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July 18, 2017

Scott Glenn, Director
Office of Environmental Quality Control
Department of Health, State of Hawaii
235 South Beretania Street, Room 702
Honolulu, Hawai'i 96813

Dear Director,

With this letter, the State of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) hereby transmits the Draft Environmental Assessment and Finding of No Significant Impact (DEA- AFONSI) for the Lower Waiohuli Trail Improvements situated at TMK (2)2-2-007:001 (portion), in the Kula District, on the island of Maui for publication in the next available edition of the Environmental Notice.

Enclosed is a completed OEQC Publication form, two copies of the DEA-FONSI, and Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

If there are any questions, please contact Torrie Nohara, Na Ala Hele, Trails and Access Specialist, at the Maui Division of Forestry and Wildlife Office at (808)984-8100, or email at: Torrie.L.Nohara@hawaii.gov.

Sincerely,

Suzanne D. Case

Suzanne D. Case
Chairperson, Board of Land and Natural Resources

17-046

AGENCY
PUBLICATION FORM

Project Name:	Lower Waiohilu Trail Improvements and Re-Alignment Draft Environment Assessment
Project Short Name:	Lower Waiohuli Trail EA
HRS §343-5 Trigger(s):	Use of state lands and state and federal funds
Island(s):	Maui
Judicial District(s):	Makawao
TMK(s):	(2)2-2-007.001(por)
Permit(s)/Approval(s):	Construction Permits, CDU
Proposing/Determining Agency:	State of Hawaii, Dept. of Land and Natural Resources
Contact Name, Email, Telephone, Address	Torrie Nohara, DOFAW, Trails and Access Specialist, 1955 Main Street Room 301, Wailuku, Maui, HI 96793, 808-984-8100, torrie.l.nohara@hawaii.gov
Accepting Authority:	(for EIS submittals only)
Contact Name, Email, Telephone, Address	
Consultant:	WHALE Environmental Services LLC
Contact Name, Email, Telephone, Address	Mark Howland, markahowland@hawaii.rr.com, 808-294-9254, PO Box 455, Kahuku, HI 96731

Status (select one)	**Submittal Requirements**
_X_ DEA-AFNSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEA, and 4) a searchable PDF of the DEA; a 30-day comment period follows from the date of publication in the Notice.
____ FEA-FONSI	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; no comment period follows from publication in the Notice.
____ FEA-EISPN	Submit 1) the proposing agency notice of determination/transmittal letter on agency letterhead, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEA, and 4) a searchable PDF of the FEA; a 30-day comment period follows from the date of publication in the Notice.
____ Act 172-12 EISPN ("Direct to EIS")	Submit 1) the proposing agency notice of determination letter on agency letterhead and 2) this completed OEQC publication form as a Word file; no EA is required and a 30-day comment period follows from the date of publication in the Notice.
____ DEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the DEIS, 4) a searchable PDF of the DEIS, and 5) a searchable PDF of the distribution list; a 45-day comment period follows from the date of publication in the Notice.
____ FEIS	Submit 1) a transmittal letter to the OEQC and to the accepting authority, 2) this completed OEQC publication form as a Word file, 3) a hard copy of the FEIS, 4) a searchable PDF of the FEIS, and 5) a searchable PDF of the distribution list; no comment period follows from publication in the Notice.
____ FEIS Acceptance Determination	The accepting authority simultaneously transmits to both the OEQC and the proposing agency a letter of its determination of acceptance or nonacceptance (pursuant to Section 11-200-23, HAR) of the FEIS; no comment period ensues upon publication in the Notice.
FEIS Statutory Acceptance	Timely statutory acceptance of the FEIS under Section 343-5(c), HRS, is not applicable to agency actions.
____ Supplemental EIS 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 or is not required; no EA is required and no comment period ensues upon publication in the Notice.

____ Withdrawal Identify the specific document(s) to withdraw and explain in the project summary section.

____ Other Contact the OEQC if your action is not one of the above items.

Project Summary

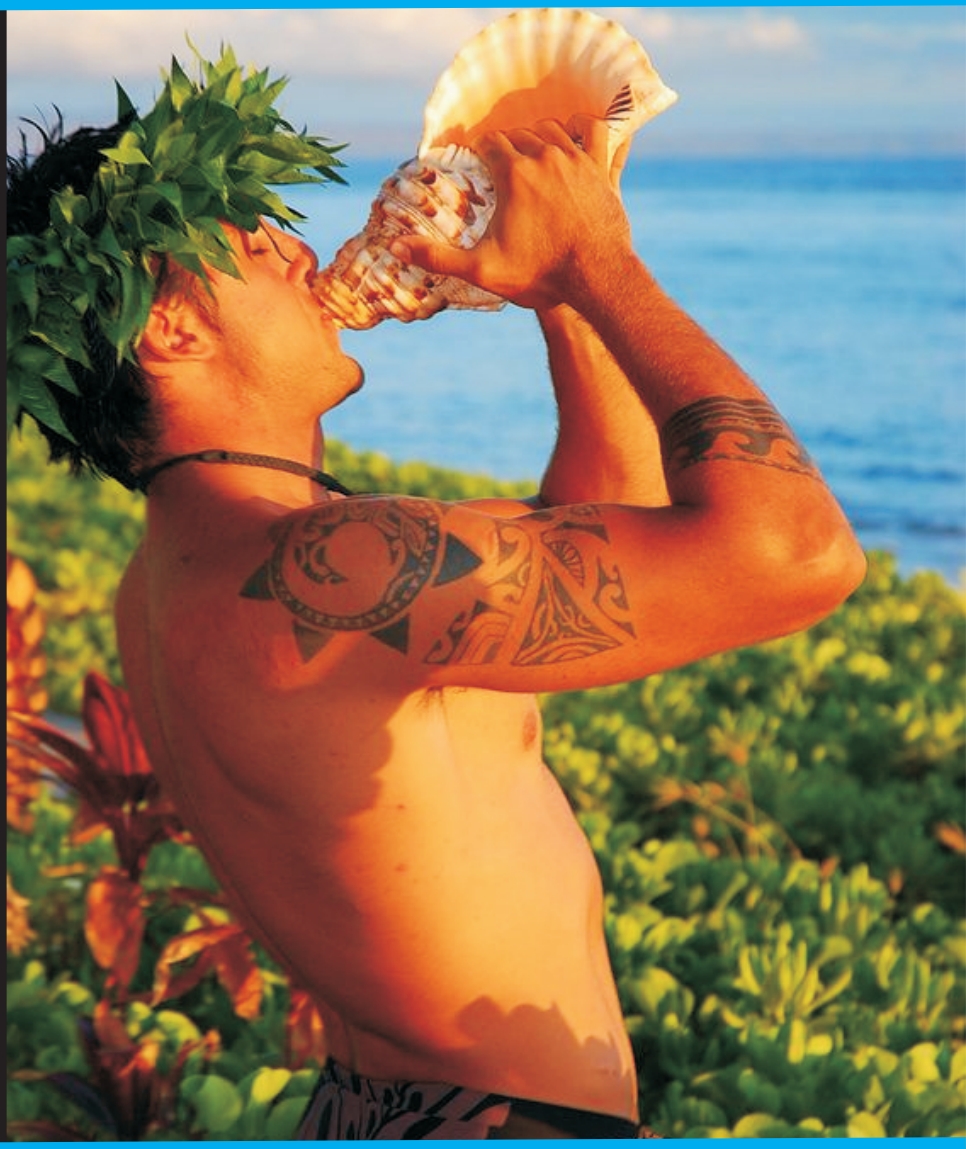
To rehabilitate the existing Lower Waiohuli Trail in the Kula NAR with minor trail re-alignment to reduce grades for hiking and biking safety, and improve drainage and surface conditions on the trail to address stormwater runoff and erosion issues for trail improvement and re-alignment for bike recreational use.

WHALE Environmental Services LLC
P.O. Box 455. KAHUKU, HI 96731 808-294-9254

Lower Waiohuli Trail - Draft Environmental Assessment

DOFAW - Division of Forestry and Wildlife

August 2017



Speak to the 'aina...
Work with Lokahi

HARMONY AND BALANCE

Prepared by: WHALE Environmental Services LLC www.whalees.com

DAVID Y. IGE
GOVERNOR OF
HAWAII

SUZANNE D. CASE
CHAIRPERSON
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Enclosed is a completed OEQC Publication form, two copies of the DEA-FONSI, and Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file by electronic mail to your office.

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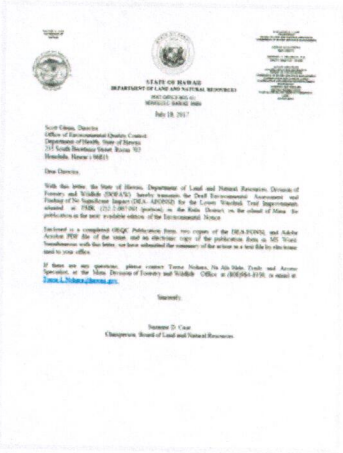
Sincerely,

Suzanne D. Case

Suzanne D. Case
Chairperson, Board of Land and Natural Resources



STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES

July 18, 2017

Scott Glenn, Director
Office of Environmental Quality Control
Department of Health, State of Hawaii
235 South Beretania Street, Room 702
Honolulu, Hawaii 96813

Dear Director,

With this letter, the State of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW), hereby transmits the Draft Environmental Assessment and Finding of No Significant Impact (DEA-AFONSI) for the Lower Waiahole Trail Improvements, situated at TMK: (2) 1-9-007:007 (portion), in the Hale Ko'olau District, on the island of Maui. Its publication in the next available edition of the Environmental Notice.

Enclosed is a completed OEQC Publication form, two copies of the DEA-FONSI, and Adobe Acrobat PDF file of the same, and an electronic copy of the publication form in MS Word. Simultaneous with this letter, we have submitted the summary of the action in a text file to the e-mail address provided to your office.

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Sincerely,

Suzanne D. Case
Chairperson, Board of Land and Natural Resources

17.07.17 DEA OEQC Submittal letter

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By:	Carrie Nohara (Torrie.L.Nohara@hawaii.gov)
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Preface

This Chapter 343, Hawaii Revised Statutes (HRS), Environmental Assessment (EA) has been prepared to address actions on lands owned by the State of Hawaii, Department of Land and Natural Resources, Division of Forestry and Wildlife. These actions are triggers for the preparation of an EA, as follows:

1. DLNR- DOFAW proposes the improvement of trail components and slight trail realignments on the Lower Waiohuli Trail (TMK (2)-2-007:001 (portion) to improve trail sustainability and to allow for bicycle use. This action triggered the need to provide trail improvements with State and Federal funds, and State-owned lands will be used for the implementation of these projects. Accordingly, a Chapter 343, HRS, EA is required.

