical Report HCSU-041. Hawai`i National Park, HI.

Jacobs. D. 1994. Distribution and Abundance of the Endangered Hawaiian Hoary Bat, *Lasiurus cinereus semotus*, on the Island of Hawai'i. *Pacific Science* 48(2): 193-200

Federal Highway Administration, Central Federal Lands Highway Division (FHWA-CFLHD). 1999. *Final Environmental Impact Statement, Saddle Road (State Route 200) Mamalahoa Highway (State Route 190) to Milepost 42*. Denver, CO.

Giambelluca, T.W., Q. Chen, A.G. Frazier, J.P. Price, Y.-L. Chen, P.-S. Chu, J.K. Eischeid, and D.M. Delparte, 2014: Online Rainfall Atlas of Hawai'i. *Bull. Amer. Meteor. Soc.*, doi: 10.1175/BAMS-D-11-00228.1.

Hawaii Wildfire Management Organization (HWMO). 2007. *Community Wildfire Protection Plan for Northwest Hawaii Island.* With support from the Fire Management Program of Hawaii State Department of Land and Natural Resources, Division of Forestry and Wildlife.

Krushelnycky, P. D., S. M. Joe, A. C. Medeiros, C. C. Daehler and L. L. Loope. 2005. The role of abiotic conditions in shaping the long-term patterns of a high-elevation Argentine ant invasion. Diversity and Distributions 11(4): 319-331.

Kumu Pono Associates. 2005. *Mauna Kea-Ka Piko Kaulana O Ka 'Aina: Mauna Kea – the Famous Summit of the Land.* Prep. for Office of Mauna Kea Management, University of Hawai'i.

Leonard, D. L., Jr., P. C. Banko, K. W. Brinck, C. Farmer, and R. J. Camp. 2008."Recent surveys indicate rapid decline of Palila population." *'Elepaio* 68:27–30.

Olson, S.L. and H.F. James. 1982. “Prodromus of the fossil avifauna of the Hawaiian Islands.” *Smithsonian Contributions to Zoology* 365:1-59.

U.S. Army Garrison, Hawaii, HQ. 2003. *Integrated Wildland Fire Management Plan Oahu and Pohakuloa Training Areas*. Prep. by the Center for Environmental Management of Military Lands, Fort Collins, Colorado.

U.S. Fish and Wildlife Service (USFWS). 1967. *Office of the Secretary; native fish and wildlife; endangered species; notices*. Federal Register 37(32):4001.

_____. 1977. *Determination of critical habitat for six endangered species*. Federal Register 42:40685-40690.

_____. 2015. *USFWS Threatened and Endangered Species System (TESS).* Washington: GPO. http://ecos.fws.gov/tess_public/StartTESS.do.

University of Hawai‘i at Hilo, Dept. of Geography. 1998. *Atlas of Hawai‘i.* 3rd ed. Honolulu: University of Hawai‘i Press.

Wetterer, J. K., P. C. Banko, L. P. Laniawe, J. W. Slotterback and G. J. Brenner. 1998. Nonindigenous ants at high elevations on Mauna Kea, Hawaii. *Pacific Science* 52(3): 228-236.

Wolfe, E.W., and J. Morris. 1996. *Geologic Map of the Island of Hawai‘i.* USGS Misc. Investigations Series Map i-2524-A. Washington, D.C.: U.S. Geological Survey.

Zimmerman, E. C. 1941. Argentine ants in Hawaii. *Proceedings of the Hawaiian Entomological Society* 11(1): 108.

Mauna Kea Recreation Area Improvements

Environmental Assessment

APPENDIX 3
Archaeological Report

[This page intentionally left blank]

An Archaeological and Architectural Assessment Survey of the County of Hawai‘i Administered Mauna Kea Recreation Area

TMK: (3) 4-4-016:003 (por.)

Ka‘ohe 4 Ahupua‘a
Hāmākua District
Island of Hawai‘i

DRAFT VERSION

Prepared By:

Benjamin Barna, Ph.D.
and
Robert B. Rechtman, Ph.D.

Prepared For:

Ron Terry
Geometrician Associates, LLC
P.O. Box 396
Hilo, HI 96721

May 2015

ASM Project Number 23440.00

ASM affiliates
Archaeology • History • Ethnography • Architectural History
Office: (808) 969-6066 • Fax: (808) 443-0065

An Archaeological and Architectural Assessment Survey of the County of Hawai‘i Administered Mauna Kea Recreation Area

TMK: (3) 4-4-016:003 por.

Ka‘ohe 4 Ahupua‘a
Hāmākua District
Island of Hawai‘i

ASM affiliates

EXECUTIVE SUMMARY

At the request of Ron Terry of Geometrician Associates, LLC, ASM Affiliates (ASM) a survey for historic properties within a roughly 34-acre project area within the County of Hawai‘i administered Mauna Kea Recreation Area (MKRA), located on a portion of TMK: (3) 4-4-016:003 in Ka‘ohe 4 Ahupua‘a, Hāmākua District, Island of Hawai‘i. This study was conducted in support of proposed renovations to existing structures and the potable water system in the recreation area. The scope of work includes constructing a section of gravel road and widening an existing section of gravel road, widening and repaving the parking area at the Recreation/Dining Hall and replacing its ADA accessible ramp, installing new fencing around the perimeter of the MKRA, constructing a new twelve-foot wide multi-use path, refurbishing of the vacation cabins, and installing a new potable water tank near the existing pump station and waterlines within the recreation area.

Fieldwork was conducted under the direction of Robert Rechtman, Ph.D. on November 2, 2014, by Benjamin Barna, Ph.D., and Lauren Kepa‘a and on January 20, 2015 by Benjamin Barna, Ph.D. Fieldwork consisted of a pedestrian survey with 100% coverage of the study area. The survey crew walked in systematic sweeps paralleling the survey area boundaries with spacing between crew members of no more than 20 meters. Visibility of the ground surface was very good throughout the study area. Mapping of the study area, including existing buildings and other structures (e.g., sidewalks and roads) was conducted by Engineering Partners at the request of ASM. Buildings and structures within the recreation area were photographed, recording each elevation and specific construction details as warranted. This study was undertaken in accordance with Hawai‘i Administrative Rules 13§13–275, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawai‘i Administrative Rules 13§13–276. Compliance with the above standards is sufficient for meeting the initial historic preservation review process requirements of both the Department of Land and Natural Resources and the County of Hawai‘i Planning Department.

As a result of the current study, no archaeological features were observed in the study area. Observations of past ground disturbance and the results of previous studies in and around Pōhakuloa indicate that subsurface archaeological resources are unlikely to be found within the study area. Six architectural resources in the study area (Vacation Cabins 1-5 and the Comfort Station) have reached the 50-year age threshold to be considered “historic properties” under HRS §6E-2. The findings of this study are consistent with other studies that show that the area around Pōhakuloa was sparsely used in Precontact and early Historic times, with the majority of activity near Pōhakuloa Gulch occurring at the springs located more than 2000 feet elevation above the study area or the transportation corridor now (most likely) covered by the Saddle Road alignment. Constant use and development activities at the MKRA have removed archaeological and architectural evidence associated with activities in the study area pre-dating the 1960s. At present, six of the MKRA’s buildings are older than 50 years, but as determined in consultation with the acting SHPD Architecture Branch Chief, none of the historic buildings are significant. Given this assessment, we recommend “no historic properties affected” in accordance with HAR §13-275-6(e).

CHAPTERS

Page

FIGURES

Page

Page

TABLES

Page

1. INTRODUCTION

At the request of Geometrician Associates, LLC, ASM Affiliates (ASM) conducted a survey for historic properties within a roughly 34-acre project area associated with proposed facilities renovations at the County of Hawai‘i administered Mauna Kea Recreation Area (MKRA), located on a portion of TMK: (3) 4-4-016:003 in Ka‘ohe 4 Ahupua‘a, Hāmākua District, Island of Hawai‘i (Figures 1 through 4). The County of Hawai‘i - Department of Parks and Recreation (DPR) has recently assumed management of the MKRA, which had formerly been under the jurisdiction of the Department of Land and Natural Resources – State Parks Division. The DPR-proposed renovations involve improvements to existing structures and the recreation area’s potable water system (Figure 5). The scope of work includes constructing a section of gravel road and widening an existing section of gravel road, widening and repaving the parking area at the Recreation/Dining Hall and replacing its ADA accessible ramp, installing new fencing around the perimeter of the MKRA, constructing a new twelve-foot wide multi-use path, refurbishing of the vacation cabins, and installing a new potable water tank near the existing pump station and waterlines within the recreation area.

This study was undertaken in accordance with Hawai‘i Administrative Rules13§13–275, and was performed in compliance with the Rules Governing Minimal Standards for Archaeological Inventory Surveys and Reports as contained in Hawai‘i Administrative Rules 13§13–276. According to 13§13-275-5(b)(5)(A) when no archaeological resources are discovered during an archaeological survey the production of an Archaeological Assessment report is appropriate. Compliance with the above standards is sufficient for meeting the initial historic preservation review process requirements of both the Department of Land and Natural Resources and the County of Hawai‘i Planning Department. This report contains background information outlining the project area’s physical and cultural contexts, a presentation of previous archaeological work in the vicinity of the project area, and current survey expectations based on that previous work. Also presented is an explanation of the project’s methods and a description of the findings.

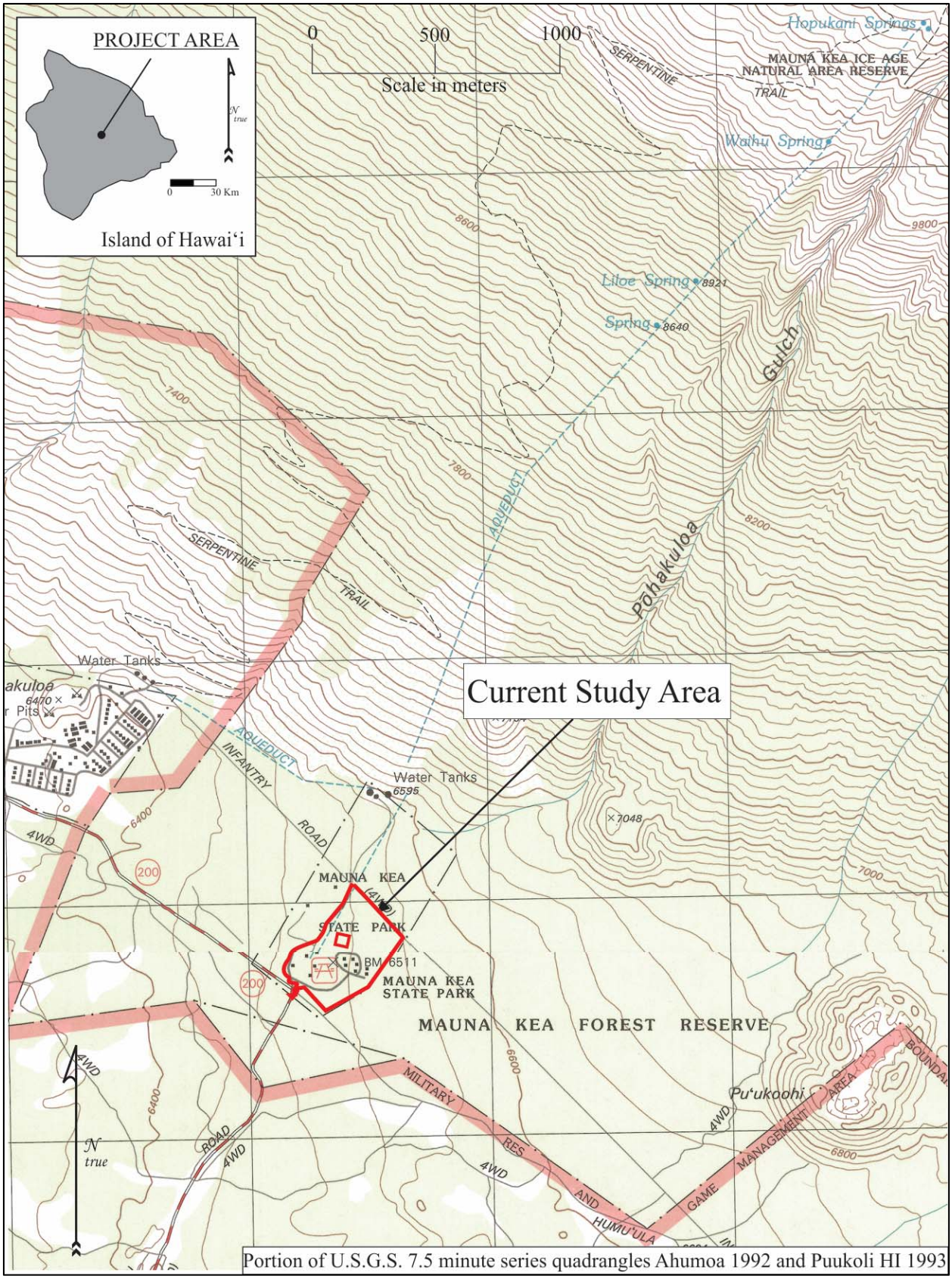


Figure 1. Study area location.

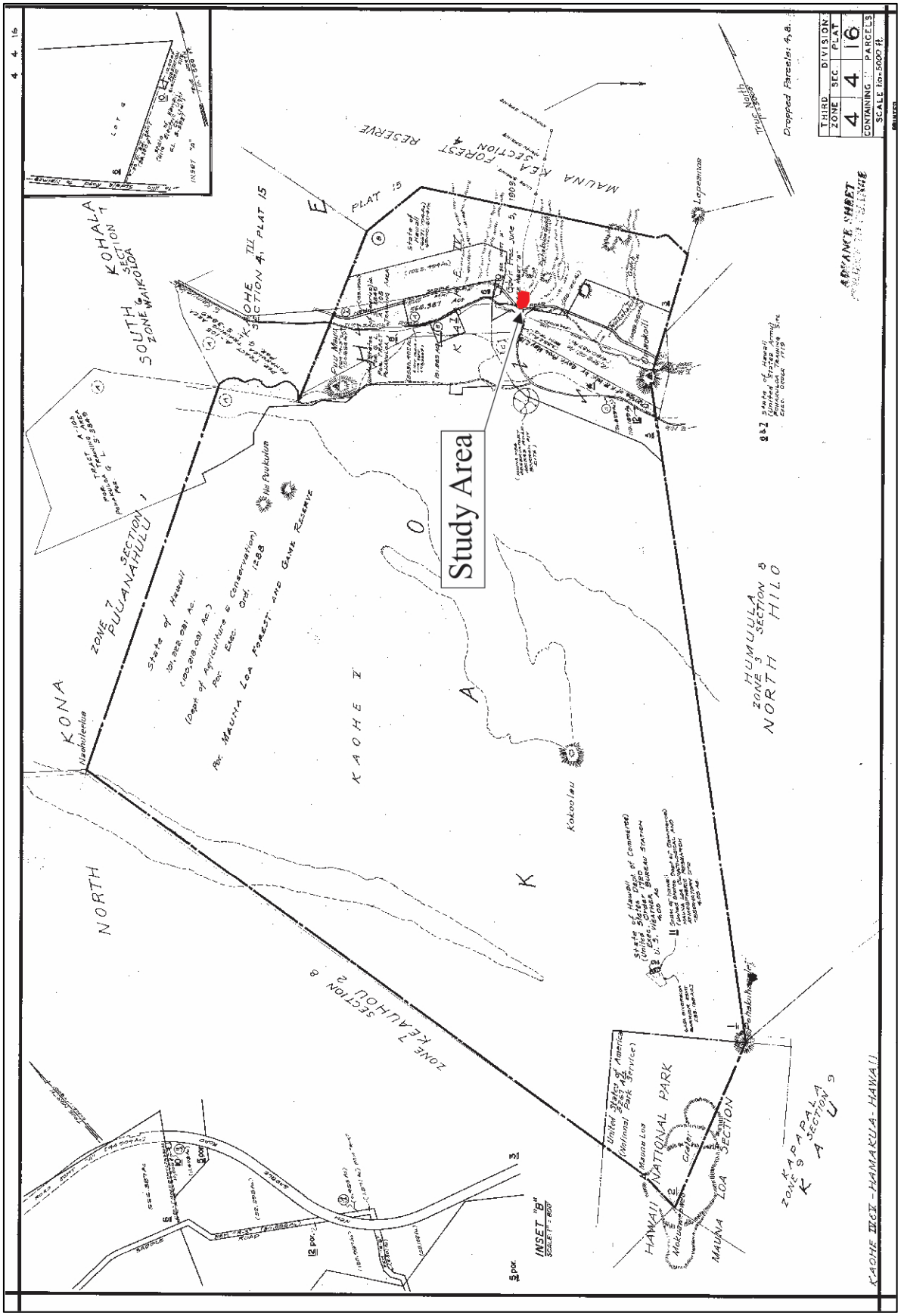


Figure 1. Tax Map Key (TMK): (3) 4-4-016 showing current study area (portion of Parcel 003).