List of Acronyms

List of Acronyms

ADA	Americans with Disabilities Act
AIS	Archaeological Inventory Survey
ALISH	Agricultural Lands of Importance to State of Hawaii
AMSL	Above Mean Sea Level
BMP	Best Management Practice
BSA	Boy Scouts of America
CIA	Cultural Impact Assessment
CZM	Coastal Zone Management
DLNR	Department of Land and Natural Resources
DOE	Department of Education
DOFAW	Division of Forestry and Wildlife
DWS	Department of Water Supply
EA	Environmental Assessment
FONSI	Findings of No Significant Impact
GPD	Gallons Per Day
GPM	Gallons Per Minute
HAR	Hawaii Administrative Rules
HC&S	Hawaiian Commercial & Sugar Company
HDPE	High Density Polyethylene
HRS	Hawaii Revised Statutes
HwD	Honolua Silty Clay, 15 to 25 percent slopes
KAPWC	Kahakuloa Acres Private Water Company
LSB	Land Study Bureau
MCR	Maluhia County Ranches
MGD	Million Gallons per Day
MIP	Maui Island Plan
NPDES	National Pollutant Discharge Elimination System
rRK	Rock Land
SDR	Standard Dimension Ratio
SMA	Special Management Area
TMK	Tax Map Key
USDA	U.S. Department of Agriculture

Other Acronyms

AAQS	Ambient Air Quality Standards
ac	acre(s)
CAA	Clean Air Act
CoM	County of Maui
CFR	Code of Federal Regulations
CZM	Coastal Zone Management Program
DLNR	State of Hawaii Department of Land and Natural Resources
EA	Environmental Assessment
EIS	Environmental Impact Statement
ESA	Endangered Species Act
ft	feet/foot
ft^2	square feet/foot
ha	hectare(s)
HAR	Hawaii Administrative Rules
HDOH	State of Hawaii Department of Health
HRS	Hawaii Revised Statutes
IRBH	Indoor Radiological Health Board (DOH)
m	meter(s)
m^2	square meter(s)
mi	mile
NAAQS	National Ambient Air Quality Standards
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
OEQC	Office of Environmental Quality Control
SHPD	State Historic Preservation Division
SMA	Special Management Area
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service

Executive Summary

Project Name: Lower Waiohuli Trail Improvements
Type of Document: Draft Environmental Assessment
Legal Authority: Chapter 343, Hawaii Revised Statutes
Determination: Finding of No Significant Impact (FONSI)
Applicable Environmental Assessment review "Trigger": Use of Mechanized Equipment, Use of State and Federal Funds and Lands, Land Use Change
Location: Maui Island, Wailuku: (TMK (2) 2-2-007:001 (portion)
Landowners: State of Hawaii, Department of Land and Natural Resources
1955 Main Street, #301, Wailuku, Hawaii 96793
Phone No.: (808) 984-8100
Applicants: State of Hawaii, Department of Land and Natural Resources
1955 Main Street, #301, Wailuku, HI 96793
Phone No.: (808) 984-8100
Approving Agency: State of Hawaii, Board of Land and Natural Resources, Chairperson
P.O. Box 621, Honolulu HI, 96809
Phone No.: (808) 587-0400
Consultant: WHALE Environmental Services LLC
P.O. Box 455, Kahuku, HI 96731
Contact: Mark Howland
Phone: (808) 294-9254

Project Summary:
This Environmental Assessment (EA) analyzes the environmental consequences of the Proposed Action and reasonable alternatives in accordance with Hawaii Administrative Rules (HAR) and Chapter 343, Hawaii Revised Statutes (HRS). This EA demonstrates that construction and operation of the Proposed Action would not result in any significant effects to the environment. Pursuant to Chapter 343, HRS, should a Finding of No Significant Impact be determined, an Environmental Impact Statement would not be required.

Proposed Action
The State of Hawaii – Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOFAW) is proposing to implement trail improvements and re-alignment on the Lower Waiohuli Trail (TMK (2) 2-2-007:001) located at the Kula District, Maui, Hawaii. The property is owned by the DLNR.

Purpose and Need

These trail improvements and re-alignment are intended to update the trail to address public safety concerns as related to hikers and/or other trail users through surface improvements, drainage upgrades, and vegetative management; to provide great sustainability and to allow for bicycle use.

Related improvements include a trail realignment to minimize fall-line trail alignment which are intended to enhance the existing trail system experience and bring the trail up to current trail improvement design standards.

The underlying land use designations for the parcel are as follows:

- State Land Use Classification: Agricultural
- Makawao – Pukalani – Kula Community Plan Classification: Agricultural
- County Zoning: Agricultural

The Lower Waiohuli Trail is considered a permitted use under Chapter 205, Hawaii Revised Statutes (HRS).As well, under Maui County Code (MCC) Chapter 19.30A relating to the County's Agricultural zoning district, the trail is deemed to be an existing non-conforming use. For this reason, an application for County Special Use Permit for the trail improvements and structures may not be necessary for approval by the Maui Planning Commission. The provision of the Draft EA will allow the Maui Planning Commission to determine if the existing non-conforming use is adequate for permitting. The trail originates along the Polipoli State Park Access Road within the Kula Forest Reserve.

The underlying land use designations for the trail are as follows:

- State Land Use Classification: Conservation
- Makawao – Pukalani – Kula Community Plan Classification: Conservation
- County Zoning: Conservation

The trail is considered a permitted use under Chapter 205, HRS as well as MCC 19.30A as open area recreation. Due to the foregoing project's use of State and County funds and use of State-owned lands, compliance with Chapter 343, HRS will be necessary. The approving agency for the Environmental Assessment will be the State Department of Land and Natural Resources.

The Proposed Action will have no significant impacts to any environmental resources areas. The implementation of standard Best Management Practices will ensure no significant impacts occur to geological and soil resources and water resources. The Proposed Action will not contribute to any significant cumulative impacts or reasonably foreseeable direct or indirect effects on any land use or resource use of the State's lands. WHALE Environmental Services LLC has included the Archaeological Literature Review and Field Inspection report for review by the State of Hawaii Preservation Division per the National Historic Preservation Act Section 106 as an appendix. The Proposed Action is not anticipated to adversely affect historic properties. Included also is the Biological Assessments in the appendixes as performed by STARR Environmental.

Alternatives. The filing entertains the Proposed Action or a No Action Alternative to the Proposed Action:

1. Trail improvements to surface, vegetative and drainage of the trail, as well as related trail re-alignment for better trail alignment by decreasing fall-line trail and sustainability.

2. The No-Action Alternative where the proposed project would not be constructed.

The alternate No-Action Alternative that is considered would be on the same 1.5 mile trail site. The environmental consequences of the No Action Alternative are evaluated as a baseline for comparison with the environmental consequences of the Proposed Action. Under this alternative, the Proposed Action would not be constructed. Therefore, DLNR would not benefit from the increase of safety factors for trail bicycle riders, hikers and/or other users, nor gain from the improvements to drainage and vegetative management. In addition, there would be a lost opportunity to assist the State in reaching the tourism goal of having the Lower Waiohuli Trail a lead hiking trail in the state with improved hiking conditions and safety improvements.

Environmental Consequences. The Proposed Action would have beneficial socio-economic impact. No significant adverse impacts are anticipated to biology, noise, air quality, geology and soils, land use, socioeconomics and traditional cultural practices, hazardous materials and waste, utilities and public services, and adherence to existing laws and regulations, water or archaeological resources. Moreover, this EA

demonstrates that the Proposed Action will not have reasonably foreseeable direct or indirect effects on any land use or resource of the State's designated zones.

Based on the review of potential environmental resource impacts, the construction and operation of the Proposed Action would not result in any significant environmental impacts. The vast majority of potential impacts can and will be fully mitigated with the use of proper planning, construction mitigation, and compliance with the rules and regulatory policies. Best Management Practices (BMPs) will be in place to govern such impacts and to ensure protection of the natural and human environment. Thus, the Proposed Action will not contribute to any significant cumulative impacts or reasonably foreseeable direct or indirect effects on any land use or resource of the State's designated zones.

SECTION ONE

LOCATION, PURPOSE OF, AND NEED FOR ACTION

PROJECT OVERVIEW

Table DA-1 Summary of Potential Environmental Resource Impacts and Proposed Mitigation Measures

Table DA.1 Summary of Affected Environmental Resources and Impact And Mitigation

Affected Environmental Resource	Level of Concern	Impact and Mitigation
Air Quality	No	Impact: Fugitive dust during construction
		Mitigation: Grading Permit to include Dust Control Plan
Noise	No	Impact: Additional noise during construction
		Mitigation: Noise negligible during operation and consistent with
		surrounding during construction
Infrastructure	Low	Impact: Additional traffic and utility connection
		Mitigation: Marginal increase in demand on transportation, storm
		water, and solid waste infrastructure
Climate	No	None
Visual Resources	No	There will be no change to scenic vistas or unique view
		planes
Hazardous Waste and Materials	Low	Impact: hazardous materials or wastes are discovered or released
		during construction or operations
		Mitigation: If discovered or released, they will be handled, removed,
		and disposed of in accordance with applicable state and federal laws,
		regulations, ordinances, and standards
Recreational Resources	No	None
Geology and Soil	Low	Impact: Soil erosion during construction
		Mitigation: Grading Permit to include Erosion Control Plan
Water Resources	Low	Impact: Potential stormwater runoff during construction
		Mitigation: NPDES construction permitting with best management
		practices
Biological Resources	Low	Impact: Area is previously disturbed with invasive vegetation
		Mitigation: Restore indigneous vegetation where possible
Cultural Resources	Low	Impact: Possible discovery during construction, but not likely due to
		location
		Mitigation: Stop construction in the event of a discovery
Land Use	No	None: mo change
Socio-Economic	No	None
Cumulative Impacts	No	None

A. PROPERTY LOCATION, EXISTING USE, AND LAND OWNERSHIP

The DLNR - Division of Forestry and Wildlife (DOFAW) is proposing to implement trail alignment and allow bicycle riding at the Lower Waiohuli Trail, [TMK (2) 2-2-007:001] located in the Kula Forest Reserve, Maui, Hawai'i. See **Figure 1**.

This project will implement trail alignment improvements and allow bicycle riding for the Lower Waiohuli Trail. Situated on the lower slopes of Mountain Haleakala, the trail is located within hilly, densely vegetated land which provides scenic views of the Kula/Kihei//Wailea/Makena areas and the Pacific Ocean.

Figure 1

Land Ownership is the State of Hawai'i Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOF AW) and is utilized for outdoor wilderness hiking and hunting experiences.

There are no buildings on the parcel.

Existing use is for hikers utilizing the Lower Waiohuli Trail (Trail) which originates along the Polipoli State Park Access road. Refer to **Figure 2**.

The Trail is an approximately 1.5 mile hike which descends the western slope of Mountain Haleakala and affords the hikers panoramic views of Maui.

Figure 2 - Lower Waiohuli Trail and maintenance locations

B. - PROJECT NEED

Figure 3 - Aerial image showing project area/proposed realignment (yellow line); current/existing trail is depicted as dashed red line

Lower WaiohuliTrail Improvements

The trail parcel is owned and operated by State of Hawai‘i Department of Land and Natural Resources (DLNR), Division of Forestry and Wildlife (DOF AW). The trail is operated as part of the state’s Nā Ala Hele Trail & Access Program.

Description

The Lower Waiohuli Trail begins along the Waipoli Access Road (Figure 3), near the Upper Waiohuli/Waiakoa trailhead; and heads downslope, in the makai direction, until it connects at a T-shaped junction with the Boundary Trail, a cross-slope trail along the lower edge of the Kula Forest Reserve. The terrain over which the trail passes is relatively steep. Mean annual rainfall in the project area is approximately 35 inches (889 mm) (Giambelluca et al. 2013), but it also receives additional precipitation from fog and mist that rolls in many afternoons (see photograph on page 2). Due to its relatively high elevation (~6,400 to 5,520 ft. [1,951 to 1,683 m] above mean sea level), the project area enjoys a cool climate, with a mean annual temperature of 53°F. No drinking water is available along the trail. Camping is not permitted.

Special Conditions

Do not use any trail or access road that is not delineated by name and color and that may also be displayed on these maps. The marked features are managed for public recreational use. Other trails or roads that branch off from the public features may be on private property, and are not managed for any public recreational use. Access is subject to adjacent landowner approval, and if used without authorization, you will be trespassing and possibly putting yourself at risk.

Currently, the trail has issues with trail stability due to a fall-line trail alignment which takes the trail directly down a ridge and other drainage related issues which results in erosive potentials. Some areas of the trail have eroded to a point when an alternative route is needed, causing minor trail re-alignment to be a need

C. - SUMMARY OF PROPOSED ACTION

The proposed project is to conduct a series of trail improvements along the 1.5 mile trail as shown in Figure 3. The varieties of implementation actions include surface stabilization, drainage improvements, and vegetative management. As well minor re-alignment will be needed. The user group of the trail will be extended to include bicycle riding. Specific improvements for bicycles include bermed corners and turns will be implemented

Lower Waiohuli Trail Improvements

The series of improvements to be implemented range from rolling dips (re-directs runoff to side of trail minimizing erosion), vegetation management (i.e. – dead tree removal), re-routing (to minimize fall-line trails) and to install bermed corners and turns.

D. – APPLICABLE REGULATORY REQUIREMENTS OVERVIEW

The proposed trail improvements at the Lower Waiohuli Trail will use Federal funds, as well as State lands. As well, mechanized equipment will be used. As such, compliance with Chapter 343, Hawai‘i Revised Statutes (HRS) is triggered. Therefore, this Environmental Assessment (EA) has been prepared pursuant to Title 11, Chapter 200, Hawai‘i Administrative Rules (HAR), Environmental Impact Statement Rules to evaluate the proposed action's technical characteristics, environmental and socio-economic impacts, and alternatives, as well as to advance findings relative to the significance of

the project's potential impacts and proposed mitigation measures. The Approving Agency for the EA is the Board of Land and Natural Resources.

Land Designations of Project Area Parcels

It is noted that the underlying land use designations for one parcel (028) is:

- Land Use Designations — Agricultural
- State Land Use Classification — Agricultural
- Makawao/Pukalani/Kula Community Plan — Agricultural
- County Zoning — Agricultural

And furthermore noted that the underlying land use designations for the other parcel (006) are:

- Land Use Designations — Conservation
- State Land Use Classification — Conservation
- Makawao/Pukalani/Kula Community Plan — Conservation
- County Zoning — Conservation

The Lower Waiohuli Trail is considered a permitted use under Chapter 205, HRS, as well as permitted under Maui County Code Chapter 19.30A, relating to the County's Conservation and Agricultural zoning districts, the trail is considered an existing permitted use. For this reason, the review for the potential need for a County Special Use Permit will be limited to proposed improvements on the Lower Waiohuli Trail, and will be filed for review and consideration by the Maui Planning Commission. It is likely that the Maui Planning Commission will only require the filing of a building permit for the Lower Waiohuli Trail re-alignment components.

The Applicant will coordinate with the Maui Planning Commission to address applicable regulatory requirements to ensure that Lower Waiohuli Trail improvements needs are appropriately addressed.

After reviewing the EA, the County of Maui, and the Department of Land and Natural Resources shall provide a notice of determination pursuant to Chapter 343, HRS. An action shall be determined to have a finding of no significant impact (FONSI) on the environment if it does not:

(1) Involve an irrevocable commitment to loss or destruction of any natural or cultural resource;

(2) Curtail the range of beneficial uses of the environment;

(3) Conflict with the state's long term environmental policies or goals and guidelines as expressed in Chapter 343, HRS, and any revisions thereto, court decisions, or executive orders;

(4) Substantially affects the economic welfare, social welfare, and cultural practices of the community or State;

(5) Substantially affects public health;

(6) Involve substantial secondary impacts, such as population changes or affects public facilities;

(7) Involve a substantial degradation of environmental quality;

(8) Is individually limited by cumulatively considerable effect upon the environment or involves a commitment for larger actions;

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

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

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

(12) Substantially affects scenic vistas and view planes identified in county or state plans or studies

OR

(13) Require substantial energy consumption.

As this project does not trigger any of these conditions which would deny a FONSI, it is believed that the Lower Waiohuli Trail improvements project would be issued a finding of no significant impact (FONSI).

SECTION TWO

DESCRIPTION OF THE EXISTING ENVIRONMENT, POTENTIAL IMPACTS, AND MITIGATION MEASURES

AFFECTED ENVIRONMENT

This section describes the existing environmental setting and baseline conditions in the areas that would be affected by the Proposed Action and alternatives under consideration. The description of the affected environment serves as the basis of comparison for analysis of potential environmental effects of the Proposed Action.

Lower Waiohuli Trail Improvements – Description of the Existing Environment, Potential Impacts, and Mitigation Measures

Physical Setting

1. Surrounding Land Uses

   Definition of Resource

   Land use includes the past, present, and planned land uses and government policies governing the preservation and development of land.

   a. Existing Conditions

   The project site is located in the Kula Forest Reserve, Maui, Hawai‘i. (*Refer to Figure 1*). The area surrounding the trail and trailhead is characterized as agricultural and conservation lands. Lands have open vistas and view planes making this an ideal location for recreation amenities such as the trail. Residential uses are non-existent in keeping with the area's agricultural and conservation land use context.

   b. Potential Impacts and Mitigation Measures

   The proposed trail improvements will be located throughout the entire 1.5 mile trail length; with the proposed trail re-alignments, improvements and addition of bicycle use, also will be located on or near the existing trail. These improvements are compatible with the existing uses of the properties and are not anticipated to create adverse impacts to the surrounding community.

2. Climate

Definition of Resource

Climate refers to meteorological conditions, such as the temperature range, precipitation levels, and wind conditions in a particular region, and is addressed under climate for purposes of this EA.

a. Existing Conditions

Like most areas in Hawai‘i, the climate in the Kula region is relatively uniform year-round. Characteristic of the island's climate, the project site experiences mild and uniform temperatures, moderate humidity, and relatively consistent northeasterly trade winds. This climatic stability is due to Maui's tropical latitude, its location relative to the Pacific anticyclone and storm tracts, and the surrounding ocean currents. Variations in climate among the different regions in Maui are largely due to local terrain. As the Lower Waiohuli Trail is at a relatively high elevation, (5530’ to 6430’) elevations, the microclimate is cooler.

Historically, August is the warmest month with an average temperature in the high 80 degrees Fahrenheit (measured at the Kahului Airport), while the coolest month is February with an average in the low 60s. Rainfall in the region is seasonal, with the most precipitation occurring between October and March. Annual rainfall data for nearby Kula shows an average of 35 inches (Maui County Data Book, 2012).

b. Potential Impacts and Mitigation Measures

The proposed project is not anticipated to affect or be affected by climatic conditions in the area.

3. Agricultural Productivity Considerations

a. Existing Conditions

In 1977, the State of Hawai‘i, Department of Agriculture developed a classification system to identify Agricultural Lands of Importance to the State of Hawai‘i (ALISH), based primarily, though not exclusively, on soil characteristics of the underlying land. The three (3) classes of ALISH lands are "Prime", "Unique", and "Other Important" agricultural lands, with the remaining non-classified

lands termed "Unclassified". When utilized with modern farming methods, "Prime" agricultural lands have soil quality, growing season, and moisture supply needed to produce sustained crop yields economically; "Unique" agricultural lands contain a combination of soil quality, growing season, and moisture supply to produce sustained yields of a specific crop. "Other Important" agricultural lands include those important lands that have not been rated as "Prime" or "Unique".

The Lower Waiohuli Trail, as reflected by the ALISH map, is located on lands designated as "Unclassified" and “Other” agricultural lands. Additionally, the trail also lies on lands zoned “conservation”.

Additionally, the University of Hawai‘i, Land Study Bureau (LSB) developed the Overall Productivity rating, which classified soils according to five (5) levels, with "A" representing the class of highest productivity soils and "E" representing the lowest. These letters are followed by numbers which further classify the soil types by conveying such information as texture, drainage, and stoniness.

The LSB classifications for the proposed project area are "E96". The "E96" classification reflects an Overall Productivity rating of E, the lowest possible rating. The soils are characterized as non-stony to rocky. Soil depths are variable, and with an average slope of 36 to 80 percent. The soil is of moderately fine to medium grain and well-drained.

The land is typically found at an elevation of 1000 to 5,000 feet, and experiences a mean annual rainfall of 30 to 50 inches. The soils are dark brown to dark reddish-brown in color. E rated lands are suitable for grazing (University of Hawai‘i, Land Study Bureau, 1967).

b. Potential Impacts and Mitigation Measures

The trail is used for outdoor recreational purposes. Adverse impacts to agricultural productivity are not anticipated as a result of the proposed action.

4. Topography/Geology and Soils Characteristics

Definition of Resource

Geology refers to the surface and subsurface materials of which a land area is composed, including soils and rocks. Important geologic characteristics of soils and underlying rocks include stability, slope, compatibility, shear strength, and productivity. Discussions of geology and soils typically identify existing conditions and determine how the Proposed Action and alternatives under consideration would likely affect, and be affected by, geology and soils.

a. Existing Conditions

Elevations at the project site range from approximately 5,530 feet above mean sea level (amsl) to 6,430 feet (amsl). The site generally slopes in an east to west direction, ranging from 40 to 70 percent.

The project site consists of soils within the Loumaia-Kappoioi-Olinda association, which is found on intermediate uplands and is characterized by deep, gently sloping to moderately steep, well-drained soils that have a moderately fine textured subsoil (U.S. Department of Agriculture (USDA), 1972). Rock outcrops and very shallow soils are the main characteristics of this soil type. In many places, the soil material is very sticky and very plastic, and has high shrink-swell potential (USDA, 1972).

b. Potential Impacts and Mitigation Measures

The proposed project is not anticipated to affect or be affected by underlying soil or topographic conditions in the area. The slope at the site ranges from approximately 30 to 70 percent, and does not pose constraints on project constructability.

5. Flood and Tsunami Hazards

According to the Hawai‘i - National Flood Insurance Program Flood Hazard Assessment Tool, the areas that would be affected by the Proposed Action and alternative under consideration are not designated 100 Year Floodplain Zones. (Hawai‘i National Flood Insurance Program, 2011).

Additionally, the Proposed Action is not located within the tsunami hazard zone identified by the Maui Civil Defense Agency.

a. Existing Conditions

The project site is located on the slopes of Mountain Haleakala at an elevation of approximately 5,500 to 6,300 feet above mean sea level. As indicated by the Flood Insurance Rate Map for the County of Maui, the project site is located within Zone X. Zone X is the flood insurance rate zone that corresponds to areas of minimal flooding or areas determined to be outside the 0.2 percent annual chance flood plain.