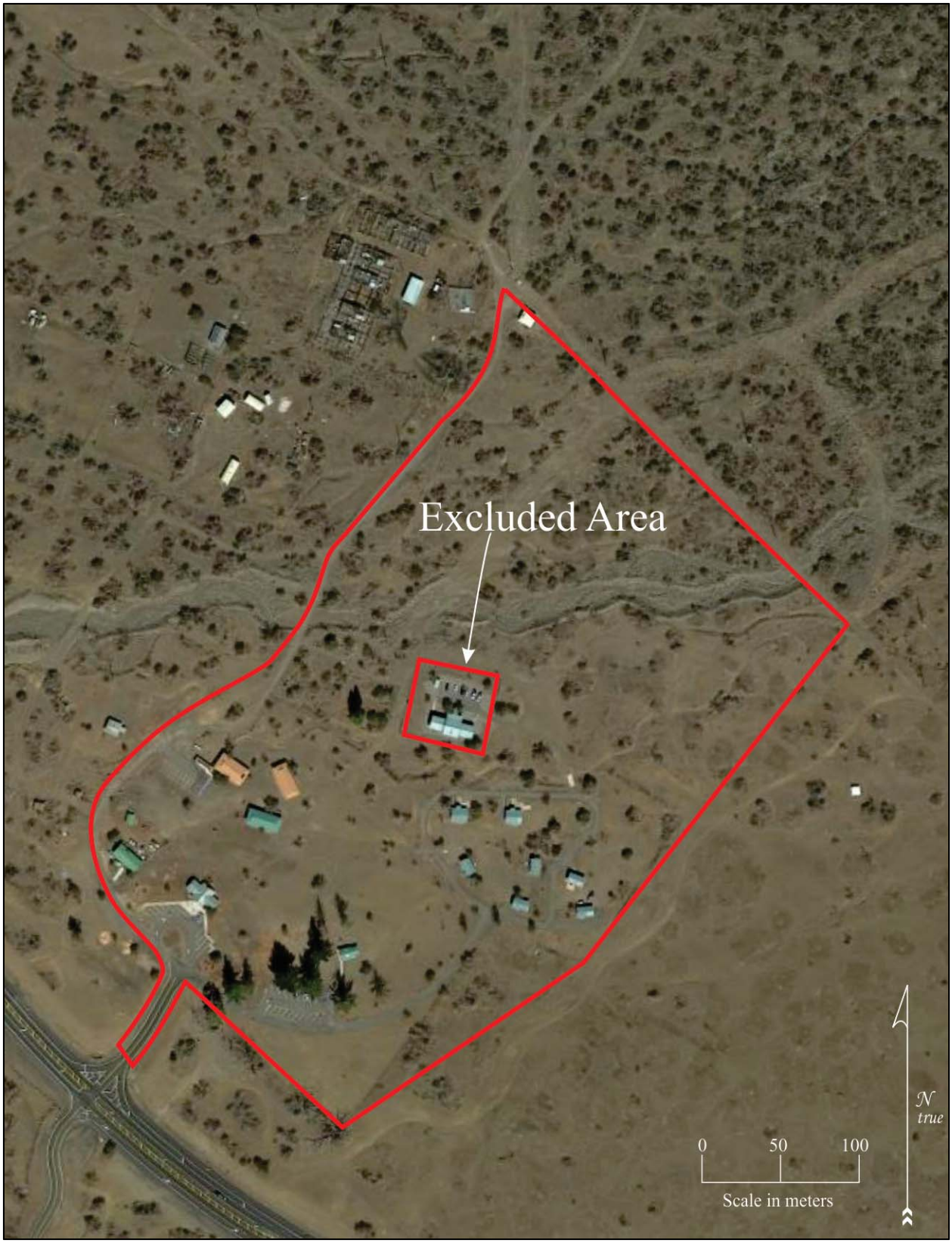


Figure 3. Satellite image of the study area (outline in red) *ca.* 2013 (Google Earth™).

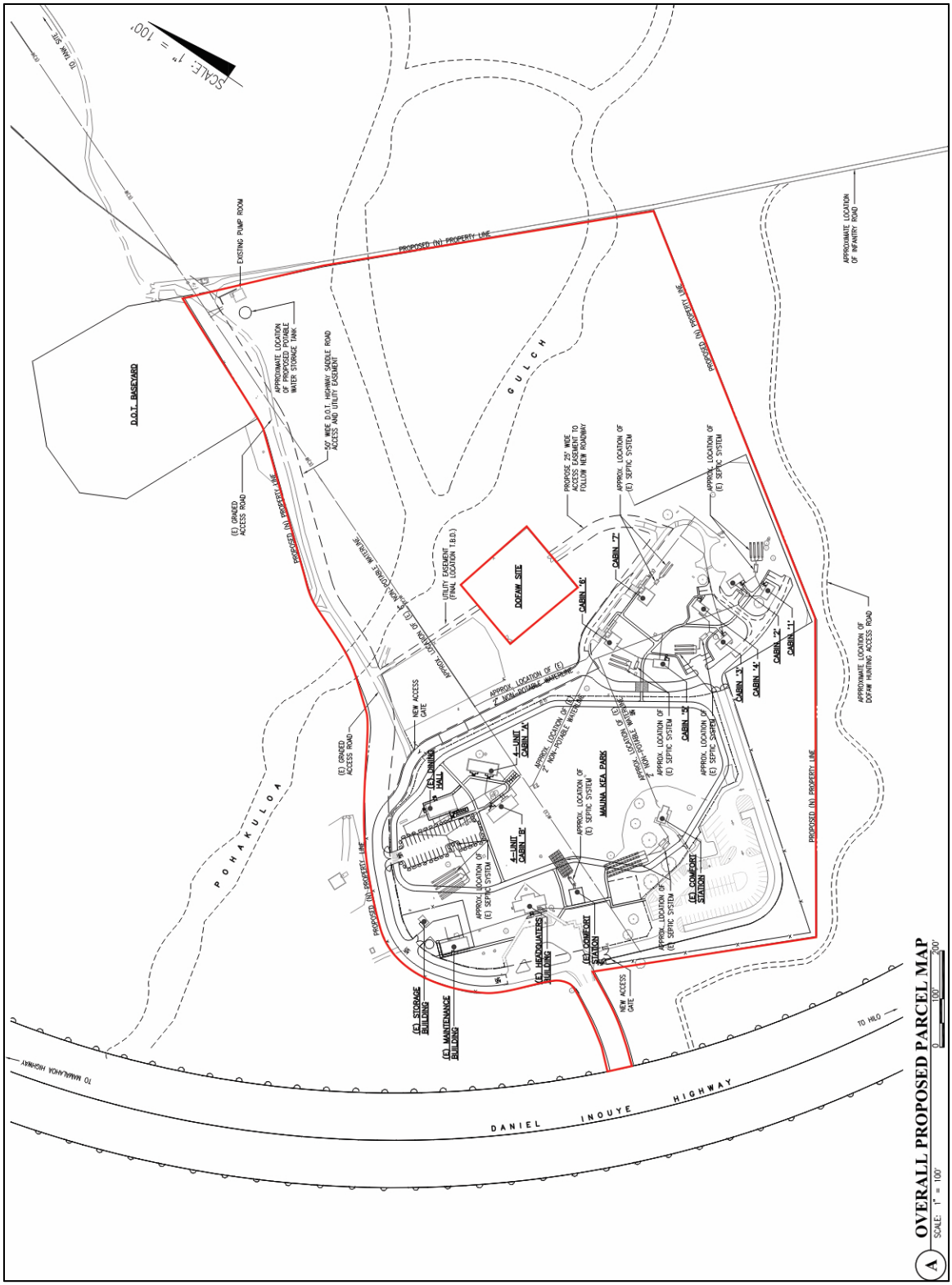


Figure 4. Proposed Parcel Map of MKRA boundary with study area boundary indicated in h red.

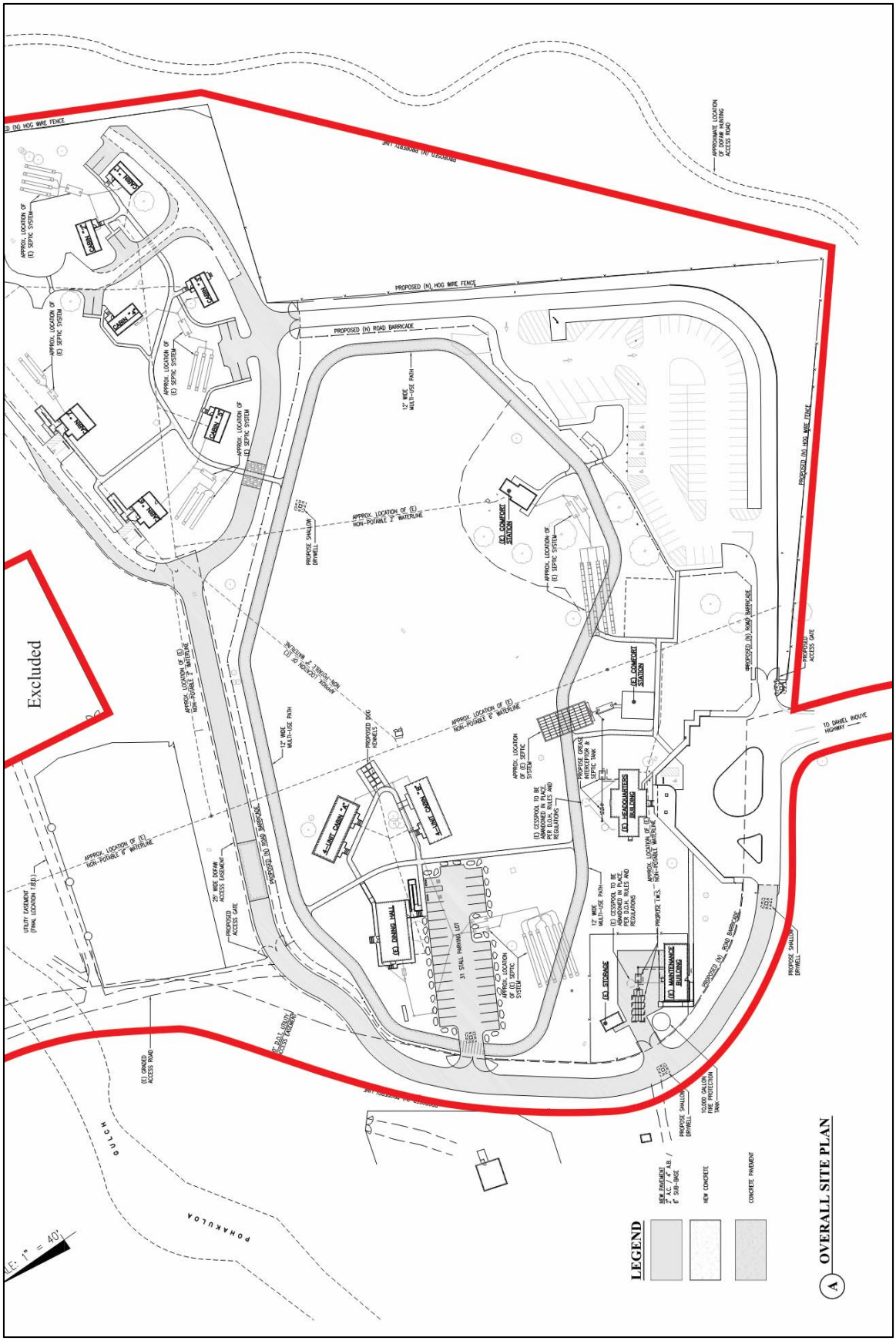


Figure 5. Development plan (study area indicated in red).

STUDY AREA DESCRIPTION

The current study area is a roughly 34-acre portion of TMK (3) 4-4-016:003 situated at elevations ranging from 6,470-6,560 feet above sea level on the southern flank of Mauna Kea (see Figures 1 and 2). The MKRA is located in a portion of the saddle region between Mauna Kea and Mauna Loa locally known as Pōhakuloa. Access to the study area is from the Daniel K. Inouye Highway (new Saddle Road). Brief descriptions of the current natural and built environments found in the study area follow, and the history of development of the built environment in the MKRA is elaborated in the cultural-historical background section below.

The Natural Environment

The study area climate is relatively cool and dry, with average daytime temperatures ranging between 50 and 60° F but reaching as low as the 30°s F during the winter. Average annual rainfall in the area is between 20 and 30 inches. Soils in the study area consist of Alaone-Keekee loamy sands, 2-6 percent slope found as alluvial fans on footslopes in the saddle between Mauna Kea and Mauna Loa (USDA-NRCS 2014). In the immediate study area, the Keekee loamy sand 0-6% slope component of this complex, as mapped by Sato et al. (1973:28), are described as a somewhat excessively drained ashy loamy sand formed from basic volcanic ash over sandy and gravelly alluvium derived from basalt. The surrounding area lacks permanent streams, but three named springs are located beside Pōhakuloa Gulch above the study area at elevations ranging from 8,640 and 10,400 feet above sea level. The natural vegetation within the study area has been characterized as *ʻĀweoweo (Chenopodium) Subalpine Shrubland* (Gagne and Cuddihy 1990) variably invaded by a number of non-native plants. Most of the site, however, is in the highly disturbed, artificial state. During a recent vegetation survey conducted as part of this overall project, fifty-two plant species were identified, with four indigenous and fourteen endemic species (Table 1).

Table 1. Plant species observed with the current study area.

Scientific name	*Family*	*Common name*	*Status*
Acacia koa	Fabaceae	*Koa*	E*
Anthoxanthum odoratum	Poaceae	Sweet vernal grass	A
Argemone glauca	Papaveraceae	*Puakala*	E
Bidens alba	Asteraceae	Beggartick	A
Bidens menziesii var. *filiformis*	Asteraceae	*Koʻokoʻolau*	A
Bidens pilosa	Asteraceae	Beggartick	A
Brassica nigra	Brassicaceae	Black mustard	A
Bromus tectorum	Poaceae	Cheat grass	A
Buddleia asiatica	Buddleiaceae	Dogtail	A
Cenchrus clandestinus	Poaceae	Kikuyu grass	A
Cenchrus setaceus	Poaceae	Fountain grass	A
Chenopodium murale	Amaranthaceae	Lamb's quarters	A
Chenopodium oahuense	Amaranthaceae	*ʻĀweoweo*	E
Cynodon dactylon	Poaceae	Bermuda grass	A
Deschampsia nubigena	Poaceae	Hairgrass	E
Dicranopteris linearis	Gleicheniaceae	*Uluhe*	I
Dodonaea viscosa	Sapindaceae	*ʻAʻaliʻi*	I
Dubautia sp.	Asteraceae	Dubautia	E
Epilobium sp.	Onagraceae	Willow herb	A
Eragrostis atropioides	Poaceae	Lovegrass	E
Erodium cicutarium	Geraniaceae	Pin clover	A
Heterotheca grandiflora	Asteraceae	Telegraph weed	A
Hibiscadelphus sp. (giffardianus?)	Malvaceae	*Hau kuahiwi*	E*
Holcus lanatus	Poaceae	Velvet grass	A
Hypochoeris radicata	Asteraceae	Hairy cat's ear	A
Lepidium bonariense	Brassicaceae	Pepperwort	A
Leptecophylla tameiameiae	Epacridaceae	*Pukiawe*	I
Malva parviflora	Malvaceae	Cheese weed	A
Melinus minutiflora	Poaceae	Molasses grass	A

**continued on next page*

Table 1 cont.

Scientific name	*Family*	*Common name*	*Status*
Metrosideros polymorpha	Myrtaceae	*ʻOhiʻa*	E*
Myoporum sandwicense	Myoporaceae	*Naio*	I
Opuntia ficus-indica	Cactaceae	*Panini*	A
Pelargonium x hortorum	Geraniaceae	Geranium	A*
Persicaria capitata	Polygonaceae	Pink head knotweed	A
Pinus radiata	Pinaceae	Monterey pine	A
Pinus sp.	Pinaceae	Pine	A
Pseudognaphalium sandwicensium	Asteraceae	*ʻEnaʻena*	E
Rhamnus californica	Rhamnaceae	Coffeeberry	A
Rhynchelytrum repens	Poaceae	Natal red-top	A
Salsola tragus	Chenopodacieae	Tumbleweed	A
Santalum paniculatum	Santalaceae	*ʻIliahi*	E*
Senecio madagascariensis	Asteraceae	Fireweed	A
Sicyos anunu	Cucurbitaceae	*Anunu*	E
Sophora chrysophylla	Fabaceae	*Māmane*	E
Stenogyne sessilis	Lamiaceae	N/A	E*
Tagetes minuta	Asteraceae	Southern cone marigold	A
Tetramolopium sp.	Asteraceae	N/A	E*
Trifolium arvense	Fabaceae	Rabbit foot clover	A
Verbascum thapsis	Scrophulariaceae	Mullein	A
Verbena litoralis	Verbenaceae	*ʻOwi*	A
Verbesina encelioides	Asteraceae	Golden crown-beard	A
Wikstroemia hawaiiensis	Thymelaeaceae	*ʻAkia*	E*

A=Alien, I=Indigenous, E=Endemic, *in a cultivated state.

The Built Environment

The built environment of the study area consists of recreation facilities, associated infrastructure, and non-park facilities. The study area is bounded by the proposed borders of the MKRA depicted in Figure 4, which excludes a fenced area that is administered by the Department of Land and Natural Resources - Division of Conservation and Resource Enforcement. The recreation area facilities include fifteen standing buildings, twelve of which are park facilities, surrounded by partially-landscaped open space (Figure 6). The park buildings are arranged in two clusters, with the exception of the existing Comfort Station, which is located near the south parking lot (Figure 7, Table 2). The eastern cluster of buildings include five Vacation Cabins (Buildings 1-5) and two ADA-accessible Family Cabins (Buildings 6 & 7). To the northwest of the Family Cabins is a small native plant fenced enclosure. In the western cluster, Group Cabins "A" and "B" are located near a Recreation/Dining Hall, and these three buildings share a common parking lot. The western cluster also contains the Headquarters Building, the Caretaker's Cabin, a Storage Building, a booster pump station, and a new comfort station under construction at the time of the current study. The MKRA facilities are partially surrounded by gravel roads (see Figures 3 and 5); the eastern cluster of buildings is served by a loop road, while the western cluster is surrounded by a partial loop (which will be completed as part of the proposed development). The park's picnic area is currently located near the existing comfort station. A new comfort station near the Headquarters Buildings and a booster pump station near Group Cabin "B," which were under construction at the time of this study are not present in Figure 7. At the time of the current study, the Hawaiʻi Department of Transportation was in the process of developing a new baseyard *mauka* of the park facilities near the old *nēnē* propagation center (Mitchell et al. 2012).

Figure 6. Landscaped open space in the study area, view to the west.

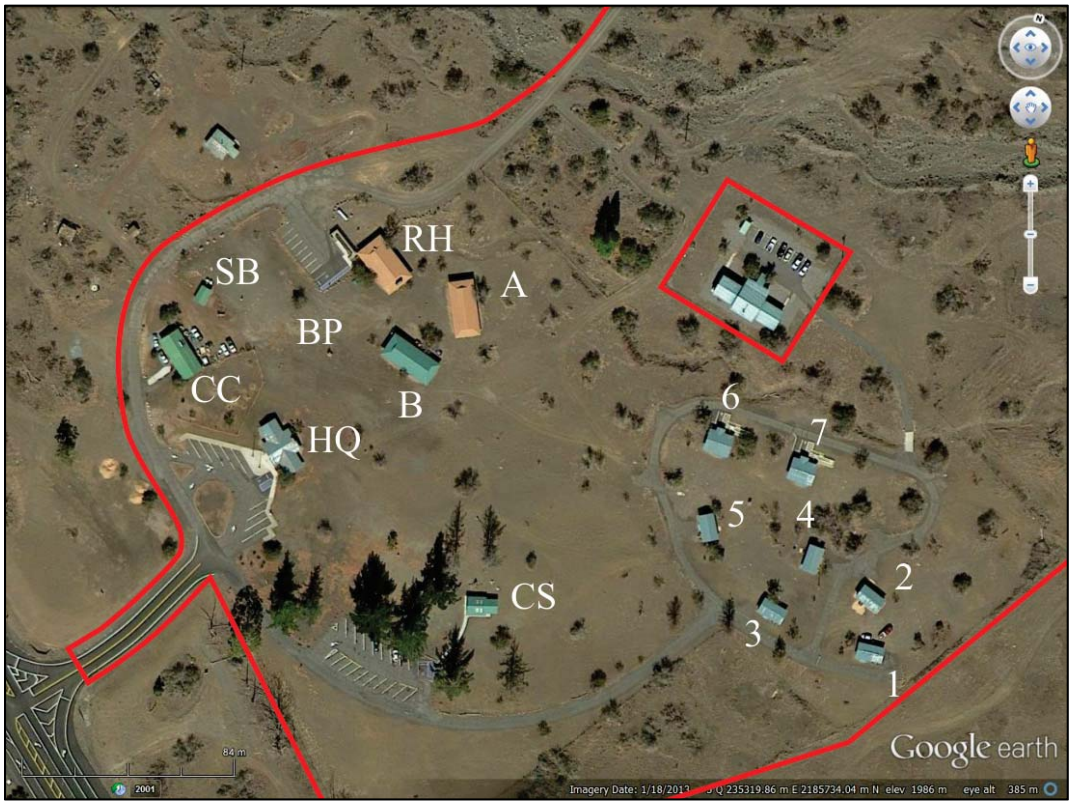


Figure 7. Satellite image of MKRA facilities and adjacent buildings in the study area (Google Earth™).

Table 2. MKRA facilities and adjacent buildings shown in Figure 7.

Key	*Building*	*Location in study area*
1	Vacation Cabin 1 "Mamani"	East cluster
2	Vacation Cabin 2 "Iliahi"	East cluster
3	Vacation Cabin 3 "Naio"	East cluster
4	Vacation Cabin 4 "Pilo"	East cluster
5	Vacation Cabin "5 Aalii"	East cluster
6	Family Cabin "Cabin 6"	East cluster
7	Family Cabin "Cabin 7"	East cluster
A	Group Cabin "A"	West cluster
B	Group Cabin "B"	West cluster
BP	Booster Pump Station	West cluster
CC	Caretaker's Cabin	West cluster
CS	Comfort Station	Near south parking lot
HQ	Headquarters Building	West cluster
RH	Recreation/Dining Hall	West cluster
SB	Storage Building	West cluster

Disturbance from past and recent improvements are evident around the MKRA. There are several push-piles from vegetation clearance near the perimeter of the MKRA (Figure 8). Disturbance from the 2007 upgrade of the MKRA's wastewater system (Quinn 2007), is still visible in places where vegetation is re-establishing itself between buildings (Figure 9). At the time of the current study, parking lots were being repaved (Figure 10). Along the southern bank of the dry drainage extending from Pōhakuloa Gulch, there appears to be an intentionally built berm of cobbles, boulders, and sediment (Figure 11).

Figure 8. Disturbance in the northeast of the study area from brush clearing.

Figure 9. Area between MKRA cabins disturbed by recent wastewater system upgrades, view to the east.

Figure 10. Recently re-paved parking lot in southeastern portion of study area, view to the west.

Figure 11. Berm along the southern bank of the dry drainage forming a boundary of the current study area.

2. BACKGROUND

To generate a set of expectations regarding the nature of archaeological resources that might be encountered within the study area, and to establish an environment within which to access the significance of any such resources, a general culture-historical background for the region is presented, the results of previous archaeological studies conducted in the vicinity of the project area are summarized, and oral-historical information pertaining to the specific study area is discussed. Oral traditions, historical accounts, and archaeological studies track changes in land use in the study area from limited resource acquisition during Precontact times, to livestock ranching during the nineteenth and early twentieth centuries, to conservation and public recreation in the present. The study area has also been associated with a major transportation corridor that very likely dates back to early Precontact times but has been improved and modernized since becoming a wagon road in the 1860s. Major sources of information for this background information include previous research conducted by Maly and Maly (2005), Quinn (2007), Cordy (1994), and Langlas et al. (1999).

CULTURE-HISTORICAL CONTEXT

The current study area is located in the saddle between Mauna Kea and Mauna Loa in Kaʻohe 4 Ahupuaʻa, in the general area sometimes referred to as Pōhakuloa. Kaʻohe 4 Ahupuaʻa is part of the inland portion of the district of Hāmākua, one of six traditional districts on Hawaiʻi Island. Although the boundaries of the Hāmākua District are strictly political, the lands encompassed by it possess a unique environment that played a large role in determining the boundaries and shaping its history from the time of Polynesian settlement to the modern day. Understanding this environment is important for understanding the history of the current study area:

> Hāmākua district is a windward district in the truest sense. It has ca. 29 miles of shoreline, primarily focused on Mauna Kea's eastern slopes with exposed cliffs, rough seas, and narrow reef formations. Above the sea cliffs, the gentle slopes have a thick soil cover and abundant rainfall, and lush vegetation, with the upper slopes from 1,000-6,000 feet in an *ʻōhiʻa-koa* rain forest. The slopes are cut by deep (up to 300-foot), narrow stream gulches cloaked with *kukui* and pandanus. Yet Hāmākua is more than these slope and gulch lands. It also includes the extremely

> large, deep valleys of Waipiʻo and Waimanu which have cut over a millennia into the older Kohala Mountain, valleys which … dominated the history of the district and the island. Hāmākua also extended inland, encompassing the high elevation *māmane-naio* forests of Mauna Kea and the subalpine, oft snow-covered, summit itself. The district continued across the foggy and cold upland plateau or Saddle with its terrain a mixture of bare lava and soils, and with its vegetation a mixture of *ʻōhiʻa* and *māmane-naio* forests. This plateau had important nesting grounds of *ʻuʻau* and *nēnē*. And, Hāmākua virtually spanned the island-reaching to and looking down into the upper edges of Kona. (Cordy 2000:21).

It was to this general environmental setting that the first Polynesians in Hawaiʻi arrived. Over generations they shaped and utilized the natural environment to provide all they needed for sustenance and survival. In the process they created a uniquely Hawaiian culture that was wholly adapted to the environment. The brief generalized cultural sequence that follows below provides a time frame for the peopling of Hawaiʻi, the development of Hawaiian culture, the expansion and intensification of the Hawaiian population, and the resulting stresses on it from the earliest Polynesian settlers to the time of European Contact.

A Generalized Model of Hawaiian Prehistory

The generalized cultural sequence that follows is based on Kirch's (1985) model, and amended to include recent revisions offered by Kirch (2011). The conventional wisdom has been that the first inhabitants of Hawaiʻi Island probably arrived by at least A.D. 300, and focused habitation and subsistence activity on the windward side of the island (Burtchard 1995; Kirch 1985; Hommon 1986). However, there is no archaeological evidence for occupation of Hawaiʻi Island (or perhaps anywhere in Hawaiʻi) during this initial settlement, or colonization stage of island occupation (A.D. 300 to 600). More recently, Kirch (2011) has convincingly argued that Polynesians may not have arrived to the Hawaiian Islands until at least A.D. 1000, but expanded rapidly thereafter. The implications of this on the currently accepted chronology would alter the timing of the Settlement, Developmental, and Expansion Periods, possibly shifting the Settlement Period to A.D. 1000 to 1100, the Developmental Period to A.D. 1100 to 1350, and the Expansion Period to A.D. 1350 to 1650.

The initial settlement in Hawaiʻi is believed to have occurred from the southern Marquesas Islands. This was a period of great exploitation and environmental modification, when early Hawaiian farmers developed new subsistence strategies by adapting their familiar patterns and traditional tools to their new environment (Kirch 1985; Pogue 1978). Their ancient and ingrained philosophy of life tied them to their environment and kept order. Order was further assured by the conical clan principle of genealogical seniority (Kirch 1984). According to Fornander (1969), the Hawaiians brought from their homeland certain universal Polynesian customs: the major gods Kāne, Kū, and Lono; the *kapu* system of law and order; cities of refuge; the *ʻaumakua* concept; various epiphenomenal beliefs; and the concept of *mana*. Initial permanent settlements in the islands were established at sheltered bays with access to fresh water and marine resources. Communities shared extended familial relations and there was an occupational focus on the collection of marine resources. Over a period of several centuries the areas with the richest natural resources became populated and perhaps even crowded, and there was an increasing separation of the chiefly class from the common people. As the environment reached its maximum carrying capacity, the result was social stress, hostility, and war between neighboring groups (Kirch 1985). Soon, large areas of Hawaiʻi were controlled by a few powerful chiefs.

The Development Period brought about a uniquely Hawaiian culture. The portable artifacts found in archaeological sites of this period reflect not only an evolution of the traditional tools, but some distinctly Hawaiian inventions. The adze (*koʻi*) evolved from the typical Polynesian variations of plano-convex, trapezoidal, and reverse-triangular cross-section to a very standard Hawaiian rectangular quadrangular tanged adze. A few areas in Hawaiʻi produced quality basalt for adze production. The summit region of Mauna Kea, above the current study area, was a well-known adze quarry. The two-piece fishhook and the octopus-lure breadloaf sinker are Hawaiian inventions of this period, as are ʻ*ulu maika* stones and *lei niho palaoa*. The later was a status item worn by those of high rank, indicating a trend toward greater status differentiation (Kirch 1985).

The Expansion Period is characterized by the greatest social stratification, major socioeconomic changes, and intensive land modification. Most of the ecologically favorable zones of the windward and coastal regions of all major islands were settled and the more marginal leeward areas were being developed. The greatest population growth occurred during the Expansion Period. Subsistence patterns intensified as crop farming evolved into large irrigated field systems and expanded into the marginal dry land areas. The *loko* or fishpond aquaculture flourished during this period (Bellwood 1978; Kirch 1985).

It was during the Expansion Period that a second major migration settled in Hawai‘i, this time from Tahiti in the Society Islands. According to Kamakau (1976) the *kahuna* Pā‘ao settled in the islands during the 13th century. Pā‘ao was the keeper of the god Ku‘ka‘ilimoku, and had fought bitterly with his older brother, the high priest Lonopele. After much tragedy on both sides, Pā‘ao was expelled from his homeland by Lonopele. He prepared for a long voyage, and set out across the ocean in search of a new land. On board Pā‘ao’s canoes were thirty-eight men (*kānaka*), two stewards (*kānaka ‘ā‘īpu‘upu‘u*), the chief Pilika‘aiea (Pili) and his wife Hina‘aukekele, Nāmau‘u o Malaia, the sister of Pā‘ao, and the prophet Makuaka‘ūmana (Kamakau 1991). In 1866 Kamakau told the following story of their arrival in Hawai‘i:

> Puna on Hawai‘i Island was the first land reached by Pā‘ao, and here in Puna he built his first heiau for his god Aha‘ula and named it Aha‘ula [Waha‘ula]. It was a luakini. From Puna, Pā‘ao went on to land in Kohala, at Pu‘uepa. He built a heiau there called Mo‘okini, a luakini.
>
> It is thought that Pā‘ao came to Hawai‘i in the time of the ali‘i La‘au because Pili ruled as mo‘i after La‘au. You will see Pili there in the line of succession, the mo‘o kū‘auhau, of Hanala‘anui. It was said that Hawai‘i Island was without a chief, and so a chief was brought from Kahiki; this is according to chiefly genealogies. Hawai‘i Island had been without a chief for a long time, and the chiefs of Hawai‘i were ali‘i maka‘āinana or just commoners, maka‘āinana, during this time. (Kamakau 1991:100)
>
> . . . There were seventeen generations during which Hawai‘i Island was without chiefs—some eight hundred years. . . . The lack of a high chief was the reason for seeking a chief in Kahiki, and that is perhaps how Pili became the chief of Hawai‘i. He was a chief from Kahiki and became the ancestor of chiefs and people of Hawai‘i Island. (Kamakau 1991:101-102)

The Pili line’s initial ruling center was likely in Kohala, but Cartwright (1933) suggests that Pili resided in and ruled from Waipi‘o Valley in the Hāmākua District. Ethnohistorical traditions (Fornander 1880) indicate that valley was associated with at least nine successive Pili line rulers of Hawai‘i Island, from Kaha‘imoele‘a to Umi (from roughly AD 1460 to 1620). Prior to the establishment of these Pili rulers, Waipi‘o was the residential base for powerful local rulers dating back to at least the A.D. 1200s (Cartwright 1933).

The concept of the *ahupua‘a* was established during the A.D. 1400s (Kirch 1985), adding another component to a then well-stratified society. This land unit became the equivalent of a local community, with its own social, economic, and political significance. *Ahupua‘a* were ruled by *ali‘i ‘ai ahupua‘a* or lesser chiefs; who, for the most part, had complete autonomy over this generally economically self-supporting piece of land, which was managed by a *konohiki*. *Ahupua‘a* were usually wedge or pie-shaped, incorporating all of the eco-zones from the mountains to the sea and for several hundred yards beyond the shore, assuring a diverse subsistence resource base (Hommon 1986). Ka‘ohe, however, is one of two large *ahupua‘a* in eastern Hāmākua (the other being Pā‘ahau) that were created above the upper gulches of the windward *ahupua‘a* to manage special resources such as those found in the *māmane* forests and the high-altitude regions of Mauna Kea. The bulk of Ka‘ohe encompasses these upland resources, and like its neighboring North Hilo *ahupua‘a* of Humu‘ula, it rises above its narrow coastal band, “engulfing all the other inland areas of Hāmākua—including the rest of Mauna Kea’s upper slopes and its summit and all the Interior Plateau” (Cordy 1994:12). Curtis Lyons described the special relationship of native tenants of Ka‘ohe to the mountain lands:

> The ordinary ahupuaa extends from half a mile into this [forest] belt. Then there are larger ahupuaas which are wider in the open country than others, and on entering the woods expand laterally so as to cut off all the smaller ones, and extend toward the mountain till they emerge to the open interior country; not however to converge to a point at the tops of the respective mountains. Only a rare few reach those elevations, sweeping past the upper ends of all the others, and by virtue of some privilege in bird-catching, or some analogous right, taking the whole mountain to themselves…the whole main body of Mauna Kea belongs to one land from Hamakua, vis., Kaohe, to whose owners belong the sole privilege of capturing the ua‘a [*sic*], a mountain-inhabiting but sea-fishing bird. (Lyons 1875:111, quoted in Maly and Maly 2005).

The *ali‘i* and the *maka‘āinana* (commoners) were not confined to the boundaries of the *ahupua‘a*; when there was a perceived need, they also shared with their neighbor *ahupua‘a ohana* (Hono-ko-hau 1974). The *ahupua‘a* were further divided into smaller sections such as the *‘ili, mo‘o‘aina, pauku‘aina, kihapai, koele, hakuone*, and *kuakua* (Hommon 1986, Pogue 1978). The chiefs of these land units gave their allegiance to a territorial chief or *mō‘ī* (king). *Heiau* building flourished during the Expansion Period as religion became more complex and embedded in a sociopolitical climate of territorial competition. Monumental architecture, such as *heiau*, “played a

key role as visual markers of chiefly dominance" (Kirch 1990:206). Waipiʻo was one of the most important religious and chiefly centers on the Island of Hawaiʻi, and a number of large *heiau* were maintained in the valley throughout the Precontact Period (Cordy 1994).