Additionally, the project is located inland and outside the tsunami inundation zone.

b. Potential Impacts and Mitigation Measures

Given the location of the project site within Flood Zone X and outside of the tsunami inundation zone, there are no anticipated adverse effects to the proposed project from flooding or tsunami related events.

6. Streams and Wetlands

Definition of Resource

Water resources is a broad term that encompasses surface water, groundwater, near-shore water, wetlands, and other sources of water that support a variety of human activities, plant and wildlife species, habitats, and ecosystems. Surface water resources typically include stormwater, lakes, streams, and rivers, while water located beneath the ground surface within soil pore spaces or the fractures of rock formations is known as groundwater. Near-shore water is generally considered the area extending seaward from the shoreline beyond the surf zone. A wetland is an area of land that is saturated with water either permanently or seasonally. Water within wetlands can be saltwater, freshwater, or brackish. Examples of wetlands include marshes and swamps. Services performed by wetlands include water purification, shoreline stability, and habitat for plant and wildlife species.

a. Existing Conditions

There are no streams or wetlands on the State-owned parcel that are within the vicinity of the proposed project.

b. Potential Impacts and Mitigation Measures

The project will utilize Best Management Practices (BMPs) to minimize soil erosion attributed to construction. Runoff will be managed so as not to affect downstream properties, resources, or any water resource systems. In this regard, the proposed project is not anticipated to affect stream and wetland conditions in the area.

7. Flora and Fauna

Definition of Resource

Biological resources include species of vegetation, wildlife, fisheries, and habitat. Biological resources discussed in this section include botanical, avian, or mammalian resources of special concern, particularly species listed under federal or state endangered species law. Also discussed are species considered sensitive, protected, or proposed for protection.

Affected Environment

The affected environment for biological resources described below is based on the biological resources survey report prepared for this EA unless otherwise noted (DLNR, March 2017). This report may be found in the appendixes.

a. Existing Conditions

A flora and fauna field survey of the Lower Waiohuli trail corridor was undertaken. The results of this study are documented in the report entitled "BIOLOGICAL ASSESSMENT – Botanical and Fauna Survey of the Lower Waiohuli Trail Re-alignment" which is incorporated in this EA document as Appendix "A".

Based on the trail routing, the project has the potential to affect two federal listed species – the endangered Hawaiian Hoary Bat, and the Hawaiian Nene Goose. As well, there are known to be in the overall project area critical habitat for the plants, *Argyroxiphium sandwicensis* spp. *Macrocephalum, Asplenium dielerectum, A.*

peruvianum var.*insular, Bidens micrantha* spp. *Kalealaha, Clermontia lindseyana, Cyanea horrida, C. obtuse, Cyrtandra ferripilosa, C. oxybapha, Diplazium molokaiense, Geranium arboretum, G. multiflora, Huperzia mannii, Melicope adscendens,* and *Neraudia servica.*

b. Potential Impacts and Mitigation Measures

The flora and fauna report by Star Environmental concludes that there are no endangered or threatened species of plant life and animal life which will be impacted by the project in the trail route. More particularly, there will be no adverse impacts to these resources as a result of the proposed action. In the unlikely event that endangered plants species are detected, relocation of the plants will occur supervised by DOFAW botanists/biologists. For the Hawaiian Nene Goose, work will stop immediately if a nest is discovered, and a buffer established with no disruptive activities in the buffer zone until goslings have fledged. If a Nene Goose appears during the project period in the work area, all work shall stop until the animal leaves on its own accord.

For the Hawaiian Hoary Bat, if detected, mitigations to reduce impact will include the fact that no woody plants taller than 15‘ high will be removed, trimmed or disturbed during the bat birthing and pup rearing season (June 1st to September 15th). As well, barbed wire will not be used for fencing.

8. Archaeological and Cultural Resources

Definition of Resource

Significant cultural resources are defined by the National Historic Preservation Act and Chapter 343 of the Hawai‘i Revised Statutes (HRS). According to the National Historic Preservation Act (NHPA), a historic resource is defined as, “any prehistoric or historic district, site, building, structure, or object included in, or eligible for inclusion in the National Register…” According to Chapter 343 of the HRS, cultural resources are defined as “cultural beliefs, practices, and resources of native Hawaiians and other ethnic groups.” Chapter 343 requires that the environmental assessment process account for cultural resources in determining the significance of impacts that could occur as a result of a proposed action.

a. Existing Conditions

An archaeological assessment of the project area was undertaken, together with associated archival investigations. See Appendix "B". A well, a Cultural Impact Assessment Report was conducted. See Appendix “C”.

b. Potential Impacts and Mitigation Measures

The archaeological assessment report by Dr. Chris Monohan explains that it is unlikely that the trail area was a major permanent settlement in the pre-contact era. Refer to Appendix "B". No surface cultural remains or historic surface features were identified. The report notes that modern era clearing and grading on the parcel associated with the development of the trail have likely disturbed any previously existing sites or surface deposits. There is mention of one potential cultural structure in the form of a natural cave, of which it was not determine if it had been used by humans. The report recommends the re-alignment avoid this area, which has been taken into consideration. Based on the foregoing, the report concludes that the proposed project will not have an adverse impact on any significant sites in the project area or nearby the project area. As such, no further archaeological work has been recommended. See Appendix(s) "B" and “C”.

9. Additional Cultural Resources

To better understand the relationship between the proposed action and cultural resources and practices in the immediate vicinity of the project site, an extensive consultation process with individuals who have knowledge of the area was undertaken by Dr. Chris Monahan. Refer to Appendix "C".

a. Existing Conditions

A Cultural Impact Assessment (CIA) was prepared for the project area. See Appendix "C". From a cultural context perspective, the CIA notes that the project area is situated on a rugged slope and unsuitable for wetland taro cultivation. Historically, a region such as this one would have been used for hunting, birding, and lumber on a limited basis due to high elevations.

b. Potential Impacts and Mitigation Measures

This process included oral interviews, via telephone interviews, and email correspondences. Based on results of the consultation process, it has been determined that the area of the proposed improvements have not been used for traditional cultural purposes within recent times. It is reasonably concluded, therefore, that the proposed actions will not affect the exercise of Native Hawaiian rights, or the rights of any other ethnic group, as it relates to gathering, access, or other customary activities.

10. Air Quality

Definition of Resource

Air quality is defined by the concentrations of specific pollutants of concern in the general outdoor atmosphere to which the public has access, with respect to the health and welfare of the general public. These pollutants are generated by many direct and indirect sources such as: Factories and power plants (stationary); automobiles, buses and planes (mobile); windblown dust and volcanic eruptions (natural), construction and site preparation (fugitive dust).

The United State Environmental Protection Agency (EPA) administers and enforces the Clean Air Act, a federal law that regulates air emissions from stationary and mobile sources. Passed by Congress in 1970, and later amended in 1977 and 1990, this law authorizes EPA to establish National Ambient Air Quality Standards (NAAQS) to protect public health and public welfare and to regulate emissions of hazardous, commonly occurring pollutants known as “criteria” pollutants. Thus far NAAQS have been set for six criteria pollutants (40 Code of Federal Regulations [CFR] 50): carbon monoxide (CO); nitrogen dioxides (NO2); ozone (O3) with nitrogen oxides [NOx] and volatile organic compounds [VOCs] as precursors; particulate matter (PM) PM10 – less than 10 microns in particle diameter and PM2.5 – less than 2.5 microns in particle diameter; lead (Pb); and sulfur dioxide (SO2). Two types of standards have been established. "Primary standards" set limits to protect public health, including the health of sensitive

populations such as asthmatics, children, and the elderly. "Secondary standards" set limits to protect public welfare which includes protection against decreased visibility, and damage to animals, crops, vegetation, and buildings. The EPA requires that states monitor the ambient air to determine attainment of the NAAQS and regulate industries that emit these and other pollutants.

In addition to NAAQS, the Hawai‘i DOH has established State ambient air quality standards (SAAQS) to further protect human health. SAAQS exist for the following pollutants: CO, NO2, O3, PM10, Pb, hydrogen sulfide (H2S), and SO2. Performance standards exist for volatile organic compounds (VOC) and total suspended particulates (TSP) within HAR and are controlled by permit.

a. Existing Conditions

Given the project area's location in a relatively remote and heavily vegetated area, it does not, in general, experience adverse air quality conditions. There are no point sources of airborne emissions within close proximity to the project site. Point sources in the Central Maui region include the Māalaea Power Plant, Puunēnē Sugar Mill, and the rock quarry at Puunēnē, all of which are well over five (5) miles from the project site.

A non-point source of pollution in the vicinity of the project site is vehicular exhaust from the Waipoli Access Road and other nearby roadways.
Emissions from these sources, however, are quickly dispersed by prevailing trade winds. Overall, Maui's air quality index is rated good, with 97 percent of days with good air quality and three (3) percent with moderate air quality (Scorecard, 2011).

b. Potential Impacts and Mitigation Measures

During construction, airborne particulates as a result of construction related activities may temporarily affect the ambient air quality within the immediate vicinity of the project site. Mitigation measures may include utilization of watering work areas to control dust, as well as other appropriate BMPs to ensure that fugitive dust from the

project area is minimized. By effectively employing these mitigation measures, construction-related activities are not anticipated to pose a significant impact to the air quality in the surrounding area.

11. Noise

Definition of Resource

Noise is defined by the EPA as "unwanted or disturbing sound", and in the HAR as "any sound that may produce adverse physiological or psychological effects or interfere with individual or group activities, including but not limited to communication, work, rest, recreation, or sleep".

While the typical human response to noise pollution is annoyance, Noise pollution can cause stress related illnesses (eg. high blood pressure, sleep disruption, and lost productivity) and potentially hearing loss, with prolonged exposure. The response of individuals to similar noise events is diverse and influenced by the type of noise; the perceived importance of the noise, and its appropriateness in the setting; the time of day and the type of activity during which the noise occurs; and the sensitivity of the individual. Most environmental noise includes a mixture of noise from distant sources that creates a relatively steady background noise in which no particular source is identifiable.

Sound is generally characterized by several variables, including frequency and intensity. Frequency describes the pitch of the sound and is measured in Hertz (Hz), while intensity describes the sound's loudness and is measured in decibels (dB). Normal speech has a sound level of approximately 60 dB. For the purpose of quantify sound for ordinance, sound level is usually expressed by reference to a known standard. Because the human ear is less sensitive to low audio frequencies, a table of octave values are added to the dB sound pressure level to make the A-weighted scale (dBA). The result is a standard scale relative to the loudness perceived by the human ear, which incorporates both sound intensity and frequency.

In 1970 under the CAA, the EPA established the Office of Noise Abatement and Control (ONAC) with the purpose of performing studies on noise and its effect on the public health and welfare. In 1972 Congress passed the Noise Control Act, followed by the Quiet Communities Act in 1978. By 1981 the EPA concluded that noise issues were best handled at the State and local level. The Hawai‘i DOH is the State administrator of noise control ordinance in Hawai‘i. The DOH has set maximum permissible sound levels (specified in HAR §11-46-4), which cannot be exceeded beyond the source's property line. These maximums vary based on zoning district, being the highest for industrially zoned parcels. These noise limits apply to "stationary noise sources; and equipment related to agricultural, construction, and industrial activities". "Construction equipment" means any device designed and intended for use in construction, including but not limited to any air compressor, pile driver, bulldozer, pneumatic hammer, steam shovel, derrick, crane, tractor, grader, loader, power saw, pump, pneumatic drill, compactor, on-site vehicle, and power hand tool (HAR §11-46-4(a)).

a. Existing Conditions

The predominant source of noise in the vicinity of the project site stems from traffic traveling along Waipoli Access Road. The lands adjacent to the trail parcel are State-owned lands and are used for recreational activities.

b. Potential Impacts and Mitigation Measures

Ambient noise conditions may be temporarily affected by construction related activities. Construction machinery and activities are anticipated to be the dominant noise-generating sources during the construction period. Mitigation measures for construction-related activities may include equipment mufflers or other noise attenuating equipment.

Construction activities are anticipated to occur during daylight hours, Monday through Friday, excluding holidays. The use of BMPs

for construction, combined with the area's remote location, will ensure that noise impacts associated with construction are appropriately mitigated. In the long term, the trail improvement will not create noise conditions different from those associated with current operations.

12. Scenic and Open Space Resources

Definition of Resource

Visual resources are public in nature and include views of a project to and from neighboring scenic resources. When evaluating scenic quality, both natural and manmade components of the existing visual environment should be collectively considered. These components may be evaluated in terms of whether each contributes or detracts to the overall scenic landscape character. In turn, this evaluation contributes to the assessment of scenic quality levels, which are established by evaluating the distinctiveness and diversity of a particular landscape setting. Public concern over adverse visual impacts is also an important part of the visual impact assessment process. Public concerns over the visual impacts associated with a project are often directly connected to the size and scale of a project. Additionally, the number and presence of people or activities nearby will further inform the level of concern for impacts to the existing scenic quality of the area. Visual impacts associated with a project can be evaluated in the following objective terms: form, line, color and texture. Such terms are used to measure the existing scenic quality and proposed scenic quality with the addition of the project. This methodology allows for an objective assessment of visual resources. The visibility of a project determines how the Project will be seen from particular viewing areas, which directly relates to the level of concern nearby viewers will have. In general, however, perception of details relating to form, line, color, and texture diminishes with increasing distance.

a. Existing Conditions

The project site's location, nestled against the slopes of Mountain Haleakala, provides picturesque views of the Pacific Ocean and the central region with both the West and East Maui mountains as a backdrop to the trail experience.

b. Potential Impacts and Mitigation Measures

The proposed project will not obstruct views from the trail or from Waipoli Access Road. As such, the proposed project will not adversely affect scenic resources.

13. Beach and Mountain Access
    a. Existing Conditions

The project site is an inland mountain site and not on the coastline. There is no direct connecting road to the ocean environments downslope.

b. Potential Impacts and Mitigation Measures

The proposed trail improvement projects are not anticipated to affect beach access conditions in the area. In addition, the proposed trail improvements are intended to improve access and use thereof to the Lower Waiohuli Trail for hikers and other recreational users.

Socio-Economic Environment

Socioeconomic resources refer to the social and economic qualities of the human environment, such as demographic characteristics, employment and income-generating activities, and the ways in which people live, relate to one another, organize to meet their needs, and engage in leisurely activities.

1. Population

a. Existing Conditions

The population of the County of Maui has exhibited relatively strong growth over the past decade. The County's resident population grew by 20.9 percent between 2000 and 2010, compared to a 12.3 percent increase in the State of Hawaiʻi as a whole during the same time period. Maui County's population increased from 128,094 residents in 2000 to 154,834 residents in 2010. Population on the island of Maui exhibited even stronger growth than the County as a whole, with a 22.8 percent population increase over the decade.

Approximately 144,444 residents lived on the island of Maui in 2010 (U.S. Census Bureau, 2000 and 2010).

Maui County's resident population is projected to rise to 174,450 people in 2020 and to 199,550 people in 2030 (SMS, 2006). The proposed project is located on the upper slopes of the central region of Maui, within the Makawao/Pukalani/Kula Community Plan region. Just as Maui County and Maui Island's populations have grown, the resident population of the Central Maui region has also increased. The estimated population of the Wailuku-Kahului region in 2000 was 41,503 (SMS, June 2006), which comprised 35.3 percent of the island's population. In 2010, the region's population stood at approximately 54,400 residents, a 31.2 percent increase over 10 years (U.S. Census Bureau, 2010). The population of the Wailuku-Kahului region is projected to increase to 60,877 people in 2020 and to 71,223 people in 2030 (SMS, June 2006). The Kula region appears to have a growth pattern as well with many new home construction sites in the Upcountry region.

b. Potential Impacts and Mitigation Measures

The proposed trail improvements are intended to provide upgraded trail structure and enhanced safety factors for hiking and bicycle use. The improvements are not considered a population generator. Accordingly, the proposed actions will
not affect the island's population outside of providing additional recreational resources for the new populations.

2. Economy

a. Existing Conditions

The Wailuku region is Maui County's center of governmental activity. Along with neighboring Kahului, the region encompasses a broad range of commercial, service, and public sector activities. In addition, the region is surrounded by approximately 32,000 acres of vacant sugar cane lands. This vast expanse of agricultural land is managed by Hawai‘ian Commercial & Sugar Company (HC&S), and was a key contributor to the local economy, though HC&S recently

closed sugar harvesting activities and replacement revenue has not been identified.

Non-seasonally-adjusted unemployment rates for both Maui County and the Island of Maui in December 2014 were 3.8 percent and 3.6 percent, respectively. These rates both decreased from the December 2013 unemployment rates of 4.7 percent and 4.5 percent (Department of Labor and Industrial Relations, March 2015).

b. Potential Impacts and Mitigation Measures

In the short term, the proposed project will provide construction-related revenue and employment. Accordingly, the project will have a beneficial impact on the local economy during the construction phase.

In the long term, the proposed actions are not anticipated to have a significant impact on the economy of Maui County.

Public services

1. Police and Fire Protection

a. Existing Conditions

Police protection for the Kula region is provided by the Maui County Police Department. The region is served by the Department's Central Maui station, which is divided into three (3) sectors. Each sector is divided into three (3) beats, each patrolled by a single officer.

Fire prevention, suppression, and protection services for the upcountry regions are provided by the County Department of Fire and Public Safety's Kula station. The region is also served by the Department's Makawao station.

b. Potential and Impacts and Mitigation Measures

The proposed projects will not affect the service area limits or personnel for police and fire protection.

2. Medical Services

a. Existing Conditions

The island's major medical facility is Maui Memorial Medical Center, midway between Wailuku and Kahului. Acute, general, and emergency care services are provided at the facility.

b. Potential Impacts and Mitigation Measures

The proposed projects will not affect requirements for medical services. As with police and fire protection services, service area limits for medical emergency responders will not be affected by the proposed project.

3. Solid Waste

a. Existing Conditions

Single-family residential solid waste collection service is provided by the County of Maui. Residential solid waste collected by County crews is disposed at the County's Central Maui Landfill, located four (4) miles southeast of the Kahului Airport. Commercial waste from private collection companies is also disposed at the Central Maui Landfill. A County-operated green waste recycling facility is also located at the Central Maui Landfill.

Maui Demolition and Construction Landfill, a privately owned facility, accepts solid waste and concrete from demolition and construction activities. This facility is located at Māalaea, near Honoapiʻilani Highway's junction with North Kīhei Road and Kūihelani Highway.

b. Potential Impacts and Mitigation Measures

Construction waste which may be generated from implementation of the project will be recycled or disposed at an appropriate construction waste disposal location following trail guidelines of "carry in, carry out". After project construction, the proposed actions will not result in the generation of additional solid waste. With these solid waste management measures, the contribution of construction waste to landfills will be minimized. Thus, the proposed actions are not anticipated to adversely affect capacity parameters of the County's solid waste system.

4. Recreational Resources
    a. Existing Conditions
        The Lower Waiohuli Trail itself is considered a recreational opportunity, as various open land recreation activities such as hiking and hunting are carried out on this trail and nearby regions.

    b. Potential Impacts and Mitigation Measures
        The proposed projects are not anticipated to adversely impact the trails' existing recreational purposes, nor will it adversely affect use of the Lower Waiohuli Trail or other recreational facilities /opportunities in Upcountry Maui. Allowing bicycles to use the Lower Waiohuli Trail with the connection to the Upper Waiohuli Trail increases recreational activities in the area.

5. Schools
    a. Existing Conditions
        The Upcountry region is served by the State Department of Education's (DOE) public school system and by several privately operated schools. The University of Hawai‘i - Maui College, located in Kahului, serves as the island's primary higher education institution.

    b. Potential Impacts and Mitigation Measures
        The proposed projects are not anticipated to impact school enrollments or facility requirements.

Infrastructure

Infrastructure is the basic structure of the affected environment, including utilities, transportation facilities, drinking water, and wastewater systems.

1. Roadways
    a. Existing Conditions
        The project site is located downslope of the Waipoli Access Road to the Polipoli State Park, Maui, Hawai‘i. The project area is upslope of Keokea, with Waipoli Road marking the mauka (upslope) boundary and the Kula Forest Reserve boundary marking the makai (downslope) boundary.

b. Potential Impacts and Mitigation Measures

There will be a short-term increase in traffic along Waipoli Access Road associated with construction workers and equipment entering and leaving the project site. Parking for construction workers will be on-site at the top of trail parking location to minimize additional traffic impacts. There are no anticipated long-term traffic impacts resulting from the proposed action. No adverse impacts to traffic are anticipated as a result.

2. Water

a. Existing Conditions

Water to the region is provided by the Maui County, Department of Water Supply (DWS) Central Maui. The trail itself has no water facilities.

b. Potential Impacts and Mitigation Measures

The trail does not require domestic water service.

In this regard, appropriate construction mitigation measures will be implemented to ensure the protection of the underlying aquifer. Such measures may include, as applicable, management of hazardous onsite materials to ensure proper security and handling, and the proper maintenance of construction vehicles and stationary equipment to ensure that there is no leakage of fuel and other petroleum-based fluids.

3. Wastewater

a. Existing Conditions

Wastewater from the region is treated at the Wailuku Kahului Wastewater Reclamation Facility (WKWWRF). There are no existing County sewer system facilities at the work site.

b. Potential Impacts and Mitigation Measures

The proposed trail improvements will not require wastewater connections or service. In this regard, there will be no impacts to County collection, transmission and treatment systems.

4. Drainage
    a. Existing Conditions
        The proposed project site has no drainageways at the site. Runoff currently sheet flows through the site and percolates into nearby soils.

    b. Potential Impacts and Mitigation Measures
        The increase in runoff resulting from the proposed trail improvements will be mitigated by drainage improvements outlines earlier such as rolling dips. The BMPs will collect runoff and implement control of the outflow of runoff. As such, there are no anticipated adverse effects on adjacent or downstream properties as a result of this project.