Līloa and his son ʻUmi were two of the most renowned rulers of the Pili line. Both were from Hāmākua and had their ruling centers in Waipiʻo (Cordy 1994). ʻUmi, who is often credited with uniting the island of Hawaiʻi under one rule, had a chiefly father (Līloa) and a mother (Akahi) who was a commoner (Kamakau 1992). Līloa met Akahi when he secretly left the valley to visit his other Hāmākua lands. As a young boy ʻUmi was raised in the countryside by his mother, but he soon moved to Waipiʻo to reside with his father and learn the chiefly ways (Kamakau 1992). Waipiʻo remained a leading chiefly center until the end of ʻUmi's reign around ca. 1620 (Cordy 1994).

Kirch (1985) places the beginning of the Proto-Historic Period during the rule of Lonoikamakahiki. This was a time marked by both political intensification and stress and continual conquest by the reigning *aliʻi*. Wars occurred regularly between intra-island and inter-island polities during this period. It was during this time of warfare that Kamehameha, who would eventually rise to power and unite all the Hawaiian Islands under one rule, was born in the District of North Kohala on the Island of Hawaiʻi (Kamakau 1992). There is some controversy about the year of his birth, but Kamakau (1992:66–68) places the birth event sometime between A.D. 1736 and 1758, most likely nearer to the later date. This period was one of continual conquest by the reigning *aliʻi*. In A.D. 1775 Kalaniʻōpuʻu and his forces, who had already conquered Hana in eastern Maui, raided and destroyed the neighboring Kaupō District, then launched several more raids on Molokaʻi, Lānaʻi, Kahoʻolawe, and parts of West Maui. It was at the battle of Kalaeokaʻilio that Kamehameha, a favorite of Kalaniʻōpuʻu, was first recognized as a great warrior and given the name of Paiʻea (hard-shelled crab) by the Maui chiefs and warriors (Kamakau 1992).

Kaʻohe Ahupuaʻa and the study area in oral traditions

Because of Mauna Kea's prominence in Hawaiʻi Island traditional beliefs, a substantial literature exists of *moʻolelo* and other traditions of the mountain (and thus Kaʻohe Ahupuaʻa) that were passed down from the Precontact Period. Previous studies have collected and summarized many of these accounts; in particular, Maly and Maly (2005) and Mitchell et al. (2012) present a number of traditions relating to the saddle and summit regions of Mauna Kea. The following discussion of legendary accounts of Kaʻohe and the study area focuses narrowly on the immediate vicinity of Pōhakuloa, taking the *ahupuaʻa* name of Kaʻohe as a point of departure to illustrate how Pōhakuloa is intimately connected to gods, heroes, and the greater landscape as conceived by Hawaiian culture.

Ahupuaʻa names often invoke history, legend, important people or resources found within them. The name "Kaʻohe" translates literally as "the bamboo" (Pukui et al. 1974:84-85). Unlike other lower-elevation places that share this name (e.g., an *ahupuaʻa* of the same name in South Kona), the bamboo to which the name refers is not meant to invoke vegetation, but rather is associated with the transportation of water. Dr. Pualani Kanahele has elaborated on this meaning of Kaʻohe in the context of modern military activities at the U.S. Army Pohakuloa Training Area:

> … one of the earlier reasons for bamboo was to transport water. So what does that relationship, Kaʻohe, have to do with water? And so, the idea that part of the land may be producing a lot water…the tops of the mountains were important to the kupuna's because that's where the water would go into the earth, seep into the earth…and then come out. So, now they're bombing up there and that's detrimental to our water source, higher source. (quoted in Meyer 2003:172-173)

The place name Pōhakuloa, which refers to this general area within Kaʻohe, translates literally as "long stone" (Pukui et al. 1974:186), and also refers to a deity of the forest lands that extended across Mauna Loa towards Mauna Kea. Pōhakuloa, the deity, was a form of the *akua* Kū, a lover of Poliʻahu, a patron of canoe makers, and in his human form an *ʻolohe* expert and woodworker. Pōhakuloa appears in "*Kaao Hooniua Puuwai no Ka-Miki*" (The Heart Stirring Story of Ka-Miki), published in *Ka Hoku O Hawaii* between 1914 and 1917. In the translation presented by Maly and Maly (2005:20-21), Pōhakuloa features prominently in an episode in which Ka-Miki and his companion Makaʻiole conquer the deity while travelling in the uplands of Puna. The two heroes stop to ask Pōhakuloa for directions, but end up goading him into conflict. Ka-Miki and Makaʻiole overcome Pōhakuloa and bind him. The deity surrenders to the two brothers and invites them to eat and drink *ʻawa*. This part of the story continues with Pōhakuloa's relatives seeking revenge on the two heroes, despite this reconciliation.

Pōhakuloa appears later the Ka-Miki *moʻolelo*, both as a supernatural being and as a place name, in an episode involving the sacred waters of Kāne in Lake Waiau and Waihu Spring located near Pōhakuloa Gulch (see Figure 1). Waihu Spring, located at about 9,760 feet above sea level, is not listed in Pukui et al.'s (1974) volume of place names. William Alexander (1892) was told that "[a] spring on the southern side of the mountain, called 'Wai Hu' is

believed by the natives to be connected to [Lake Waiau]." In their version of the Ka-Miki story, Maly and Maly (2005:40-47) interpret the spring's name as "Wai" for water and "hū" for rising, swelling, or overflowing, and they attribute the spring's creation to the exploits of Ka-Miki and Maka'iole. In preparation for an epic journey around Hawai'i Island, Ka-Miki and Maka-'iole train in various contest skills under the tutelage of their ancestress Ka-uhule-nui-hihi-kolo-i-uka (Ka-uhule). When they complete their training, Ka-uhule instructs them to fetch water and *'awa* so they can commemorate the occasion. The water they are to fetch is the sacred water of Kāne in Lake Waiau atop Mauna Kea, but the water is guarded by Poli'ahu (to whom the two heroes are also related), her companion Lilinoe, and their ward Ka-piko-o-Waiau. The water is kept below the ledge of a platform called Pōhakuakāne overlooking Pōhakuloa (the place). Ka-Miki and Maka-'iole set out on this mission, carrying with them a *kānoa* (*'awa* bowl) named Hōkū'ula and a *mau'u 'awa* (strainer) named Ka-lau-o-ke-Kāhuli obtained from another ancestress named Lani-ku'i-a-mamao-loa. Arriving at Pōhakuakāne under cover of mists, Ka-Miki ladles water into his *'awa* bowl. Two guardians of the waters of Kāne (also named Pōhakuakāne and Pōhakuloa), see the water rippling and overflowing from Ka-Miki's ladle and investigate. Ka-miki escapes through the mists, leaving only the overflowing waters from which the name Ka-wai-hū-a-Kāne ("Waters of Kāne overflowing") is given to the spring. Ka-Miki joins his brother around Mauna Kea at Holoholokū on the Waikōloa plain. Near Pu'u Ke'e, the wind goddess, Wai-kō-loa causes some of the sacred water to spill from Ka-Miki's *'awa* bowl, and the spilled water creates a spring. The new spring draws the attention of Pōhakuakāne, who fetches (*ki'i*) the water, giving the spring its name, "Wai-ki'i." Pōhakuakāne then takes this water back to the plain of Pōhakuloa, digs into ground, and places the water at the location known today as Waihu Spring.

HISTORY AFTER CONTACT

Captain James Cook landed in the Hawaiian Islands on January 18, 1778. Ten months later, on a return trip to Hawaiian waters, Kalani'ōpu'u, who was at war with Kahekili, visited Cook on board the *Resolution* off the East coast of Maui. Kamehameha observed this meeting, but chose not to participate. The following January [1779], Cook and Kalani'ōpu'u met again in Kealakekua Bay and exchanged gifts. In February, Cook set sail intending to leave the Hawaiian Islands; however, a severe storm off the Kohala coast damaged a mast and he was forced to return to Kealakekua. Cook's return occurred at an inopportune time, and this misfortune cost him his life (Kuykendall and Day 1976).

Around A.D. 1780 Kalani'ōpu'u proclaimed that his son Kiwalao would be his successor, and he gave the guardianship of the war god Kū'kā'ilimoku to Kamehameha. Many chiefs, concerned about their land claims, which Kiwalao did not seem to honor, preferred Kamehameha as the next ruler. Encouraged by these chiefs Kamehameha usurped Kiwalao's authority during a sacrificial ritual in Ka'ū. He then withdrew to his home district of Kohala where he farmed the land, growing taro and sweet potatoes (Handy and Handy 1972). After Kalani'ōpu'u died in A.D. 1782 civil war broke out, Kiwalao was killed, and Kamehameha became the ruler of Hawai'i Island. The wars between Maui and Hawai'i continued until A.D. 1795 (Kuykendall and Day 1976; Handy and Handy 1972). Several battles were fought in the Hāmākua District during this period, and many of the religious structures in Waipi'o Valley were destroyed (Hazlett et al. 2007).

In 1793-1794 Captain George Vancouver, who had previously visited Hawai'i with Cook in 1778-1779, returned leading his own expedition. Archibald Menzies, a naturalist and surgeon with the Vancouver expedition, wrote the following description of the Hāmākua District in 1793 as he sailed off the coast:

> The land we passed in the forenoon rose in a steep bank from the water side and from thence the country stretched back with an easy acclivity for about four or five miles, and was laid out into little fields, apparently well cultivated and interspersed with the habitations of the natives. Beyond this the country became steeply rugged and woody, forming mountains of great elevation. (Menzies 1920:51)

It was on this voyage that Vancouver first introduced cattle to the Island of Hawai'i, giving 17 head to King Kamehameha as a gift (Barrére 1983). Kamehameha placed a *kapu* on the cattle, and they were driven to the upland plain of Waimea to increase and multiply (Vancouver in Kuykendall 1938). Inevitably, some escaped and made their way to the mountain lands of Ka'ohe, where they would later play an important role in land use for much of the nineteenth and early twentieth centuries.

Demographic trends during the early Contact period indicate population reduction in some areas, due to war and disease, yet increase in others, with relatively little change in material culture. There was a continued trend toward craft and status specialization, intensification of agriculture, *ali'i* controlled aquaculture, upland residential sites, and the enhancement of traditional oral history. The Kū cult, *luakini heiau*, and the *kapu* system were at their peaks,

although Western influence was already altering the cultural fabric of the Islands (Kirch 1985; Kent 1983). Foreigners had introduced the concept of trade for profit, and by the end of the 1700s, Hawai‘i saw the beginnings of a market system economy (Kent 1983). This marked the end of the Proto-Historic Period and the end of an era of uniquely Hawaiian culture.

Hawai‘i’s culture and economy continued to change drastically as capitalism and industry established a firm foothold during the Historic Period. The sandalwood (*Santalum ellipticum*) trade, established by Euro-Americans in 1790 and turned into a viable commercial enterprise by 1805 (Oliver 1961), was flourishing by 1810. This added to the breakdown of the traditional subsistence system, as farmers and fishermen were ordered to spend most of their time logging, resulting in food shortages and famine that led to population decline. Kamehameha did manage to maintain some control over the trade (Kuykendall and Day 1976; Kent 1983). Evidence of sandalwood harvesting in the Saddle region includes sandalwood bundles recorded archaeologically in a lava tube in the western PTA near the North Kona-Hāmākua border by Shapiro and Cleghorn (1998:48).

By 1796 Kamehameha, with the aid of foreign weapons and advisors, had conquered all of the island kingdoms except Kaua‘i. In 1810, when Kaumuali‘i of Kaua‘i gave his allegiance to Kamehameha, the Hawaiian Islands were unified under a single rule (Kuykendall and Day 1976). Kamehameha would go on to rule the islands for another nine years. He and his high chiefs participated in foreign trade, but continued to enforce the rigid *kapu* system.

Kamehameha I died in 1819 at Kamakahonu in Kailua-Kona. With the passing of Kamehameha, his heir Liholiho was given the name of Kamehameha II. Ka‘ahumanu, the favorite wife of Kamehameha, announced the last commands of Kamehameha I:

> O heavenly one! I speak to you the commands of your grandfather. Here are the chiefs; here are the people of your ancestors; here are your guns; here are your lands. But we two shall share the rule over the land. Liholiho consented and became ruling chief over the government. (Kamakau 1992: 220)

Following the death of a prominent chief, it was customary to remove all of the regular *kapu* that maintained social order and the separation of men and women and elite and commoner. Thus, following Kamehameha’s death a period of *‘ai noa* (free eating) was observed along with the relaxation of other traditional *kapu*. It was for the new ruler and *kahuna* to re-establish *kapu* and restore social order, but at this point in history traditional customs changed:

> The death of Kamehameha was the first step in the ending of the tabus; the second was the modifying of the mourning ceremonies; the third, the ending of the tabu of the chief; the fourth, the ending of carrying the tabu chiefs in the arms and feeding them; the fifth, the ruling chief’s decision to introduce free eating (*‘ainoa*) after the death of Kamehameha; the sixth, the cooperation of his aunts, Ka-ahu-manu and Ka-heihei-malie; the seventh, the joint action of the chiefs in eating together at the suggestion of the ruling chief, so that free eating became an established fact and the credit of establishing the custom went to the ruling chief. This custom was not so much of an innovation as might be supposed. In old days the period of mourning at the death of a ruling chief who had been greatly beloved was a time of license. The women were allowed to enter the heiau, to eat bananas, coconuts, and pork, and to climb over the sacred places. You will find record of this in the history of Ka-ula-hea-nui-o-ka-moku, in that of Ku-ali‘i, and in most of the histories of ancient rulers. Free eating followed the death of the ruling chief; after the period of mourning was over the new ruler placed the land under a new tabu following old lines. (Kamakau 1992: 222)

Immediately upon the death of Kamehameha I, Liholiho was sent away to Kawaihae to keep him safe from the impurities of Kamakahonu brought about by the death of Kamehameha. After purification ceremonies Liholiho returned to Kamakahonu:

> Then Liholiho on this first night of his arrival ate some of the tabu dog meat free only to the chiefesses; he entered the *lauhala* house free only to them; whatever he desired he reached out for; everything was supplied, even those things generally to be found only in a tabu house. The people saw the men drinking rum with the women *kahu* and smoking tobacco, and thought it was to mark the ending of the tabu of a chief. The chiefs saw with satisfaction the ending of the chief’s tabu and the freeing of the eating tabu. The *kahu* said to the chief, “Make eating free over the whole kingdom from Hawaii to Oahu and let it be extended to Kauai!” and Liholiho consented. Then pork to be eaten free was taken to the country districts and given to commoners, both men and women, and free eating was introduced all over the group. Messengers were sent to Maui,

> Molokai, Oahu and all the way to Kauai, Ka-umu-aliʻi consented to the free eating and it was accepted on Kauai. (Kamakau 1992: 225)

When Liholiho, Kamehameha II, ate the *kapu* dog meat, entered the *lauhala* house and did whatever he desired it was still during a time when he had not reinstituted the eating *kapu* but others appear to have thought otherwise. Kekuaokalani, caretaker of the war god Kūʻkāʻilimoku, was dismayed by his cousin's (Liholiho) actions and revolted against him, but was defeated.

With an indefinite period of free-eating and the lack of the reinstatement of other *kapu* extending from Hawaiʻi to Kauaʻi, and the arrival of the Christian missionaries shortly thereafter, the traditional religion had been officially replaced by Christianity within a year following the death of Kamehameha I. By December of 1819 Kamehameha II had sent edicts throughout the kingdom renouncing the ancient state religion, ordering the destruction of the *heiau* images, and ordering that the *heiau* structures be destroyed or abandoned and left to deteriorate. He did, however, allow the personal family religion, the ʻ*aumakua* worship, to continue (Oliver 1961; Kamakau 1992). With the end of the *kapu* system changes in the social and economic patterns began to affect the lives of the common people. Liholiho moved his court to Oʻahu, lessening the burden of resource procurement for the chiefly class on the residents of Hawaiʻi Island. Some of the work of the commoners shifted from subsistence agriculture to the production of foods and goods that they could trade with early Western visitors. Introduced foods often grown for trade included yams, coffee, melons, Irish potatoes, Indian corn, beans, figs, oranges, guavas, and grapes (Wilkes 1845).

In October of 1819, seventeen Protestant missionaries had set sail from Boston to Hawaiʻi. They arrived in Kailua-Kona on March 30, 1820 to a society with a religious void to fill. Many of the *aliʻi,* who were already exposed to western material culture, welcomed the opportunity to become educated in a western style and adopt their dress and religion. Soon they were rewarding their teachers with land and positions in the Hawaiian government. During this period, the sandalwood trade was wreaking havoc on the commoners, who were weakening with the heavy production, exposure, and famine just to fill the coffers of the *aliʻi* who were no longer under any traditional constraints (Oliver 1961; Kuykendall and Day 1976). In 1823 the Reverend William Ellis, one of the early missionaries, wrote:

> About eleven at night we reached Towaihae [Kawaihae], where we were kindly received by Mr. Young. . . . Before daylight on the 22nd, we were roused by vast multitudes of people passing through the district from Waimea with sandal-wood, which had been cut in the adjacent mountains for Karaimoku, by the people of Waimea, and which the people of Kohala, as far as the north point, had been ordered to bring down to his storehouse on the beach, for the purpose of its being shipped to Oahu. There were between two and three thousand men, carrying each from one to six pieces of sandal-wood, according to their size and weight. It was generally tied on their backs by bands of ti leaves, passed over the shoulders and under the arms, and fastened across their breasts. (Ellis 2004:405-406)

Another early industry with ties to the mountain lands in Kaʻohe grew out of Captain Vancouver's gift of cattle to Kamehameha I. By the time of Kamehameha's death in 1819, the monarchy allowed a few men to hunt the feral cattle that had spread around Hawaiʻi Island. These individuals, known as 'bullock hunters,' were mostly foreigners working individually to provide salted beef for native-owned vessels (Bergin 2004:31; Ellis 2004:291, Mills 2003). Like sandalwood, the major impetus for bullock-hunting was the export of raw materials, in this case, the hides and tallow of Hawaiʻi's cattle to leather goods factories in New England (Fischer 2007; Mills et al. 2013; Wellmon 1969). In the early 1830s, a few *vaqueros* who perfected methods of capturing wild cattle on horseback in Alta California began working for the Hawaiian monarchy. Spanish styles of hunting wild cattle avoided the use of guns (Hobbs 1939:97-98), and was more efficient than killing and skinning cattle in the mountain uplands where they roamed. Hawaiian cowboys, trained by the *vaqueros*, appropriated and adapted much of their equipment including the braided lariat, broad winged and hooded stirrups (*tapaderos*), and highly adorned saddles with large horns to conditions in Hawaiʻi (Hobbs 1939:95). Bullock-hunting continued in the mountain lands through the next decade, when dramatic changes in Hawaiʻi's land tenure system to spur the development of ranching into Kaʻohe.

Effects of the Māhele of 1848 on Kaʻohe and the Study Area

By the mid-nineteenth century, the ever-growing population of Westerners in Hawaiʻi forced socioeconomic and demographic changes that promoted the establishment of a Euro-American style of land ownership, and in 1848 the *Māhele ʻĀina* became the vehicle for determining ownership of native lands. This change in land tenure was promoted primarily by the missionaries and Western businessmen in the island kingdom. Generally these individuals

were hesitant to enter business deals on leasehold land. The *Māhele* (division) defined the land interests of Kamehameha III (the King), the high-ranking chiefs, and the *konohiki*. During the *Māhele*, all lands in the Kingdom of Hawai‘i were placed in one of three categories: (1) Crown Lands (for the occupant of the throne); (2) Government Lands; and (3) *Konohiki* Lands (Chinen 1958:vii, 1961:13). The chiefs and *konohiki* were required to present their claims to the Land Commission to receive awards for lands provided to them by Kamehameha III. They were also required to provide commutations to the government in order to receive royal patents on their awards. The lands were identified by name only, with the understanding that the ancient boundaries would prevail until the land could be surveyed. This process expedited the work of the Land Commission. As a result of the *Māhele*, Ka‘ohe was awarded to then relinquished by Victoria Kamamalu to Kamehameha III (*Buke Māhele* 1848:5-6) and then relinquished by the *Mō‘ī* to become Government Land (*Buke Māhele* 1848:191). Until 1891, the entirety of the mountain lands in Ka‘ohe was managed by the government as a single parcel. Beginning in that year with Lease No. 451 to the Humu‘ula Sheep Station, Ka‘ohe was divided to sections (e.g., Ka‘ohe 1-5) and bid out as separate parcels (see records cited Maly and Maly 2005).

All lands awarded during the *Māhele* were subject to the rights of the native tenants therein; those individuals who lived on the land and worked it for their subsistence and the welfare of the chiefs (Sinoto and Kelly 1970). Native tenants could claim, and acquire title to, *kuleana* parcels that they actively lived on or farmed at the time of the *Māhele*. The Kuleana Act of December 21, 1849 provided the framework by which native tenants could apply for and receive fee-simple interest in their *kuleana* lands from the Land Commission. The Board of Commissioners over saw the program and administered the lands as Land Commission Awards (LCAw.). Not all lands that were claimed were awarded. A review of the Waihona ‘Āina Database indicates that in Ka‘ohe, four native claims were registered in the windward, lower-elevation portion of the *ahupua‘a*, and none in the saddle region. Only one lower-elevation claim was awarded (Table 3), a 7-acre *‘āpana* awarded to Koolau.

Table 3. LCA claims in Ka‘ohe Ahupua‘a

LCAw. #	*Claimant*	*‘Āpana Claimed*	*Awarded*	*Acres*
08297	Kookooku	1 potato *kīhāpai*	No	
10180	Malalo, Tatina	1, use not described	No	
03705B	Koolau	1 houselot with two houses, 2 taro *kīhāpai*, 1 potato *kīhāpai*, 1 *kīhāpai* in banana and coffee.	1	7
03722B	Keopohaku	20 *‘āpana*, including houses, taro, *māmaki*, coffee, *wauke*, potato, cane, and banana	No	-

The activities of the *Māhele* ushered in changes in the traditional Hawaiian land tenure system that enabled foreigners to purchase lands which had previously been unavailable to them. While Ka‘ohe was not for sale, the entirety of its mountain lands was leased to Francis Spencer in 1857. In 1862, the Commission of Boundaries (Boundary Commission) was established in the Kingdom of Hawai‘i to legally set the boundaries of the *ahupua‘a* that were awarded during the *Māhele*. Subsequently, in 1874, the Commissioners of Boundaries was authorized to certify the boundaries for lands brought before them. The primary informants for the boundary descriptions were old native residents of the lands, many of whom had also been claimants for *kuleana* during the *Māhele*. Because Ka‘ohe was Government land, it was not surveyed explicitly by the Boundary Commission; rather, the surveys of the surrounding *ahupua‘a* of Humu‘ula and Keauhou established the Ka‘ohe boundaries.

The Saddle Region as a Transportation Corridor

The arid saddle region has been an important transportation corridor since Precontact times. *Nā ala hele*, the Precontact system of trails, included routes in Ka‘ohe connecting Waimea to Hilo, Waimea to Kona, and Ka‘ū to the Kona-Waimea trail. Langlas et al. (1999) describes nine early trails that pass through the interior of the island that may have been used in Precontact and early Historic times. Archaeological traces of trails in the saddle region have been elusive. While one trail (SIHP Site 19528) between Ka‘ū and the Waimea-Kona trail has been associated with ‘Umi-a-Līloa’s road to Waimea (Williams 2002), most other Precontact routes have not been identified. In general, the actual alignments of any of these routes remain conjectural due to several factors discussed by Langlas et al. (1999:24). Historic Period livestock trails and wagon roads may have been built on top of Precontact trail

alignments, effectively obliterating the older expressions of those routes. Lava flows have probably covered other sections of trails. In other cases, routes over easily-traversed *pāhoehoe* or grasslands may have simply been marked with cairns or other landmarks. All in all, Precontact use of known trails is often conjectural.

Langlas et al. (1999:24) note that route of the Saddle Road is probably the approximate route of the Precontact trail from Waimea to Kalaiʻehā and Puʻu ʻŌʻō, which was used through the first half of the nineteenth century. In a letter dated May 6, 1850, Titus Coan reported that a highway was "being brought from Kailua to Hilo across the centre of the island" (quoted in Maly and Maly 2005:141). It appears that even by the late 1850s, the road across the Saddle region was anything but well-developed. In a series of letters published in the *Pacific Commercial Advertiser* during July of 1859, a writer using the *nom de plume* "Hualalai" describes his journey from Waimea to Hilo across the saddle region, and equates the condition of the trail between Waikiʻi and Kalaiʻehā as "made of equal parts of broken bottles and slag from a blacksmith's forge." (quoted in Maly and Maly 2004:146-147). His party spent the night at Pōhakuloa Gulch (likely directly above the current study area), which he describes a "beautiful spot" with luxuriant grass, *māmane* trees, and plentiful wild hogs and cattle, but no water. The next day they continued on to Kalaiʻehā along fifteen or twenty miles across the rolling alluvial fans at the foot of Mauna Kea.

Improvements to the route across the saddle region began shortly after "Hualalai's" visit. S. C. Wiltse was contracted in 1862 to survey a route that would connect Waimea with Hilo *via* Waikiʻi and Kalaiʻehā (Maly and Maly 2003:118). The map produced by Wiltse during his survey was submitted in a draft form (S.C. Wiltse to F. W. Hutchinson, August 2, 1869, quoted in Maly and Maly 2002:120) and this draft became Registered Map 528 (Figure 12). As Maly and Maly (2004:145) report, the road that was built closely followed Wiltse's plan from between Waikiʻi and Kalaiʻehā, and the primary use of this road was related to livestock ranching until World War II. This road became known as the Waimea-Humuʻula Wagon Road, and in the saddle region it extended from Puʻu Keʻekeʻe to Pōhakuloa before running north of ʻŌmakōʻili to Kalaiʻehā (Langlas et al. 1999). In 1943, construction of Highway 200, the Saddle Road, by the US Army obliterated the wagon road between Puʻu Keʻekeʻe and the MKRA (see Figure 1). Construction of the Daniel K. Inouye Highway near the MKRA's entrance in 2006 widened and realigned the route through the Pōhakuloa area (Figure 13). This construction episode impacted the former location of a picnic area built in the late 1950s, which is discussed below.

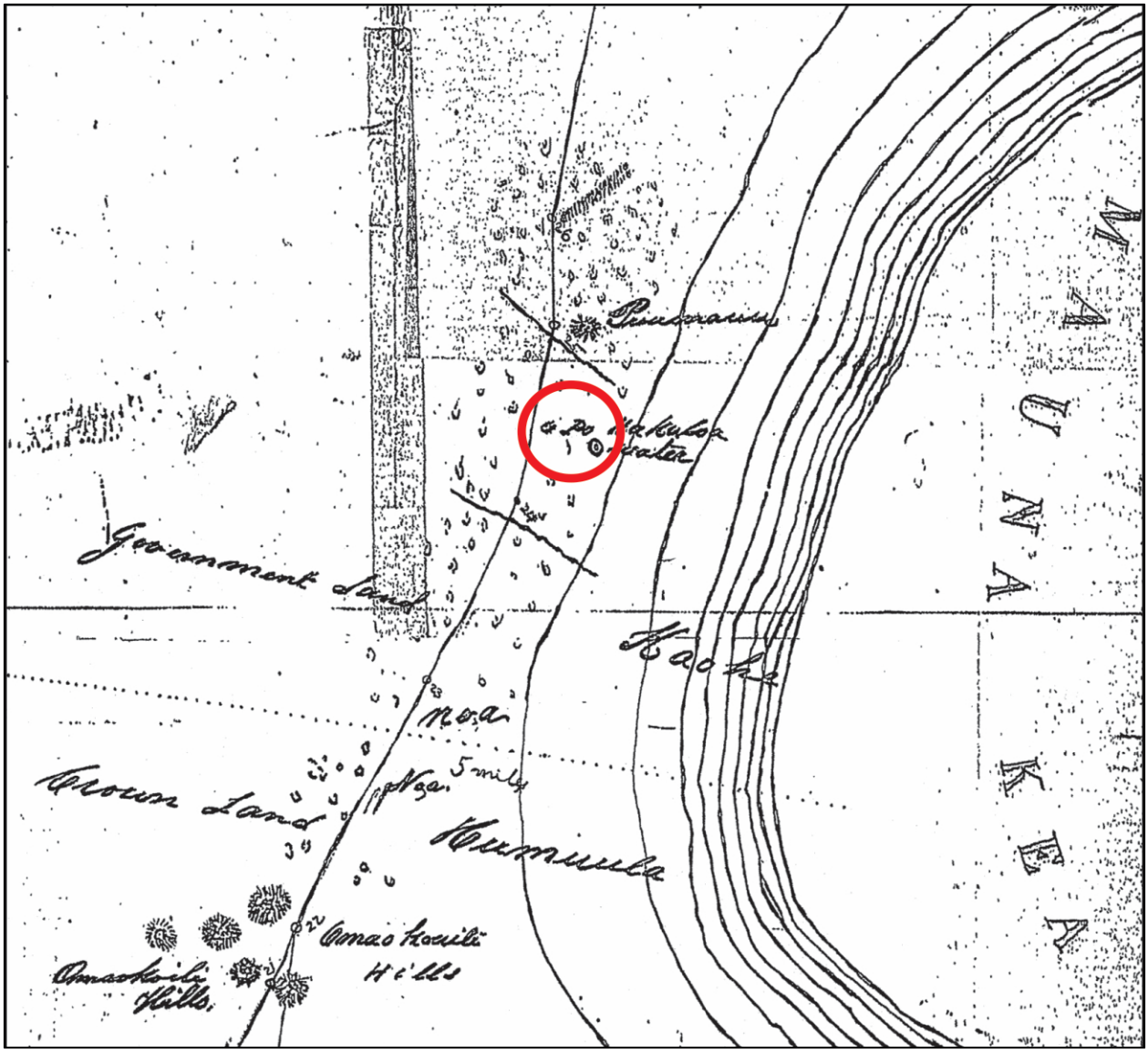


Figure 12. Portion of Registered Map 528 by S.C. Wiltse prepared during his 1862 survey for Waimea-Hilo Mountain Road showing the approximate location of the study area in red.

Figure 13. Satellite image of the construction of the Daniel K. Inouye Highway over the former site of the Pōhakuloa picnic area in 2006 (Google Earth™).

Livestock Ranching

As a few individuals and companies involved in the hide and tallow trade began to acquire private herds in the mid to late 1800s, bullock-hunting in Hawai‘i began to give way to livestock ranching. In Ka‘ohe, ranching proper began in 1859, when Francis Spencer of Waimea and his business partner Robert Janion of Liverpool, England, obtained leases on grazing lands in Ka‘ohe and Humu‘ula. Their partnership evolved into the Waimea Grazing and Agricultural Company (WGAC) with Janion and W.L. Green of Honolulu as sole stockholders. By 1871, the company was doing poorly, and Janion and Green sold out to a Dr. Robert M. Kibbin of Honolulu in 1871. On June 5, 1871, John Parker II outbid the WGAC for the lease on Ka‘ohe when it came up for renewal. When the lease came up for renewal again in September, 1891, Ka‘ohe 4 was leased (Government Lease 451) to the Humu‘ula Sheep Station Company (HSSC), which had succeeded the WGAC in Humu‘ula in 1876.

Surveyor E.D. Baldwin provides a glimpse of the Pōhakuloa area at this time in a sketch he drew from Pu‘u Io in 1890 (Figure 14). His drawing depicts a mostly empty plain below Pōhakuloa Gulch and the location of Waihu spring above the current study area. It was in this seemingly barren landscape that the HSSC operated its Pōhakuloa substation. In April of 1892, HSSC manager August Haneberg recorded in his journal that Eben Low and his men were catching wild cattle at Pōhakuloa; the cattle were probably drawn to the springs near the gulch. Later that summer, Haneberg had a ranch employee named Kauwe find Waihu spring and “put a flag up there” (quoted in Maly and Maly 2005:419). It was probably shortly after this date that Houpokāne and Waihu springs were tapped to provide water for the HSSC’s livestock. A corral and several stone walls near Houpokāne Spring were recorded by McCoy (1984), and the ranch was probably using these in the 1890s.

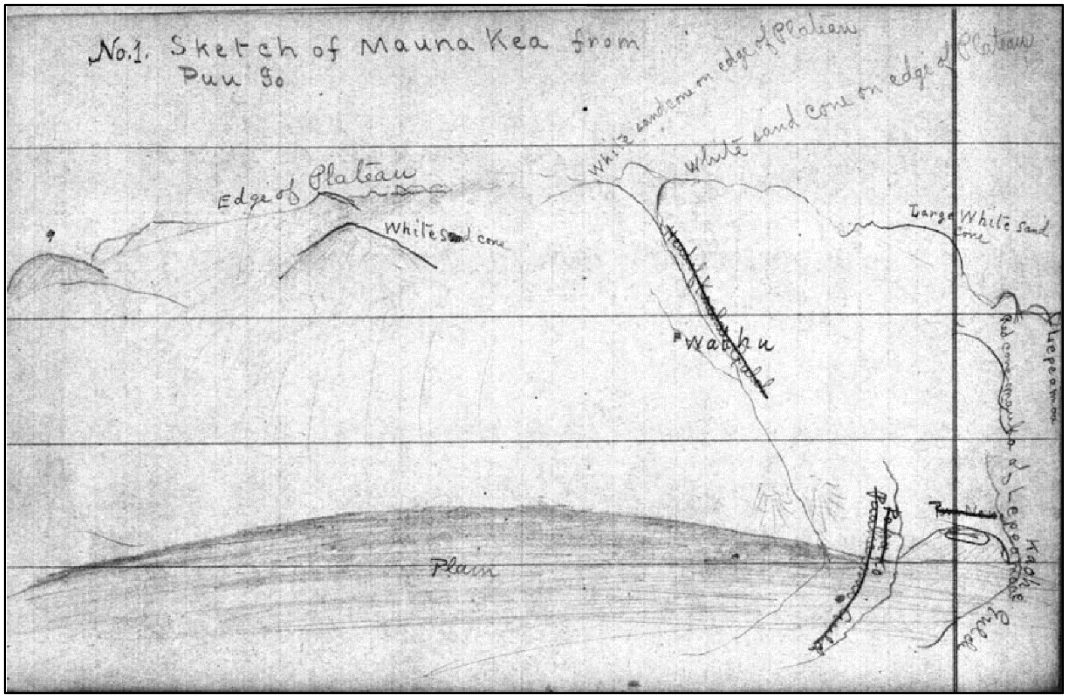


Figure 14. Sketch Mauna Kea from Pu‘u Io, including Pōhakuloa Gulch, Waihu spring, and the study area at left (E.D. Baldwin, Field Book No. 323:22, reproduced in Maly and Maly 2005:509).