5. Energy and Communication Systems
    a. Existing Conditions
        There are no electrical or telephone utilities provided to the trail.

    b. Potential Impacts and Mitigation Measures
        While the majority of construction-related activities utilize hand or battery-powered operated construction equipment, there may be short-term electrical energy needs while the project is in construction. After construction is completed, all equipment will be removed and energy consumption will be reduced again to non-generation. The proposed actions are not expected to have any long-term adverse effects on the energy and communication systems in the area.

Cumulative and Secondary Impacts

Cumulative effects are defined by Title 11, Chapter 200, Hawai‘i Administrative Rules (HAR), Environmental Impact Statement Rules as impact of an action when added to other past, present, and reasonably foreseeable future actions regardless of what agency or person undertakes such other actions.

Cumulative impacts can result from individually minor but collectively “significant actions taking place over a period of time".

A "secondary impact" or "indirect effect" from the proposed action is defined by Title 11, Chapter 200, HAR, as "effects which are caused by the action and are later in time or farther removed in distance, but are still reasonably foreseeable. "

As mentioned previously, the proposed trail improvements are intended to enhance the existing trail system and add safety and environmental improvement factors. In this regard, the proposed trail improvements are not anticipated to cumulatively have a negative effect on the environment.

In addition, there are no reasonably foreseeable effects associated with the proposed action(s) which would be deemed a secondary impact.

Lower Waiohuli Trail Improvements – Relationship to Land Use Plans, Policies, and Controls

A. STATE LAND USE DISTRICTS

Pursuant to Chapter 205, Hawai‘i Revised Statutes (HRS), all lands in the State have been placed into one (1) of four (4) land use districts by the State Land Use Commission.

These land use districts have been designated "Urban", "Rural", "Agricultural", and "Conservation". The project site is classified "Agricultural" and “Conservation” with a Land Study Bureau soil classification of "D" and "E", which allows for open land recreational facilities.

B. CHAPTER 226, HRS, HAWAI‘I STATE PLAN

Chapter 226, HRS, also known as the Hawai‘i State Plan, is a long-range comprehensive plan which serves as a guide for the future long-range development of the State by identifying goals, objectives, policies, and priorities, as well as implementation mechanisms. The proposed action is consistent with the following goals of the Hawai‘i State Plan:

- A desired physical environment, characterized by beauty,

cleanliness, quiet, stable natural systems, and uniqueness, that enhances the mental and physical well-being of the people.

- Physical, social, and economic well-being, for individuals and families in Hawai‘i, that nourishes a sense of community responsibility, of caring, and of participation in community life.

1. Objectives and Policies of the Hawai‘i State Plan

The proposed action is consistent with the following objectives and policies of the Hawai‘i State Plan:

- Chapter 226-11, HRS, Objectives and Policies for the Physical Environment Land-Based, Shoreline, and Marine Resources.
- 226-11(b)(1), HRS: Exercise an overall conservation ethic in use of Hawai‘i's natural resources.
- 226-11(b)(3), HRS: Take into account the physical attributes of areas when planning and designing activities and facilities.
- 226-11(b)(4), HRS: Manage natural resources and environs to encourage their beneficial and multiple use without generating costly or irreparable environmental damage.
- 226-11(b)(8), HRS: Pursue compatible relationships among activities, facilities, and natural resources.
- 226-11(b)(9), HRS: Promote increased accessibility and prudent use of inland and shoreline areas for public recreational, educational, and scientific purposes.
    - Chapter 226-12, HRS, Objectives and Policies for the Physical Environment - Scenic, Natural Beauty, and Historic Resources.
- 226-12(b)(3), HRS: Promote the preservation of views and vistas to enhance the visual and aesthetic enjoyment of mountains, ocean, scenic landscapes, and other natural features.
- 226-12(b)(S), HRS: Encourage the design of developments and activities that complement the natural beauty of the islands.
- Chapter 226-23, HRS, Objectives and Policies for Socio-Cultural Advancement - Leisure.

- 226-23(b)(I), HRS Foster and preserve Hawai‘i's multi-cultural heritage through supportive cultural, artistic, recreational, and humanities-oriented programs and activities.
- 226-23(b)(2), HRS: Promote a wide range of activities and facilities to fulfill the cultural, artistic, and recreational needs of all diverse and special groups effectively and efficiently.
- 226-23(b)(3), HRS: Enhance the enjoyment of recreational experiences through safety and security measures, educational opportunities, and improved facility design and maintenance.
- 226-23(b)(4), HRS: Promote the recreational and educational potential of natural resources having scenic, open space, cultural, historical, geological, or biological values while ensuring that their inherent values are preserved.
- 226-23(b)(5), HRS: Ensure opportunities for everyone to use and enjoy Hawai‘i's recreational resources.
- 226-23(b)(10), HRS: Assure adequate access to significant natural and cultural resources in public ownership.

C. GENERAL PLAN OF THE COUNTY OF MAUI

As indicated by the Maui County Charter, the purpose of the general plan shall be to: ... indicate the desired population and physical development patterns for each island and region within the county; shall address the unique problems and needs of each island and region; shall explain opportunities and the social, economic, and environmental consequences related to potential developments; and shall set forth the desired sequence, patterns and characteristics of future developments. The general plan shall identify objectives to be achieved, and priorities, policies, and implementing actions to be pursued with respect to population density; land use maps, land use regulations, transportation systems, public and community facility locations, water and sewage systems, visitor destinations, urban design, and other matters related to development.

Chapter 2.80B of the Maui County Code, relating to the General Plan and Community Plans, implements the foregoing Charter provision through enabling legislation which calls for a Countywide Policy Plan and a Maui Island Plan (MIP). The Countywide Policy Plan was adopted as Ordinance No. 3732 on March 24, 2010, while the Maui Island Plan, which delineates areas for future urban and rural growth as part of a Directed Growth Strategy, was adopted as Ordinance No. 4004 on December 21, 2012.

The following sections identify pertinent objectives, policies, implementing actions and related provisions set forth in the Countywide Policy Plan and the Maui Island Plan. It is recognized that both documents are comprehensive in nature and address a number of functional planning areas which apply to all programs, plans, and projects. However, for purposes of addressing General Plan compliance requirements, policy considerations which are deemed most relevant in terms of compatibility and consistency are addressed in this report section.

1. Countywide Policy Plan

With regard to the Countywide Policy Plan, Section 2.80B.030 of the Maui County Code states the following.

The countywide policy plan shall provide broad policies and objectives which portray the desired direction of the County's future. The countywide policy plan shall include:

1. A vision for the County;
2. A statement of core themes or principles for the County; and
3. A list of countywide objectives and policies for population, land use, the environment, the economy, and housing.

Core principles set forth in the Countywide Policy Plan are listed as follows:

1. Excellence in the stewardship of the natural environment and cultural resources;
2. Compassion for and understanding of others;
3. Respect for diversity;
4. Engagement and empowerment of Maui County residents;
5. Honor for all cultural traditions and histories;
6. Consideration of the contributions of past generations as well as the needs of future generations;
7. Commitment to self-sufficiency;

8. Wisdom and balance in decision making;
9. Thoughtful, island appropriate innovation; and
10. Nurturance of the health and well-being of our families and our communities.

Congruent with these core principles, the Countywide Policy Plan identifies goals objectives, policies and implementing actions for pertinent functional planning categories, which are identified as follows:

1. Natural environment
2. Local cultures and traditions
3. Education
4. Social and healthcare services
5. Housing opportunities for residents
6. Local economy
7. Parks and public facilities
8. Transportation options
9. Physical infrastructure
10. Sustainable land use and growth management
11. Good governance

With respect to the proposed actions, the following goals, objectives, policies and implementing actions are illustrative of the project's compliance with the Countywide Policy Plan.

PROTECT THE NATURAL ENVIRONMENT
Goal: Maui County's natural environment and distinctive open spaces will be preserved, managed and cared for in perpetuity.

- Objective 1: Improve the opportunity to experience the natural beauty and native biodiversity of the islands for present and future generations.
    - Policy: Preserve and provide ongoing care for important scenic vistas, view planes, landscapes, and open-space resources.

- Objective 2: Improve the quality of environmentally sensitive, locally valued natural resources and native ecology of each island.

        - Policy: Improve the connection between urban environments and the natural landscape, and incorporate natural features of the land into urban design.
    - Objective 3: Improve the stewardship of the natural environment.
        - Policies:
            - a. Preserve and protect natural resources with significant scenic, economic, cultural, environmental, or recreational value.
            - b. Improve enforcement activities relating to the natural environment.

IMPROVE PARKS AND PUBLIC FACILITIES
Goal: A full range of island-appropriate public facilities and recreational opportunities will be provided to improve the quality of life for residents and visitors.

- Objective 1: Expand access to recreational opportunities and community facilities to meet the present and future needs of residents of all ages and physical abilities.
    - Policies:
        - a. Protect, enhance, and expand access to public shoreline and mountain resources.
        - b. Promote the development and enhancement of community centers, civic spaces, and gathering places throughout our communities.
- Objective 2: Improve the quality and adequacy of community facilities.
    - Policies:
        - c. Ensure that parks and public facilities are safe and adequately equipped for the needs of all ages and physical abilities to the extent reasonable.
        - d. Maintain, enhance, expand, and provide new active and passive recreational facilities in ways that preserve the natural beauty of their locations.
- Objective 3: Enhance the funding, management, and planning of public facilities and park lands.
    - Policy: Develop partnerships to ensure proper

2. Maui Island Plan

The MIP is applicable to the island of Maui only, providing more specific policy based strategies for population, land use, transportation, public and community facilities, water and sewage systems, visitor destinations, urban design, and other matters related to future growth.

As provided by Chapter 2.80B, the MIP shall include the following components:

1. An island-wide land use strategy, including a managed and directed growth plan.
2. A water element addressing supply, demand and quality parameters.
3. A nearshore ecosystem element addressing nearshore waters and requirements for preservation and restoration.
4. An implementation program which addresses the County's 20 - year capital improvement requirements, financial program for implementation, and action implementation schedule.
5. Milestone indicators designed to measure implementation progress of the MIP.

It is noted that Ordinance No. 4004 does not address the component relating to the implementation program. Chapter 2.80B of the Maui County Code, relating to the General Plan, was amended via Ordinance No. 3979 on October 5, 2012, to provide that the implementation program component be adopted no later than one (1) year following the effective date of Ordinance No. 4004. In December 2013 and March 2014, the Maui County Council approved the extensions for approval and adoption of the implementation chapter. At its meeting of May 27, 2014, the Council approved the MIP's implementation component.

The MIP addresses a number of planning categories with detailed policy analysis and recommendations which are framed in terms of goals, objectives, policies, and implementing actions.

These planning categories address the following areas:

1. Population

2. Heritage Resources
3. Natural Hazards
4. Economic Development
5. Housing
6. Infrastructure and Public Facilities
7. Land Use

Additionally, an essential element of the MIP is its directed growth plan which provides a management framework for future growth in a manner that is fiscally, environmentally, and culturally prudent. Among the directed growth management tools developed through the MIP process are maps delineating urban growth boundaries (UGB), small town boundaries (SRB) and rural growth boundaries (RGB). The respective boundaries identify areas appropriate for growth and their corresponding intent with respect to development character.

The proposed actions are located on Agricultural and Conservation lands and are not within a growth boundary area. In addition, the proposed trail improvements, and have been reviewed with respect to pertinent goals, objectives, policies and implementing actions of the MIP. A summary of these policy statements are provided below:

Heritage Resources-Scenic Resources

Goal: 2.5 Maui will continue to be a beautiful island steeped in coastal, mountain, open space, and historically significant views that are preserved to enrich the residents' quality of life, attract visitors, provide a connection to the past, and promote a sense of place.

Objective:

2.5.1 a: greater level of protection for scenic resources.

Policy:

2.S.1.b: Identify, preserve, and provide ongoing management of important scenic vistas and open space resources, including mauka-to-makai and makai-to-mauka view planes.

Infrastructure and Public Facilities-Parks

Goal: 6.6 Maui will have a diverse range of active and passive recreational parks, wilderness areas, and other natural-resource areas linked, where feasible, by a network of greenways, bikeways, pathways, and roads that are accessible to all.

Objective:

6.6.1 more effective, long-range planning of parks and recreation programs able to meet community needs.

Infrastructure and Public Facilities-Water

Goal: 6.3 Maui will have an environmentally sustainable, reliable, safe, and efficient water system.

Objective:

6.3.2 Increase the efficiency and capacity of the water systems in striving to meet the needs and balance the island's water needs.

Policies:

6.3.2.a Ensure the efficiency of all water system elements including well and stream intakes, water catchment, transmission lines, reservoirs, and all other system infrastructure.

In summary, the proposed action is consistent with the above-noted themes and principles of the Countywide Policy Plan and Maui Island Plan.

D. MAKAWAO/PUKALANI/KULA COMMUNITY PLAN

The project site is located within the Makawao-Pukalani-Kula Community Plan region, one (1) of nine (9) community plan regions established in the County of Maui. Planning for each region is guided by the respective community plan, which is designed to implement the Maui County General Plan. Each community plan contains recommendations and standards which guide the sequencing, patterns and characteristics of future development in the region.

The Makawao/Pukalani/Kula Community Plan was adopted by the County of Maui and was updated in 1996. Land use guidelines are set forth by the Makawao/Pukalani/Kula Community Plan Land Use Map. The project area is

designated within the Agriculture and Conservation land use categories by the Makawao/Pukalani/Kula Community Plan Map.

The Agriculture category is defined as including uses indicative of areas for agricultural activity which would be in keeping with the economic base of the County and the requirements and procedures of Chapter 205, HRS, as amended. The proposed actions are consistent with the following goals, objectives, and policies of the Makawao/Pukalani/Kula Community Plan.

ENVIRONMENT

Goal: A clean and attractive physical and natural environment in which manmade developments or alterations to the natural environment relate to sound environmental and ecological practices, and important scenic and open space resources are maintained for public use and enjoyment.

Objective and Policy: Preserve agricultural lands as a major element of the open space setting which borders the various communities within the planning region. The close relationship between open space and developed areas is an important characteristic of community form.

CULTURAL RESOURCES

Goal: Identification, protection, preservation, enhancement, and where appropriate, use of cultural practices and sites, historic sites and structures, and cultural landscapes and view planes that:

1. Provide a sense of history and define a sense of place for the Upcountry region.

Objectives and Policies:

1. Recognize the importance of historically and archaeologically sensitive sites and encourage their preservation through development project review.
2. Require development projects to identify all cultural resources located within the project area as part of initial project studies. Further, require that all proposed activity include recommendations to mitigate potential adverse impacts on cultural resources.

E. COUNTY ZONING

1. County Special Use Permit Requirement

The project site is designated "Agricultural" and “Conservation” according to Maui County zoning. The purpose of this category is to provide areas for agricultural activity and conservation venues which would be in keeping with the economic base of the County and the requirements and procedures of Chapter 205, Hawai‘i Revised Statutes, as amended. In a phone conversation with the County of Maui, Department of Planning on 8/3/2016 for the Waihe‘e Ridge Trail EA, they responded to a question from the consultant regarding allowable uses within Agricultural and Conservation lands. The Department of Planning cited Chapter 205- 2.d.12 as regulating conservation and agricultural land with an soil classification of C, D, E, and/or U and allowing for open area recreational facilities. This would apply to the Lower Waiohuli Trail as well.

Because the project site has a soil classification of E, open area recreational facilities are deemed an allowable use. Similarly, the Maui County Code (MCC) Section 19.30A.050.B.ll also allows for open land recreation.

"Open Land Recreation" is defined in Section 19.04.040, MCC, as:

> " .. . public or private recreational use or enjoyment, including, but not limited to, parks, picnic grounds, beaches, beach accesses, greenways and **areas for hiking**, fishing, hunting, camping, equestrian activities, and other scenic interests, on a parcel or area of land or water which may be improved but which contains no buildings and which is set, aside, designated, or reserved for such purposes”.

The Department of Planning opinioned that the Nā Ala Hele trail improvements are a permitted use under the Chapter 205, HRS, and a non-conforming use under the Maui County Code, Chapter 19.30A. As such, no County Special Use Permit will be required for the trail improvements since no buildings are proposed.

The underlying land use designations for Parcel are as follows:

- State Land Use Classification: Agricultural/Conservation
- Makawao/Pukalani/Kula Community Plan: Agricultural/Conservation
- County Zoning: Agricultural/Conservation

The trail is considered a permitted use under Chapter 205, HRS, as well as MCC 19.30A as open area recreation and the improvements are considered an ancillary use.

F. COASTAL ZONE MANAGEMENT OBJECTIVES AND POLICIES

Pursuant to Chapter 20S-A, Hawai‘i Revised Statutes, projects should be evaluated with respect to Coastal Zone Management (CZM) objectives, policies and guidelines. The project site is approximately three (3) miles away from the coastline and will not involve work within the County of Maui's Special Management Area (SMA). However, coastal zone management considerations have been reviewed and assessed.

1. Recreational Resources

Objective: Provide coastal recreational opportunities accessible to the public.

a. Improve coordination and funding of coastal recreational planning and management; and

b. Provide adequate, accessible, and diverse recreational opportunities in the coastal zone management area by:

i. Protecting coastal resources uniquely suited for recreational activities that cannot be provided in other areas;

ii. Requiring replacement of coastal resources having significant recreational value, including but not limited to surfing sites, fishponds, and sand beaches, when such resources will be unavoidably damaged by development; or requiring reasonable monetary compensation to the state for recreation when replacement is not feasible or desirable;

iii. Providing and managing adequate public access consistent with conservation of natural

resources, to and along shorelines with recreational value;
iv. Providing an adequate supply of shoreline parks and other recreational facilities suitable for public recreation;
v. Ensuring public recreational use of county, state, and federally owned or controlled shoreline lands and waters having recreational value consistent with public safety standards and conservation of natural resources;
vi. Adopting water quality standards and regulating point and non-point sources of pollution to protect, and where feasible, restore the recreational value of coastal waters;
vii. Developing new shoreline recreational opportunities, where appropriate, such as artificial lagoons, artificial beaches, and artificial reefs for surfing and fishing; and
viii. Encouraging reasonable dedication of shoreline areas with recreational value for public use as part of discretionary approvals or permits by the land use commission, board of land and natural resources, county planning commissions; and crediting such dedication against the requirements of Section 46-6, HRS

Response: The project site is located inland, approximately three (3) miles from the coastline. Based on the limited scope of the project, there are no anticipated impacts on coastal recreational opportunities or existing public access to the shoreline.

2. Historic Resources
Objective: Protect, preserve and, where desirable, restore those natural and manmade historic and prehistoric resources in the coastal zone management area that are significant in Hawaiian and American history and culture.

Policies:

a. Identify and analyze significant archeological resources;
b. Maximize information retention through preservation of remains and artifacts or salvage operations,' and
c. Support state goals for protection, restoration, interpretation, and display of historic resources.

Response: A Cultural Impact Assessment (CIA) and an Archaeological Review have been completed for the project. The Cultural Impact Assessment reported that the project area has not been used for traditional cultural purposes within recent times. Similarly, the Archaeological Review concluded that no definitive surface cultural remains or historic surface features were identified. As such, the proposed project is not anticipated to have an adverse effect on any cultural or customary traditions, or on any significant historic properties.

3. Scenic and Open Space Resources
Objective: Protect, preserve and, where desirable, restore or improve the quality of coastal scenic and open space resources.

Policies:

a. Identify valued scenic resources in the coastal zone management area,'
b. Ensure that new developments are compatible with their visual environment by designing and locating such developments to minimize the alteration of natural landforms and existing public views to and along the shoreline,'
c. Preserve, maintain, and, where desirable, improve and restore shoreline open space and scenic resources,' and
d. Encourage those developments which are not coastal dependent to locate in inland areas.

Response: The project site itself is afforded scenic ocean, mountain, and open-space views. The Lower Waiohuli Trail is surrounded by heavy vegetation which limits its visibility from Waipoli Access Road. The Lower Waiohuli Trail also offers the hikers panoramic views of the Central Maui region, Kihei/Wailea

and West Maui Mountains. The trail improvement elements of the project will not have an adverse effect on scenic and open space resources.

4. Coastal Ecosystems
Objective: Protect valuable coastal ecosystems, including reefs, from disruption and minimize adverse impacts on all coastal ecosystems.

Policies:

a. Improve the technical basis for natural resource management;
b. Preserve valuable coastal ecosystems, including reefs, of significant biological or economic importance;
c. Minimize disruption or degradation of coastal water ecosystems by effective regulation of stream diversions, channelization, and similar land and water uses, recognizing competing water needs; and
d. Promote water quantity and quality planning and management practices which reflect the tolerance of fresh water and marine ecosystems and prohibit land and water uses which violate state water quality standards.

Response: The proposed project involves minimal grading to accommodate the trail improvements. Best Management Practices (BMPs) will be implemented during construction to mitigate potential erosion-related impacts.

5. Economic Uses
Objective: Provide public or private facilities and improvements important to the State's economy in suitable locations.
Policies:

a. Concentrate coastal dependent development in appropriate areas;
b. Ensure that coastal dependent development such as harbors and ports, and coastal related development such as visitor facilities and energy generating facilities, are located, designed, and constructed to minimize adverse social, visual,

and environmental impacts in the coastal zone management area,' and

c. Direct the location and expansion of coastal dependent developments to areas presently designated and used for such developments and permit reasonable long-term growth at such areas, and permit coastal dependent development outside of presently designated areas when:

i. Use of presently designated locations is not feasible,

ii. Adverse environmental effects are minimized, and

iii. The development is important to the State's economy.

Response: The proposed improvements will generate short-term construction related employment and spending which will benefit the local economy. The proposed actions do not contradict the objectives and policies for economic uses.

6. Coastal Hazards

Objective: Reduce hazard to life and property from tsunami, storm waves, stream flooding, erosion, subsidence and pollution.

Policies:

a. Develop and communicate adequate information about storm wave, tsunami, flood, erosion, subsidence, and point and nonpoint source pollution hazards,

b. Control development in areas subject to storm wave, tsunami, flood, erosion, hurricane, wind, subsidence, and point and nonpoint pollution hazards,

c. Ensure that developments comply with requirements of the Federal Flood Insurance Program,

d. Prevent coastal flooding from inland projects, and

e. Develop a coastal point and nonpoint source pollution control program.