The presence of the springs did not escape the notice of the HSSC’s rival, Parker Ranch. One of A. W. Carter’s early projects as manager of Parker Ranch was to increase the amount of water available in the Ka‘ohe lands around Pu‘u Ke‘eke‘e, and the lower Waiki‘i and Ke‘āmuku region. In 1900, he sent C.H. Kluegel and former ranch manager, Paul Jarrett, to the springs above the study area. Kluegel reported in a letter dated July 14, 1900, that “it is disappointing to find so little water in the three springs on the south slope of Mauna Kea. With an abundant supply at that elevation a large dry area could be supplied with water” and goes on to describe the improvements made at the spring by the HSSC:

> On the Southerly slope of Mauna Kea there are three springs. Waihu is the lowest. Its elevation is 8900 feet. A ¾ inch pipe 2 miles long now conveys the water to Pohakuloa, a station on the road to Kaleieha.
>
> The flow of this spring is 1730 gallons in 24 hours.
>
> The second spring is at an elevation of 9800 feet. The flow is 2900 gallons in 24 hours.
>
> The third spring, called Kahoupokani [Ka Houpo Kane], is at an elevation of 10,500 feet. The flow is 4300 gallons in 24 hours.
>
> The total flow of the three springs is 8930 gallons in 24 hours.
>
> A portion of this amount is now required in the near vicinity, and more may be required hereafter. Much trouble has been caused in the present pipe by freezing and bursting. This has been remedied to some extent by covering the pipe with earth. This would be difficult to do between the lower and the upper springs as there is only rock and no earth at hand while the protection is more needed. Even at this time we found ice at the second spring.
>
> The distance from the springs to the lower paddock at Waikii is about 16 miles… (Parker Ranch/PPS Water File, quoted in Maly and Maly 2005:450).

In 1915, Samuel Parker, Jr., sold his interests in the Humuʻula Sheep Station to Parker Ranch, including the lease on Kaʻohe 4 (including the current study area). Shortly afterward, A.W. Carter secured a new lease on Kaʻohe 4 to put the lease properly in the ranch's possession. In his lease application, he reported that water was being piped down to Pōhakuloa and stored in a tank (Maly and Maly 2005:441). For the next forty years, Parker Ranch used Kaʻohe 4 for its own sheep operations, despite temporarily losing the lease at auction in 1929. After the end of World War II, Parker Ranch began to negotiate with the United States Marine Corps to relocate some of their training areas from Lālāmilo. The new training area, which would become the Pōhakuloa Training Area (PTA), included portions of Kaʻohe 4 (but not the current study area). In 1956 Kaʻohe 4 began to be withdrawn from Parker Ranch's leases, and in 1963 Parker Ranch ceased its sheep operations (Maly and Maly 2005:447).

The Mauna Kea Forest Reserve

While livestock ranching developed in the saddle area, concerns began to be raised about a noticeable retreat of the forests on Mauna Kea and Mauna Loa. The loss of forest acreage was attributed to unchecked grazing by feral sheep, goats, and cattle. Ranching leases during this period addressed these concerns by requiring fencing and disallowing the cutting of timber in the mountain lands (examples of these leases are reproduced in Maly and Maly 2005:384, 386. Feral animals continued to exacerbate the deforestation throughout the nineteenth century. Beginning with 1876, the government began take legal measures to protect the forest when King Kalākaua enacted an "Act for the Protection and Preservation of the Woods" (Hawaiʻi Laws Chapter XXX:39). This law authorized the Minister of the Interior to set apart lands to prevent damage to government lands, particularly forest lands and water resources. This act was followed in 1893 by the establishment of the Bureau of Agriculture and Forestry through an act of the Legislature and approved by Queen Liliʻuokalani. The Bureau was charged with preserving and rehabilitating forest lands as a means of fighting the effects of diminished rainfall that had been caused by deforestation (Maly and Maly 2005:521). The Bureau was absorbed into the Board of Commissioners of Agriculture and Forestry in 1900, after which it began to study the affected forest lands in Kaʻohe and elsewhere in the islands.

The Board recommended establishing a reserve in Kaʻohe in 1905 and 1906, which ultimately led to the establishment of the Mauna Kea Forest Reserve in 1909 (Maly and Maly 2005:521). The proposal for the reserve written by Superintendent of Forestry Ralph S. Hosmer noted that unlike the Hilo Forest Reserve (established in 1904) and others that were established to protect their respective watersheds, the purpose of the Mauna Kea reserve was to develop unproductive lands for commercial forestry (Maly and Maly 2005:548). The creation of the reserve removed a total of 66,600 acres of summit and adjacent lands from private leases. In 1937, additional portions of Humuʻula, Kaʻohe, and some privately held lands were added to the reserve, increasing its area to 88,108 acres.

The Civilian Conservation Corps at Pōhakuloa

Conservation in the Mauna Kea Forest Reserve received a major boost in funding and manpower during the 1930s when the Civilian Conservation Corps (CCC), one of several New Deal programs begun in 1933, was established in the Territory. While the first 57 CCC enrollees on Hawaiʻi Island began working in 1934 (Bryan 1938), it was not until June of 1935 the first CCC camp was established (in Hawaiʻi National Park), which housed 200 enrollees (Roper 2008). Additional camps were also constructed around Mauna Kea Forest Reserve boundaries to house crews of CCC enrollees. At Pōhakuloa (within the current study area), a camp was built in 1935 (McIntosh and Milstein 1964) consisting of a cluster of buildings and tents that included a recreation/dining hall, two bunkhouses, two cottages, seven cabins, and seven outbuildings. The camp was provided with a "continuous supply of pure water" from the springs above the camp (Bryan 1939, quoted in Maly and Maly 2005:257). The camp was located in what is now the open space between the current Headquarters Building and the current Recreation/Dining Hall; however no physical evidence of the original structures remain as they were removed by 1968.

One of the major accomplishments of the CCC on Mauna Kea was the construction of over 60 miles of fence around the forest reserve to protect it from sheep. Another project undertaken by the CCC boys from Pōhakuloa involved reconstructing the trail from the Humuʻula Sheep Station to summit *via* Halepōhaku and Lake Waiau (Maly and Maly 2005:257). The Pōhakuloa boys also fenced the new boundaries of the Mauna Kea Forest Reserve after its expansion in 1937, and hunted feral sheep (Maly and Maly 2005:241). The advent of World War II brought an end to the CCC program, as the remaining manpower and funding for the program were redirected toward the war effort. By July 1, 1942, all Territory of Hawaiʻi camps were closed, transferred to the military, or abandoned (Urban and Solamillo 2011:48).

Pohakula Hunting Lodge /Mauna Kea State Recreation Area

After the end of the CCC programs and World War II, the CCC facilities at Pōhakuloa were primarily used for lodging by Territorial Division of Forestry and Fish and Game staff, sheep and bird hunters, and other members of the public (Quinn 2007:12). Visitors could "spend the night under piles of blankets…and start out before sunrise for the mountain ridges" (*Paradise of the Pacific* 1948:27). The accommodations were relatively Spartan, and one visitor to Pōhakuloa *circa* 1949 described them as having "the shape and color of a military camp. Wood-sided, canvas-topped tents were the best quarters, and barracks were available for big groups" (Johnston 1976:6). In 1954, the Division of Territorial Parks was created, and the former CCC facilities became part of Pohakuloa Park, also called "Pohakula Hunting Lodge" (Quinn 2007:12). The division began a series of improvements that would eventually replace the existing CCC cabins with all new buildings (Quinn 2007:16). Many of the details of construction of the new buildings were recorded in the as-built drawings created for each of the several phases of construction at Pohakuloa Park (DLNR 1964, 1966, 1968, 1988, 1999, 2004). Some of these drawings (e.g., DLNR 1988) were drafted using reproductions of original drawings from the 1960s taped to the new sheets, and so provide images from as-built drawings of many of the park buildings.

The first of these improvements was the construction of a picnic area south of the Saddle Road from CCC cabins (Quinn 2007). In 1961, major improvements to the Park began with the addition of new cabins. The first three cabins (Figures 15 and 16), variously called the "Housekeeping," "Family," or "Vacation" cabins, were built northeast of the former CCC complex, followed by two more (Cabins 4 and 5) in the following year. These five identical cabins, built on post-and-pier foundations, were prefabricated cedar structures manufactured by Loxide Structures, Incorporated, of Tacoma, Washington (Quinn 2007:14). The cabins were roofed with cedar shakes (which were replaced with corrugated metal in 1989) and each included a Thurman brand pre-fabricated fireplace inside the main room (DLNR 1988). Each of these cabins is named after a native Hawaiian plant as illustrated by a wooden plaque near its door with the plant name (Figure 17; see Table 2).

Figure 15. Typical Loxide vacation cabin with corrugated metal roof, southeast elevation, view to the northwest.

Figure 16.Typical Loxide vacation cabin showing rear sliding door on southern façade, view to the southwest.

Figure 17.Name plate on vacation cabin, in this case “Naio”.

In 1963, the existing comfort station (Figure 18) was built, using a combination of fir, pine, and hollow tile. The exterior of the building was faced with a lava rock veneer, and like the cabins had a cedar-shake roof (also replaced in 1989) with corrugated metal and plastic skylights. With the construction of the Comfort Station, the park's picnic area was relocated from south of Saddle Road to its present location.

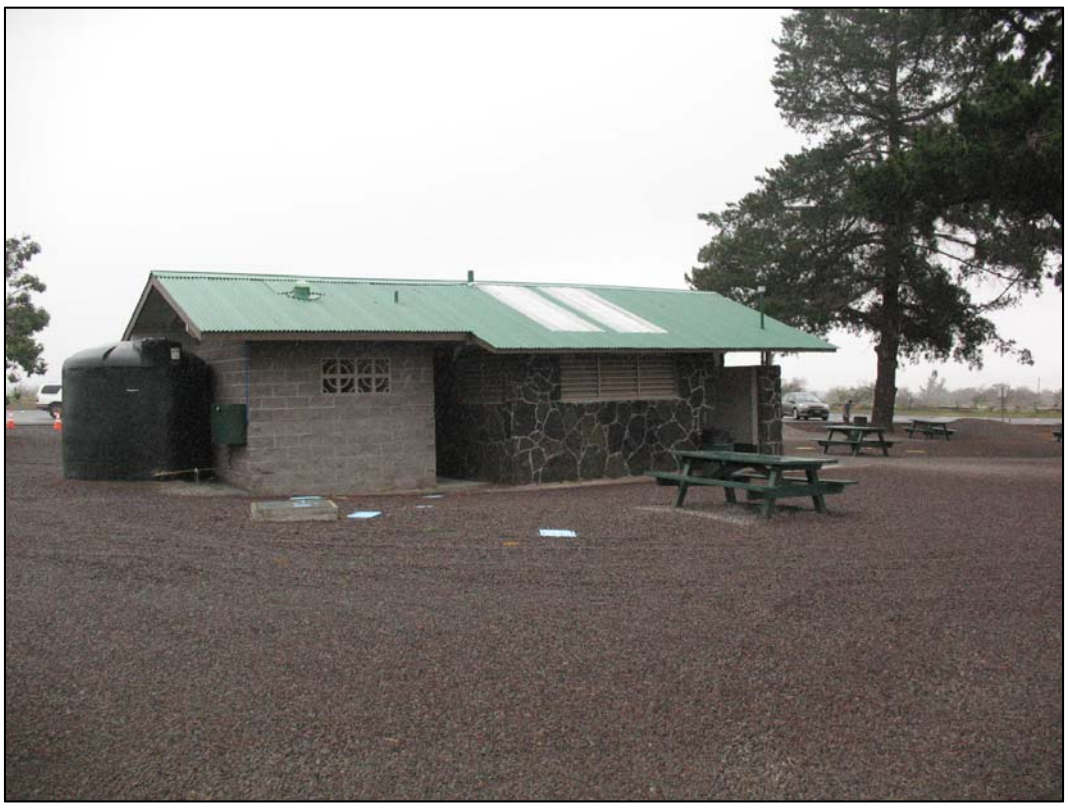


Figure 18. Comfort station northeast elevations with bare hollow-tile ADA addition at left and original lava veneer at right, view to the southwest.

Concurrent with these early additions to Park amenities, the state legislature directed a study to determine how the park should be developed further. The resulting report (McIntosh and Milstein 1964:70-75) recommended several improvements to Pōhakuloa Park (several of which were already underway), including changing its name to "Mauna Kea State Recreation Area." The report noted the poor condition of the CCC-era buildings and recommended their replacement with new facilities designed in a "truly Hawaiian" architectural style developed by the State Parks Division (McIntosh and Milstein 1964:72). The new recommended facilities included a headquarters building to serve as visitor center, two pre-fabricated cottages, two cabins for group use, and central maintenance and service buildings. The report also recommended relocating the picnic area from south of Saddle Road, and building a new toilet building (both of which were completed before the report was submitted.) Around these new facilities, the report's authors suggested landscaping with "a major forest-type planting" and temperate climate fruit trees.

Acting on this report, the State Parks Division made extensive changes to the recreation area's facilities and infrastructure between 1966 and 1970. In the first year of the project, two "Group Cabins" (Figure 19), officially called "4-Unit Cabins A and B," with four bedrooms and bathrooms each were built north of the CCC recreation/dining hall, and a new, smaller Recreation and Dining Hall (Figure 20) was added just to the west of the Group Cabins. The walls of these buildings were constructed on post-and-pier foundations with 1" x 8" vertical tongue-and-groove Douglas fir siding over horizontal 1" x 8" Douglas fir bevel siding, and like the Vacation Cabins, were topped with cedar-shake roofs. The Group Cabins had fireplace units in each of the bedrooms. Echoing the appearance of the comfort station's exterior walls, the Recreation/Dining Hall's chimney was clad in a lava-slab veneer (Figure 21). As with the earlier buildings. The dirt roads connecting the "Vacation Cabins" to the Saddle Road were also paved at this time (Quinn 2007:14).

Figure 19. Typical Douglas-fir sided Group cabin, view to the southwest.

Figure 20. Current Recreation/Dining Hall with ADA accessibility ramp in foreground, view to the north.

Figure 21. Lava veneer chimney and Douglas fir siding on the Dining/Recreation Hall, view to the west.

Between 1968 and 1970, the old CCC buildings were demolished and replaced with three new buildings. Construction began with the addition of two parking lots on the western side of the recreation area and a paved road connecting them to the recreation area entrance (DLNR 1966). After the CCC buildings were demolished (DLNR 1968), a new headquarters building (Figures 22), caretaker's cabin (Figure 23), and a storage building (Figure 24) were constructed. Each of these were pre-fabricated by Pan-Abode Company in Washington State. The buildings are tongue-in-groove cedar log cabins built on post-and-pier foundations and roofed with cedar shakes. The two "Family" cabins (now the ADA accessible cabins) were also built near the cluster of vacation cabins on the other side of the recreation area (Figure 25). These cabins, like the other new buildings, were prefabricated tongue-in-groove cedar kit cabins supplied by the Pan-Abode Company. During these periods of construction, landscaping, sprinklers, electrical connections, and amenities like picnic tables, open fireplaces, and water outlets in the new picnic area were also added.

Over the next four decades, the Division of State Parks maintained and upgraded the park facilities. Major renovations to the camp buildings involved a re-roofing project completed in 1991. During that project, the cedar shake roofs on all recreation area buildings were replaced with metal roofs, and fireplaces were removed from the cabins. A project completed in 2004 brought some of the buildings into compliance with the Americans with Disabilities Act of 1991. Ramps were added to the two Family Cabins (see Figure 24), and renovations to their kitchens, bathrooms, and interior spaces involved adding an extension on the back of the cabins. Accessible facilities, built as a hollow tile addition, were also added to the Comfort Station (see Figure 18). Ramps have also been added to the Recreation/Dining Hall and the Headquarters Buildings. Upgrades to the water and wastewater systems involved the addition of storage tanks above the camp (outside the current study area) and connecting waterlines within the park. An upgrade of the recreation area's wastewater system in 2007 (Quinn 2007) installed septic tanks and leach fields for recreation area cabins, the Comfort Station, and the Recreation/Dining Hall, which also received an ADA accessible ramp after that project was completed. At the time of this study, roads and parking lots were being replaced (see Figure 10). Also outside the current study area, the old picnic area south of the Saddle Road that was used between 1954 and 1963 was heavily disturbed in 2006, when construction of the Daniel K. Inouye Highway widened and realigned the Saddle Road through the Pōhakuloa area (see Figure 13).

Figure 22. Headquarters building with recently paved parking lot in foreground, view to the northwest.

Figure 23. Caretaker's cabin built with prefabricated Pan-Abode logs, view to northwest.

Figure 24. Storage building, view to the northeast.

Figure 25. Family cabins built with Pan-Abode prefabricated logs and modern ADA accessibility ramp, view to the southwest.

PREVIOUS STUDIES

Fourteen relevant archaeological studies have been conducted in the vicinity of the current study area (Table 3). Four archaeological studies (McCoy 1978; Quinn 2007; Bautista et al. 2012) and one cultural impact assessment (Mitchell et al. 2012) were conducted on lands that include the current study area. Eleven additional archaeological studies in the vicinity of the study area were also consulted to inform the project expectations. Figure 26 depicts the locations of these previous studies relative to the current study area.

In 1976 and 1977, Paul Rosendahl (1977) directed a general survey of the U.S. Army Pōhakuloa Training Area (PTA), including a reconnaissance-level survey of the Saddle Road corridor between mile posts 33.5 and 36, which included the area adjacent to the southern boundary of the current study area. The study recorded the Historic Period Kaʻohe Wall (SIHP Site 5002), which is a stacked basalt livestock wall.

In 1976, during the second field season of the Bishop Museum's Mauna Kea Adze Quarry Project, a reconnaissance of Pōhakuloa Gulch was made from Lake Waiau to the current study area, then called Pōhakuloa Park (McCoy 1978). This reconnaissance recorded five sites, including sites at Hopukani Spring (50-Ha-G28-34) and Liloe Spring (50-Ha-G28-35). No sites were recorded within the current study area.

In 1984, Charles Streck, U.S. Army Corps of Engineers archaeologist, surveyed five areas along Saddle Road and encountered no sites (Streck 1984). Two of these areas were located less than one mile south of the current study area and two areas were located a little over a mile to the west of the current study area.

In 1984, The Department of Anthropology at the Bernice Pauahi Bishop Museum conducted an archaeological reconnaissance of Hopukani, Waihu, and Liloe Springs in preparation for a Conservation District Use Application and Environmental Assessment for the repair and upgrade of the water catchment system at the springs (McCoy 1984). The reconnaissance recorded six sites and several find spots near the springs that linked the springs with production and distribution of adzes and toolstone from the quarries on Mauna Kea. At Hopukani Spring (Site 50-HA-G28-63/SIHP Site 16239), temporary habitation features, lithic scatters, and a shrine were recorded, and a radiocarbon date of A.D. 1050-1265 was obtained for an overhang rockshelter. Features recorded at Waihu Spring (Site 50-HA-G28-64/SIHP Site16241) included lithic scatters and temporary habitation features. Lithic scatters at Liloe Spring (Site 50-HA-G28-35/SIHP Site 16240) included charred wood that was radiocarbon dated to A.D. 1310-1515. A rockshelter and lithic scatter above Hopukani Spring (Site 50-HA-G28-34/16238) yielded several radiocarbon dates ranging between A.D. 1065-1095 and A.D. 1705-1810. A lithic scatter was also recorded west of Waihu Spring (Site 50-HA-G28-66/SIHP Site16243). A Historic Period cattle corral (Site 50-HA-G28-65) was also recorded in the next gulch west of Pōhakuloa Gulch at about 10,000 feet elevation. The spring sites are included within the boundaries of the Mauna Kea Adze Quarry. No sites were recorded below the springs.

In 1993, IARII conducted a survey and testing of a 200-foot wide corridor along each side of the Saddle Road for proposed improvements to the road (Welch 1993). This corridor included a portion of Mauna Kea State Recreation Area. The survey recorded three sites to the south of the current study area along the Saddle Road corridor. SIHP Site 5003 is a late-Precontact/early Historic Period lava tube cave shelter located approximately 500 meters south of Mile Post 35 along the old alignment of Saddle Road. SIHP Site 14638 is a lithic scatter associated with three shallow lava tubes and a possible temporary shelter located just south of Mile Post 34 on the old Saddle Road. SIHP Site 5002, which had been previously recorded by Rosendahl (1977), consists of three segments of what was probably a stacked basalt cattle wall build during the Historic Period.

In 1996, Paul H. Rosendahl, Ph.D., Inc. conducted an archaeological inventory survey and historic and traditional cultural assessment for the development of the Hawaiʻi Defense Access Road A-AD-6(1) and Saddle Road (SR 200) Project (Langlas et al. 1999). Near the current study area, this survey investigated both the older Saddle Road alignment, which had been previously investigated by Welch (1993), and what is now the current alignment of the Daniel K. Inouye Highway. The study revisited three previously-recorded sites recorded near the current study area including a lava tube shelter (SIHP Site 5003), a lithic scatter (SIHP Site 14638), and the Kaʻohe Wall (SIHP Site 5002). The study also recorded a segment of the Old Humuʻula Wagon Road (SIHP Site 21150) to the east of the recreation area, and concluded that repeated use of the road by military traffic over the previous forty years had transformed it into a deeply-rutted two-track with "no vestiges of the morphology that identify this route as the Old Waimea-Humuʻula wagon road" (Langlas et al. 1999:92). In addition to these sites, the survey also recorded several Historic/Modern and Historic/Recent military-related sites (Temporary Sites 326, 327, 516, 517, 518, and 519) along the study corridor near the recreation area; none of these were assigned SIHP numbers.

In 1998, Garcia and Associates conducted an investigation of two work areas for the Legacy Resource Management Program at PTA, which are to the south and west of the current study area (Reinman and Pantaleo 1998). The inventory recorded forty Precontact Period sites attributable to habitation, bird hunting, quarrying, and transportation.

In 2001, Cultural Surveys Hawaii, Inc. conducted a survey for the proposed PTA base camp master plan and improvements at Bradshaw Army Airfield (Hammatt and Shideler 2001). That study identified no historic properties.

In 2002, Garcia and Associates re-surveyed a 2,900-acre area south of Saddle Road and east of Redleg Trail (Roberts et al. 2004b). The survey identified seven Precontact sites, including habitation lava tubes, chill glass quarries, and excavated pits.

Also in 2002, Garcia and Associates conducted a reconnaissance survey of 8,710 acres for the BAX/AALFTR and 24,000 acres for Keʻāmuku land purchase and the PTA trail (Roberts et al 2004a). The survey identified 15 Precontact sites attributable to habitation, quarrying, bird hunting, and transportation.

In 2003, Garcia and Associates conducted reconnaissance of PTA Training Areas 1, 3, and 4 (Roberts et al. 2004c). The reconnaissance recorded ten Precontact sites and five Historic ranching sites.

Also in 2003, Garcia and Associates conducted a reconnaissance survey of the SBCT Go/No Go Maneuver Areas at PTA (Desilets et al. 2005). This study identified fifty sites, six of which were determined to be "Traditional Hawaiian" sites, three were determined to be associated with Historic ranching, and the remainder were attributed to military use.

A third study by Garcia and Associates in 2003 involved Phase II research of the BAX/AALFTR at PTA (Robins and Gonzalez 2006). This study identified 24 Precontact habitation, bird hunting, quarrying, and transportation sites.

In 2007, the Division of State Parks requested and received a determination of "No Historic Properties Affected" for improvements to the wastewater system in the Mauna Kea State Recreation Area (Quinn 2007). This study was entirely contained within the current study area. The improvements involved the installation of septic tanks, leach fields, and sewer lines in three areas adjacent to the cabins, comfort station, and dining hall (Figure 18). The study compiled a history of activities and construction within the recreation area and included an inspection of the project area. The study recorded no archaeological features. At the time of the study, it was noted that none of the affected recreation area buildings were older than 50 years or otherwise historically significant.

In 2011 and 2012, Cultural Surveys Hawaii conducted an archaeological inventory survey of a 4-acre portion of the Mauna Kea State Recreation Area for the construction of the Department of Transportation's Saddle Road Maintenance Baseyard Facility (Bautista et al. 2012). A portion of that survey included part of the current study's pipeline corridor (Figure 18). The AIS assessed four historic properties outside of the current study area to be significant. The properties were a historic cabin (SIHP Site 29222) thought to date to the late 1940s (Criterion d), three aviaries (SIHP Site 29223) that were used as part of the Commission of Agriculture and Forestry's *nēnē* propagation facility between 1949 and 1978 (Criteria b and d), a Historic stone enclosure (SIHP Site 29224) that was interpreted to be a ranching feature after subsurface testing (Criterion d), and a complex (SIHP Site 29226) consisting of a historic feed trough and series of fence lines (Criterion d). A fifth site (SIHP Site 29225), also outside of the current study area, was determined to be a modern bulldozer push pile. The AIS recommended no further archaeological work to mitigate the effects of the then-proposed undertaking. SHPD concurred with the report's findings and recommendation that effects to the *nēnē* propagation facility had been satisfactorily mitigated by the study.

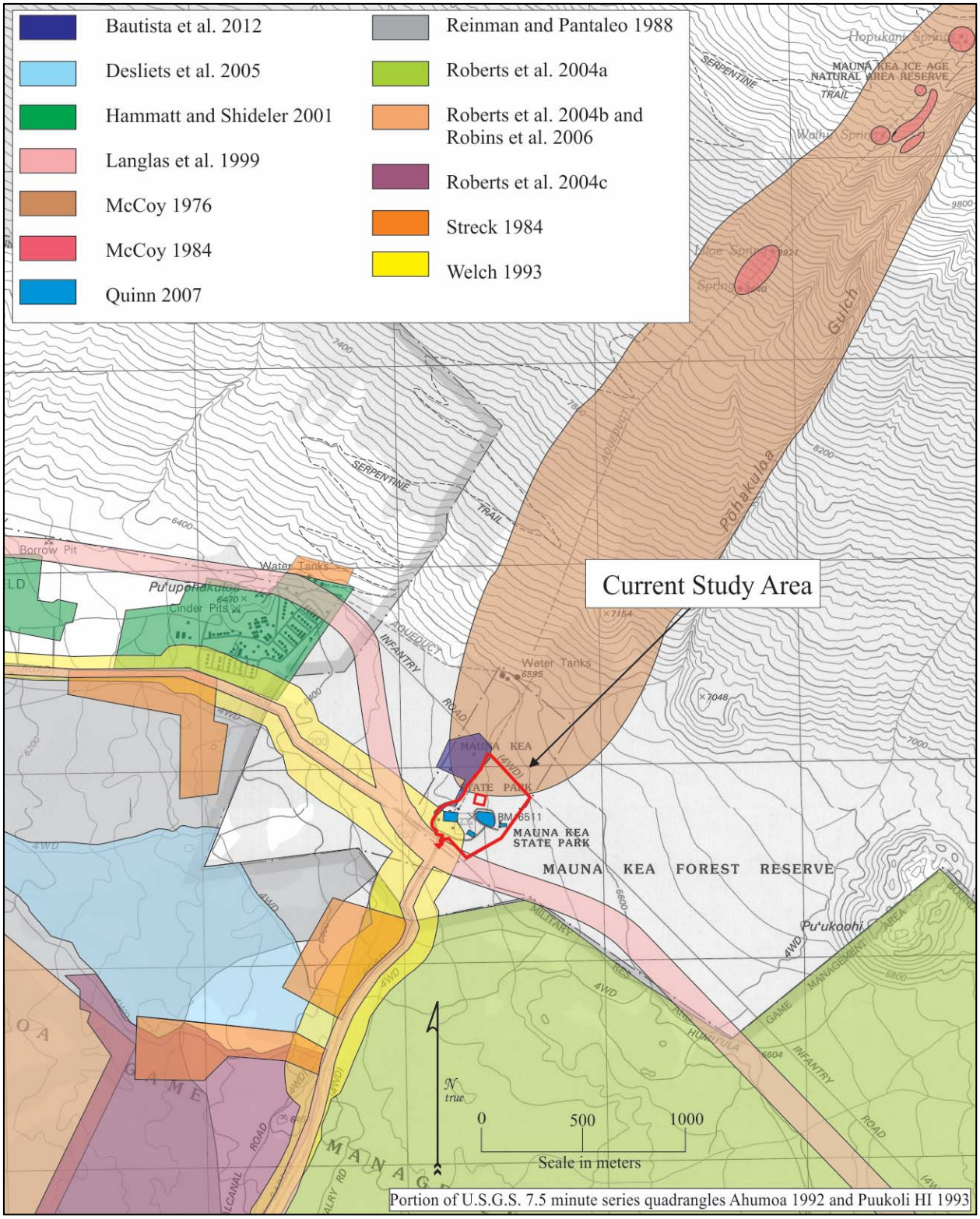


Figure 26. Previous archaeological and cultural studies in the vicinity of the project area.

Table 3. Previous Studies in vicinity of the study area

Date	*Author*	*Area*	*Type of Study*
1977	Rosendahl	Saddle Road (Mile Post 33.5 to 36)	Reconnaissance
1978	McCoy	Mauna Kea Adze Quarry	Reconnaissance
1984	Streck	PTA	Reconnaissance
1984	McCoy	Hopukani, Waihu, and Liloe Springs	Reconnaissance
1991	Hammatt and Shideler	PTA	Assessment and Sensitivity Map
1993	Welch	Saddle Road in PTA	Survey & Testing
1998	Reinman and Pantaleo	PTA	Survey
2001	Hammatt and Shideler	PTA & Bradshaw Army Airfield	Survey
2004a	Roberts et al.	Keamuku, PTA	Reconnaissance
2004b	Roberts et al.	PTA	Reconnaissance
2004c	Roberts et al.	PTA Training Areas 1,3, & 4	Reconnaissance
2005	Desilets et al.	PTA	Reconnaissance
2006	Robins and Gonzáles	PTA	Inventory
2007	Quinn	Mauna Kea State Recreation Area	Inspection
2012	Bautista et al.	Mauna Kea State Recreation Area	Archaeological Impact Assessment
2012	Mitchell et al.	Mauna Kea State Recreation Area	Cultural Impact Assessment

3. PROJECT AREA EXPECTATIONS

Based on the location and the specific history of the project area land use, the results of the background research, and a review of archaeological work previously conducted in the general vicinity, the archaeological expectations for the current study are limited. From oral traditions and ethnohistoric accounts, the study area appears to have been used during Precontact times mainly as a travel corridor to the springs in Pōhakuloa Gulch and the Mauna Kea Adze Quarry (McCoy 1984), with the bulk of activities likely to leave archaeological traces conducted at elevations at least two thousand feet above the current study area. Precontact and early Historic travelers in the Saddle region may have used trails along the current Saddle Road alignment, but previous archaeology and historic accounts have not positively identified the locations of these trails. Generally speaking, the Keʻekeʻe loamy sands in and around the study area have an "extremely low" probability of containing Precontact cultural material, although it is possible that evidence of "casual prospecting" of boulders found on the alluvial aprons by Precontact visitors to Pōhakuloa might be present (Hammatt and Shideler 1991). Quinn (2007) also notes that evidence of non-camping, transient activities undertaken during ascents up Mauna Kea *via* Pōhakuloa Gulch may have once been present in the study area, but is very likely disturbed by more recent development activities (e.g., creation of the PTA, construction and improvements of the Saddle Road, and post-World War II activities at the recreation area) in and around the study area. The recent AIS adjacent to and partially overlapping the current study area (Bautista et al. 2012) recorded no Precontact sites.

The potential for archaeological remains of twentieth-century historic properties also appears to be diminished by development activities and facility improvements within the recreation area. The transformation of the Pōhakuloa CCC camp into the Pōhakuloa Park and later Mauna Kea State Recreation Area between 1961 and 1970 has probably destroyed most, if not all, evidence of the CCC-era cabins and their use. As described above in the project area description, six architectural resources in the study area are older than fifty years old, but a review of the documented improvements to these buildings indicate significant alterations to the buildings during the last thirty years.

Given the background research conducted for this study, the overall expectation to encounter significant historic properties is low. Precontact and early Historic activities within the study area were limited and unlikely to leave archaeological traces. While the use of the study area for CCC, military, recreation, and other activities in the twentieth century has left tangible traces on the landscape, the development of the recreation area between A.D. 1960 and the present has disturbed or destroyed most evidence of those past activities within the study area. It is possible that foundation ruins of the CCC-era buildings and rubbish associated with them may be encountered in the western portion of the study area.

4. FIELDWORK, CONCLUSION, AND RECOMMENDATIONS

Fieldwork was conducted on November 2, 2014, by Robert B, Rechtman, Ph.D., Benjamin Barna, Ph.D., and Lauren Kepa‘a; and on January 20, 2015 by Benjamin Barna, Ph.D.

METHODS

Fieldwork consisted of pedestrian survey with 100% coverage of the study area. The survey crew walked in systematic transects paralleling the survey area boundaries with spacing between crew members of no more than 20 meters. Visibility of the ground surface was excellent throughout the study area. Mapping of the study area was conducted by Engineering Partners, and the base map (see Figures 3 and 4) they produced includes existing buildings and other structures (e.g., sidewalks and roads). All potentially significant historic properties were identified in the field and photographed. These potentially significant properties (Table 4) included the buildings that are more than 50 years in age (erected prior to 1965).

Table 4. MKRA potential significant historic properties.

Key on figure 9	*Building*	*Construction date*
1	Vacation Cabin 1 “Mamani”	1961
2	Vacation Cabin 2 “Iliahi”	1961
3	Vacation Cabin 3 “Naio”	1961
4	Vacation Cabin 4 “Pilo”	1962
5	Vacation Cabin “5 Aalii”	1962
CS	Comfort Station	1963

FINDINGS

As a result of the current study, there were no Precontact archaeological features observed within the study area. Field observations of past ground disturbance and the results of numerous previous studies indicate that subsurface archaeological resources are unlikely to be encountered within the study area.

As a result of the background research presented above, six architectural resources in the study area are slightly older than 50 years (e.g., between 53 and 51 years old) and therefore require consideration of their potential to be significant historic properties. These resources are the Vacation Cabins (Cabins 1-5) and the Comfort Station (see Figure 9, see Table 4). Figures 21 and 22 depict a typical Vacation Cabin, and Figure 24 shows the Comfort Station. The SHPD acting Architecture Branch Chief was consulted regarding the potential significance of these buildings. As a result of this consultation it was determined these six structures are not considered to be significant under any of the HRHP significance criteria. As such, no SIHP Site numbers were requested for these buildings, and they are not discussed further in this report.

CONCLUSION AND RECOMMENDATIONS

Given the prior determination of “no historic properties affected” (Quinn 2007) and concurrence with those findings as a result of the current study, it is concluded that the proposed development in the County of Hawai‘i administered Mauna Kea Recreation Area will not impact any known historic properties. In the unlikely event that any unanticipated archaeological resources are unearthed during development activities, in compliance with HAR 13§13-280, work in the immediate vicinity of the finds should be halted and DLNR-SHPD contacted.

REFERENCES CITED

Alexander, W.
1892 The Ascent of Mauna Kea. *Pacific Commercial Advertiser*, September 14. Page 1.

Barrère, D.
1983 Report 2: Notes on the Lands of Waimea and Kawaihae. In Clark and Kirch (editors) *Archaeological Investigation of the Mudlane-Waimea-Kawaihae Road Corridor, Island of Hawaii*. Prepared for State of Hawaii, Department of Transportation, B.P. Bishop Museum 1983:25–38.

Bautista, O., S. Wilkinson, A Mitchell, and H. Hammatt
2012 Archaeological Inventory Survey for the Baseyard at the Mauna Kea State Recreation Area, Kaʻohe Ahupuaʻa, Hāmākua District, Hawaiʻi Island TMK: [3] 4-4-016:003 Prepared for R.M. Towill.

Bellwood, P.
1978 *The Polynesians, Prehistory of an Island People*. London: Thames and Hudson, Ltd.

Bergin, B.
2004 *Loyal to the Land: The Legendary Parker Ranch, 750-1950. Aloha ʻĀina Paka*. University of Hawaiʻi Press, Honolulu.

Bryan, L.
1938 CCC on the Island of Hawaii. *Paradise of the Pacific* 50(5):15.

1939 Lake Waiau of Hawaii. *Paradise of the Pacific* 51(2):11.

Burtchard, G.
1995 Population and Land Use on the Keauhou Coast, the Mauka Land Inventory Survey, Keauhou,
North Kona, Hawaiʻi Island. Part I: Narrative Volume. International Archaeological Research Institute, Inc. (IARII). Prepared for Belt Collins and Associates and Kamehameha Investment Corporation, Honolulu.

Cartwright, B.
1933 Some Aliis of the Migratory Period. *Bishop Museum Occasional Papers,* 10(7). Honolulu.

Chinen, J.
1958 *The Great Mahele: Hawaii's Land Division of 1848*. Honolulu: University of Hawaii Press.

1961 *Original Land Titles in Hawaii.* Honolulu: privately published.

Cordy, R.
1994 A Regional Synthesis of Hāmākua District, Island of Hawaiʻi. Historic Preservation Division, Department of Land and Natural Resources, State of Hawaiʻi.

2000 *Exalted Sits the Chief: The Ancient History of Hawai'i Island*. Mutual Publishing, Honolulu.

Department of Land and Natural Resources Engineering Division (DLNR)
1964 Job No. 39-K-2, 0.5 M.G. Steel Tank and Appurtenances for Mauna Kea State Park, Pōhakuloa, Hawaiʻi, Hawaiʻi. "As Built" plans dated September 22, 1966. Prepared for Division of State Parks. Ms. on file at State of Hawaiʻi Department of Land and Natural Resources.

1966 Job No. 39-HP-8, Park Improvements, Mauna Kea State Park, Pōhakuloa, Hawai‘i, Hawai‘i. “As Built” Plans dated April, 1968. Prepared for Division of State Parks. Ms. on file at State of Hawai‘i Department of Land and Natural Resources.

1968 Job No. 39-HP-9, Additional Buildings and Tank Unit 3, Mauna Kea State Park, Pōhakuloa, Hawai‘i, Hawai‘i. Plans drafted 1968. Prepared for Division of State Parks. Ms. on file at State of Hawai‘i Department of Land and Natural Resources.

1988 Job No. 90-HP-D, Facility Reconstruction, Reconstruction, Mauna Kea State Recreation Area, Pōhakuloa, Hawai‘i, Hawai‘i. “As Built” plans dated March, 6, 1991. Prepared for Division of State Parks. Ms. on file at State of Hawai‘i Department of Land and Natural Resources.

1999 Job No. 90-HP-D2, Mauna Kea State Recreation Area Cabins 6 & 7 Improvements and Construct ADA Restroom, Pōhakuloa, Hawai‘i. “As Built” plans dated July, 2004. Prepared for Division of State Parks. Ms. on file at State of Hawai‘i Department of Land and Natural Resources.

2004 Job No. H09C636A, Mauna Kea State Recreation Area Water System Improvements, Mauna Kea, Hawai‘i. Plans drafted May, 2004. Prepared for Division of State Parks. Ms. on file at State of Hawai‘i Department of Land and Natural Resources.

Desilets, M., A. Roberts, A. Buffum, and S. Roberts

2005 Phase I Archaeological Reconnaissance Survey for SBCT Go/No Go Maneuver Areas at U.S. Army Pōhakuloa Training Area, Ka‘ohe Ahupua‘a, Hāmākua District and Pu‘uanahulu Ahupua‘a, North Kona District, Island of Hawai‘i, (TMKs 3-4-4-16:01 and 3-7-04:07). Prepared for U.S. Army Engineer District, Fort Shafter, Hawai‘i. Garcia and Associates, Kailua, Hawai‘i.

Ellis, W.

2004 *Journal of William Ellis, A Narrative of an 1823 Tour Through Hawai‘i.* Mutual Publishing.

Fischer, John Ryan

2007 Cattle in Hawai‘i: Biological and Cultural Exchange. *Pacific Historical Review*. 76(3):347-372.

Fornander, A.

1880 *An Account of the Polynesian Race*. Trubner: London.

1969 *An Account of the Polynesian Race: Its Origins and Migrations*. Tokyo: Charles E. Tuttle Co., Inc.

Gagne and Cuddihy

1990 Vegetation IN *Manual of the Flowering Plants of Hawai‘i,* W. Wagner, D. Herbts, and S. Sohmer, eds. Second Edition. Honolulu: University of Hawai‘i Press, Bishop Museum Press. Pp. 45-114.

Hammatt, H., and D. Shideler

1991 Archaeological Assessment and Sensitivity Map of the Pōhakuloa Training Area (PTA), Hawai‘i Island. Prepared for Richard Sato and Associates. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

2001 Archaeological Inventory Survey for the Proposed Pohakuloa Training Area Base Camp Master Plan and Bradshaw Army Airfield Improvements. Prepared for Townscape, Inc. Cultural Surveys Hawai‘i, Inc., Kailua, Hawai‘i.

Handy, E., and E. Handy

1972 *Native Planters in Old Hawai'i*. B.P. Bishop Museum Bulletin 233. Bishop Museum Press, Honolulu. (With M. Pukui).

Hazlett, A., D. Shideler, and H. Hammatt
2007 Supplemental Archaeological Surveying, Recordation, Monitoring, Discovery, and Data Recovery Plan for the Hamakua Ditch System. Lālākea, Kukuihaele, Kanahonua, Waikoʻekoʻe, Keaʻā, Puʻuʻōpaha, Kalakalaʻula, Moʻoiki 1, Hanapai, Niupuka, Kana, Paʻakō, Puanui, Papalapuka, Waikōloa, Waiʻaleʻale, Kapulena, Kaʻauhuhu, Keʻahakea, Haukoʻi, Moʻoiki 2, Manae, Kapoaʻula, Malanahae and Honokaiʻa Ahupuaʻa. Hāmākua District, Hawaiʻi Island. Portions of (TMK (3) 4-06, 4-07, and 4-08). Prepared for Belt Collins Hawaii, Ltd.

Hobbs, J.
1939 Our Fourth Industry is Livestock. *Hawaiian Annual.* Thos. G. Thrum, Honolulu, HI.

Hommon, R.
1986 Social Evolution in Ancient Hawai'i. IN Kirch, P.V. (ed.), *Island Societies: Archaeological Approaches to Evolution and Trans-formation*: 55-88. Cambridge: University Press.

Hono-ko-hau Study Advisory Commission
1974 The Spirit of Ka-Loko Hono-Ko-Hau. National Park Service, U.S. Department of the Interior.

Johnston, W.
1976 Winter Sports in Hawaii. *Hawaii Skier*. July:6-7.

Kamakau, S.
1976 The Works of the People of Old: Na hana a ka Poʻe Kahiko. *B.P. Bishop Museum Special Publication 61*. Bishop Museum Press, Honolulu.

1991 *Tales and Traditions of the People of Old*. Honolulu: Bishop Museum Press.

1992 *Ruling Chiefs of Hawaii*. The Kamehameha Schools Press, Honolulu (revised edition).

Kent, N.
1983 *Hawaii: Islands Under Influence*. University of Hawai'i Press, Honolulu.

Kirch, P.
1984 *Evolution of the Polynesian Chiefdoms*. Cambridge University Press, New York.

1985 *Feathered Gods and Fishhooks: An Introduction to Hawaiian Archaeology and Prehistory.* Honolulu: University of Hawaii Press.

1990 Monumental Architecture and Power in Polynesian Chiefdoms: A Comparison of Tonga and Hawaii. *World Archaeology* 22(2).

2011 When did the Polynesians Settle Hawaiʻi? A Review of 150 Years of Scholarly Inquiry and a Tentative Answer. *Hawaiian Archaeology* Vol. 12:3-26.

Kuykendall, R.
1938 *The Hawaiian Kingdom 1778–1854. Foundation and Transformation*. Honolulu: University Press of Hawaii.

Kuykendall, R., and A. Day
1976 *Hawaii: A History From Polynesian Kingdom to American Statehood*. Prentice-Hall, Inc., Englewood Cliffs.

Langlas, C., T. Wolforth, and J. Head

1999 The Saddle Road Corridor: An Archaeological Inventory Survey and Traditional Cultural Property Study for the Hawai‘i Defense Access Road A-AD-6(1) and Saddle Road (SR 200) Project. PHRI Report 1939-043099. Submitted to Federal Highways Administration, Denver. Report on file DLNR-SHPD, Kapolei.

Maly, K., and O. Maly
2005 *Mauna Kea-Ka Piko Kaulana O Ka ‘Āina (Mauna Kea-The Famous Summit of the Land):* A Collection of Native Traditions, Historical Accounts, and Oral History Interviews for: Mauna Kea, the Lands of Ka‘ohe, Humu‘ula, and the ‘Āina Mauna on the Island of Hawai‘i *Kumu Pono* Associates Study HiMK67-OMKM (033005b). Prepared for The Office of Mauna Kea Management (University of Hawai‘i-Hilo).

McCoy, P.
1978 Draft, The B.P. Bishop Museum Mauna Kea Adze Quarry Project. On file, Historic Preservation Division, Department of Land and Natural Resources, State of Hawai‘i, Honolulu (H-60).
1984 *Archaeological Reconnaissance of Hopukani, Waihu, and Liloe Springs, Mauna Kea, Hawai‘i.* Prepared for U.S. Army Corps of Engineers. Bernice P. Bishop Museum, Honolulu, Hawai‘i..

McIntosh, R., and D. Milstein
1964 The Study of the Pohakuloa-Mauna Kea Recreation Area, County of Hawaii, State of Hawai‘i. Prepared for Bureau of Business Research, College of Business Administration, University of Hawai‘i, Honolulu, Hawai‘i.

Menzies, A.
1920 *Hawaii Nei, 128 Years Ago*. Edited by William F. Wilson. Honolulu: The New Freedom Press.

Meyer, A.
2003 *Ho‘oulu: Our Time of Becoming*. Honolulu: ‘Ai Pōhaku Press.

Mills, P.
2003 *Neo* in Oceania: foreign vessels owned by Hawaiian chiefs before 1830. *Journal of Pacific History* 38(1):53-67.

Mills, P., C. White, and B. Barna
2013 The Paradox of the Paniolo: an Archaeological Perspective of Hawaiian Ranching. *Historical Archaeology* 47(2):117-138.

Mitchell, ‘A., M. Wheeler, and H. Hammatt
2012 A Cultural Impact Assessment for the Proposed Saddle Road Maintenance Base Yard at the Mauna Kea State Recreation Area, Ka‘ohe Ahupua‘a, District of Hāmākua, Island of Hawai‘i. TMK: (3) 4-4-016:003. Prepared for R.M. Towill Corporation.

Oliver, D.
1961 *The Pacific Islands*. University of Hawaii Press, Honolulu.

Paradise of the Pacific
1948 Hunting on the big *island* of Hawaii—Sheep, wild goats, and pigs by thousands create hunters’ paradise. *Paradise of the Pacific* May: 26-27.

Pogue, J.
1978 Moolelo Hawaii. Hale Paipalapala Aupuni, Honolulu (Revised Edition).

Pukui, M., S. Elbert, and E. Moʻokini
1974 *Place Names of Hawaii*. *Revised and Expanded Edition.* Honolulu: University of Hawaii Press, Honolulu.

Quinn, D.
2007 Request for Determination of "No Historic Properties Affected," Wastewater System Improvements, Mauna Kea State Recreation Area Kaʻohe, Hamakua, Hawaiʻi. TMK: (3) 4-4-014:003(por.). Memorandum on file at State Historic Preservation Division.

Reinman, F., and J. Pantaleo
1998 Archaeological Investigations of Two Work Areas for the Legacy Resource Management Program at the Pōhakuloa Training Area, Hawaiʻi Island, Hawaiʻi. Prepared for the U.S. Army Corps of Engineers, Pacific Ocean Division, Fort Shafter, Hawaiʻi. Garcia and Associates, Honolulu, Hawaiʻi.

Roberts, A., J. Robins, and A. Buffum
2004a Final Report: Archaeological Surveys of Proposed Training Areas for the Stryker Brigade Combat Team, U.S. Army Pohakuloa Training Area, Island of Hawaiʻi, Hawaiʻi. Prepared for the U.S. Army Engineer District, Honolulu by Garcia and Associates, Kailua.

Roberts, A., K. Brown, and A. Buffum
2004b Archaeological Survey of Training Areas 5 and 21 and Eligibility Evaluations of Volcanic Glass Quarry Sites in the Vicinity of Redleg Trail (Range 10), U.S. Army Pohakuloa Training Area, Island of Hawaiʻi, Hawaiʻi. Prepared for the U.S. Army Engineer District, Honolulu by Garcia and Associates, Kailua.

Robins, J, and A. Gonzáles
2006 Phase II Archaeological Research of Proposed Battle Area Complex (BAX)25 and Anti-Armor Live Fire and Training Range (AALFTR) Training Areas for Stryker Brigade Combat Team (SBCT), U.S. Army Pōhakuloa Training Area, Hawaiʻi Island, Hawaiʻi (TMK 3-4-4-16:1). Garcia and Associates, Inc., Kailua, Hawaiʻi.

Roberts, A., S. Roberts, and M. Desilets
2004c Final Report: Archaeological Reconnaissance of Training Areas 1, 3, and 4. U.S. Army Pohakuloa Training Area, Island of Hawaiʻi, Hawaiʻi. Prepared for the U.S. Army Engineer District, Honolulu by Garcia and Associates, Kailua.

Roper, S.
2008 *Hilina Pali 2005: The Civilian Conservation Corps, an Archeological Inventory Survey of the Hilina Pali Erosion Control Project of 1940*. Publications in Anthropology 12. acific Island Network, National Park Service, U.S. Department of the Interior.

Rosendahl, P.
1977 Archaeological Inventory and Evaluation Report for Installation Environmental Impact Statement for U.S. Army Support Command Hawaii (USASCH). Part 1: Report Text; Part 2: Tables. Prepared for Department of the Army, U.S. Army Engineer Division, Pacific Division, by Department of Anthropology, B.P. Bishop Museum, Honolulu.

Sato, H., W. Ikeda, R. Paeth, R. Smythe, and M. Takehiro, Jr.
1973 *Soil Survey of the Island of Hawaii, State of Hawaii.* U.S. Department of Agriculture, Soil Conservation Service and University of Hawaii Agricultural Experiment Station. Washington, D.C.: Government Printing Office.

Shapiro, L., and P. Cleghorn

1998 *Final Archaeological Investigations of Two Work Areas for the Legacy Resource Management Program at Pohakuloa Training Area, Hawai'i Island, Hawai'i.* Biosystems Analysis, Inc., Kailua, Hawai'i.

Sinoto, Y., and M. Kelly
1970 Archaeological and Historical Survey of Pakini-Nui and Pakini-Iki Coastal Sites, Waiahukini, Kailikii, and Hawea, Ka'u, Hawaii. *Departmental Report Series* 75-1. Department of Anthropology, B.P. Bishop Museum, Honolulu.

Streck, C.
1984 *Archaeological Reconnaissance Site Survey of Five Land Parcels at PTA,* Island of Hawai'i.. Department of the Army Headquarters United State Army Support Command, Fort Shafter, Hawai'i.

United States Department of Agriculture-Natural Resources Conservation Service (USDA-NRCS)
2014 Web Soil Survey Island of Hawai'i Area, Hawai'i. Survey Area Data Version 7, Sep 25. http://websoilsurvey.nrcs.usda.gov

Urban, K. and S. Solamillo
2011 Civilian Conservation Corps In Hawai`i: Oral Histories of the Haleakalā Camp, Maui. Prepared for Haleakala National Park, NPS Contract #C8298090010. Prepared by K Design Group, Honolulu.

Welch, D.
1993 Archaeological Survey and Testing for the Saddle Road Improvement Project, Pōhakuloa Area, Hawai'i Island, Hawai'i. Prepared for Federal Highways Administration, Denver, Colorado. International Archaeological Research Institute, Inc., Honolulu, Hawai'i.

Wellmon, B.
1969 *The Parker Ranch: A History*. Doctoral dissertation, Department of History, Texas Christian University. University Microfilms International, Ann Arbor, MI.

Wilkes, C.
1845 *Narrative of the United States Exploring Expedition During the Years 1838–1842, Under the Command of C. Wilkes, U.S.N.,* Volume 4. Philadelphia: Loa and Blanchard.

Williams, S. (ed.)
2002 *Final Report. Archaeological Reconnaissance Survey U.S. Army Pohakuloa Training Area (PTA) for the U.S. Army Garrison, Hawaii, Ecosystem Management Program, Hawai'i Island, Hawai'i*. Ogden Environmental and Energy Services Co., Inc., Honolulu.