Response: The project site falls within Zone X, an area of minimal flooding, as indicated by the Flood Insurance Rate Map for the

County of Maui. BMPs will be implemented during construction to mitigate potential erosion and stormwater impacts.

7. Managing Development
Objective: Improve the development review process, communication, and public participation in the management of coastal resources and hazards.

a. Use, implement, and enforce existing law effectively to the maximum extent possible in managing present and future coastal zone development,
b. Facilitate timely processing of applications for development permits and resolve overlapping of conflicting permit requirements, and
c. Communicate the potential short and long-term impacts of proposed significant coastal developments early in their life-cycle and in terms understandable to the public to facilitate public participation in the planning and review process.

Response: The Chapter 343, HRS EA involves review by governmental agencies and provides for public comment opportunity on the project. Applicable State and County requirements will be adhered to in the design and construction of the project.

8. Public Participation
Objective: Stimulate public awareness, education, and participation in coastal management.

Policies:

a. Maintain a public advisory body to identify coastal management problems and to provide policy advice and assistance to the coastal zone management program;
b. Disseminate information on coastal management issues by means of' educational materials, published reports, staff contact, and public workshops for persons and organizations concerned with coastal-related issues, developments, and government activities; and
c. Organize workshops, policy dialogues, and site-specific mediations to respond to coastal issues and conflicts.

Response: The project will meet County public awareness, education and participation objectives. Opportunities for agency and public review will be provided as part of the notification, review and comment process required for the EA.

9. Beach Protection
Objective: Protect beaches for public use and recreation.
Policies:

a. Locate new structures inland from the shoreline setback to conserve open space and to minimize loss of improvements due to erosion;
b. Prohibit construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities; and
c. Minimize the construction of public erosion-protection structures seaward of the shoreline.

Response: The Lower Waiohuli Trail is located inland, away from the shoreline. As a result, there are no anticipated adverse impacts on beach resources.

10. Marine Resources
Objective: Implement the State's ocean resources management plan.

Policies:

a. Exercise an overall conservation ethic, and practice stewardship in the protection, use, and development of marine and coastal resources;
b. Assure that the use and development of marine and coastal resources are ecologically and environmentally sound and economically beneficial;

c. Coordinate the management of marine and coastal resources and activities management to improve effectiveness and efficiency;
d. Assert and articulate the interests of the State as a partner with federal agencies in the sound management of ocean resources within the United States exclusive economic zone;
e. Promote research, study, and understanding of ocean processes, marine life, and other ocean resources in order to acquire and inventory information necessary to understand how ocean development activities relate to and impact upon ocean and coastal resources; and
f. Encourage research and development of new, innovative technologies for exploring, using, or protecting marine and coastal resources.

Response: As previously stated, the project site is located inland and away from the ocean. Adverse impacts on marine and coastal resources are not anticipated from the proposed trail improvements.

IV. UNAVOIDABLE ADVERSE ENVIRONMENTAL EFFECTS AND IRREVERSIBLE AND IRRETRIVEABLE COMMITMENT OF RESOURCES

In the short term, the proposed trail improvements project will result in unavoidable construction-related impacts, including light noise impacts generated by construction equipment and activities. In addition, there may be temporary air quality impacts associated with dust generated from site work and exhaust emissions from construction material delivery equipment and vehicles. These noise and air quality impacts will be temporary in nature, occurring only during the construction period, and will be mitigated to the extent practicable through implementation of Best Management Practices (BMPs).

The proposed actions commit a defined area of land for improvements which is already in use for similar activities. Other resources which will be committed in the

implementation of the proposed actions include material and fuel resources. The projects will result in short-term beneficial impacts related to temporary construction employment and spending.

V. ALTERNATIVES TO THE PROPOSED ACTION

Alternatives to the preferred alternative, which is the proposed action, include the "no action" alternative.

A. NO ACTION ALTERNATIVE
As a hiking trail on Maui, the Lower Waiohuli Trail is hiked and utilized as part of the Nā Ala Hele trail system in the Kula Forest Reserve. As such, the trail is exhibiting signs of its usage, including but not limited to surface damage, drainage failures, over-vegetation and other factors which pose impact to hiking safety and the environment.

A no action alternative would deny the Division of Forestry and Wildlife the opportunity to Improve the trail for hikers and other users. Similarly, continued use of the trail in its current state represents potential future safety hazards for users of the trail and an economic and liability burden for the County and State.

VI. SIGNIFICANCE CRITERIA ASSESSMENT

The proposed actions involve improvements to the Lower Waiohuli Trail on the State-owned parcel in Waiohulu, Maui, Hawai‘i. Since the proposed actions will involve the use of Federal funds with improvements and re-alignments undertaken on State lands, compliance with Chapter 343, Hawai‘i Revised Statutes (HRS), and Chapter 200 (Title 11), Hawai‘i Administrative Rules, Environmental Impact Statement Rules is necessary. Every aspect of the proposed action, expected primary and secondary consequences, and the cumulative as well as the short-term and long-term effects of the action have been evaluated in accordance with the Significance Criteria of Section 11-200-12 of the Administrative Rules. Discussion of project
conformance to the Significance Criteria follows:

1. <u>Involves all irrevocable commitment to loss or destruction of any natural or cultural resource.</u>

The remote, densely vegetated nature and general topography of the trail

results in an area conducive to recreational activities. There are no adverse effects to natural resources anticipated as a result of the project.

Similarly, the mountainous nature of the region provides for a unique and scenic trail experience for hikers who travel from outside the Upcountry region to utilize the trail.

As discussed previously in Chapter II, a Cultural Impact Assessment and Archaeological Review has been completed for the proposed project and may be found in the appendixes.

The Cultural Impact Assessment reported that the project area has not been used for traditional cultural purposes within recent times. Similarly, the Archaeological Review concluded that no definitive surface cultural remains or historic surface features were identified. As such, the proposed project is not anticipated to have an adverse effect on any cultural or customary traditions, or on any significant historic properties.

2. Curtails the range of beneficial uses of the environment.

The proposed actions involve lands designated as "Agricultural" and “Conservation” at the State and County levels. As the site contains soils with relatively low productivity ratings, the lands have not been used for agricultural production.

The proposed improvements are limited in scope and are intended to enhance the existing trail facilities. Based on the foregoing facts, the proposed project will not curtail the beneficial use of the site.

3. Conflicts with the state's long-term environmental policies or goals and guidelines as expressed in Chapter 344, HRS, and any revisions thereof and amendments thereto, court decisions, or executive orders.

The proposed improvements do not conflict with the State's Environmental Policy and Guidelines as set forth in Chapter 344, Hawai‘i Revised Statutes (HRS).

4. Substantially affects the economic welfare, social welfare, and cultural practices of the community or State.

The proposed improvements will directly benefit the local economy by providing construction and construction-related employment. Therefore, the proposed actions will have a positive short-term effect on the economy. The proposed actions will result in improved trail components for the hikers and bikers, as well as improved trail amenities to all who utilize it. These improvements contribute, in a positive way, to the social welfare of the island. Long-term adverse impacts to social welfare and cultural practices are not anticipated.

5. Substantially affects public health.

During the construction period, appropriate best management practices will be implemented to mitigate potential air quality and noise impacts. Following construction, there will be no long-term public health impacts resulting from the proposed actions.

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

The proposed actions are not anticipated to result in significant adverse secondary impacts. No significant population changes are anticipated as a result of the proposed project. There are no anticipated adverse effects on public services, such as police, fire, medical, educational, or solid waste collection, as service limits and service capacities will not be affected.

7. Involves a substantial degradation of environmental quality.

Construction activities will create temporary short-term nuisances related to noise and dust. Appropriate dust control and noise mitigation measures will be implemented by the contractor to ensure that fugitive dust and noise generated in connection with construction is minimized.

As previously discussed in Chapter II of this EA document, adverse impacts to natural resources and the natural environment are not anticipated.

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

The proposed trail improvements and upgrades are standalone projects to improve the existing trail facilities. As such, the project is not anticipated to cumulatively have a considerable effect upon the environment or involve a commitment for larger actions.

9. Substantially affects a rare; threatened, or endangered species, or its habitat.

As discussed previously in Chapter II, a flora/fauna study has been completed and may be found in the appendixes.

Based on the results of this study, the project is not expected to have an adverse effect on rare, threatened, or endangered species of flora, fauna, avifauna, or their habitats.

10. Detrimentally affects air or water quality or ambient noise levels.

Construction activities will result in short-term air quality and noise impacts. Best Management Practices (BMPs) for dust control will be implemented to minimize construction-related air quality impacts. Short-term noise impacts will occur primarily from construction material delivery equipment. Noise attenuating equipment, as well as proper equipment and vehicle maintenance and other BMPs are anticipated to mitigate adverse noise conditions from construction of trail improvement activities. Erosion control measures will mitigate silt and stormwater runoff flowing into downstream properties.

Based on the discussion provided above, the proposed actions are not anticipated to detrimentally affect air, water quality or ambient noise levels.

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

The project area is not located within any environmentally sensitive areas and, as such, there are no anticipated hazard-related effects as a result of the proposed actions.

12. Substantially affects scenic vistas and view planes identified in county or state plans or studies.

The project site's location provides picturesque views of the Pacific Ocean and Upcountry/South Maui regions with the mountains as a backdrop to the trail. The proposed actions will not obstruct views from the trail or from Waipoli Access Road. The dense vegetation surrounding the area provides visual screening from Waipoli Access Road. As such, the proposed project will not adversely affect scenic view corridors.

13. Requires substantial energy consumption.
The construction-related activities will utilize hand operated construction equipment, and gasoline powered equipment, while the projects are in construction. After construction is complete, all equipment will be removed and there will be no energy consumption while the trail is being utilized. As such, this project component is not expected to require substantial energy consumption.

Based on the aforementioned findings, the proposed project will result in a **Finding of No Significant Impact (FONSI)** determination.

VII. LIST OF PERMITS AND APPROVALS

The following permits and approvals will be required prior to the implementation of the project:

State of Hawai‘i
1. Chapter 343, HRS compliance
2. National Pollutant Discharge Elimination System (NPDES) Permit, as applicable
3. Community Noise Permit, as applicable
4. Conservation District Use Permit (if applicable)

County of Maui
1. Construction Permits (i.e., grading permit, building permit)

VIII. DISTRIBUTION LIST OF PARTIES TO BE CONSULTED FOR THE DRAFT ENVIRONMENTAL ASSESSMENT;

The following agencies constitute the distribution list for the Draft Environmental Assessment (EA) in order to solicit comments and responses. Agency comments and responses to substantive comments will be included in the Final EA.

Office of Conservation and Coastal Lands
Kalanimoku Building
1151 Punchbowl St., Room 131
Honolulu, HI 96813

State Conservationist
U.S. Department of Agriculture
Natural Resources Conservation Service
P.O. Box 50004
Honolulu, Hawai‘i 96850-0001

Soil Conservationist
Natural Resources Conservation Service
U.S. Department of Agriculture
77 Hookele Street, Suite 202
Kahului, Hawai‘i 96732

Regulatory Branch
U.S. Department of the Army
U.S. Army Engineer District, Honolulu
Regulatory Branch, Building 230
Fort Shafter, Hawai‘i 96858-5440

U. S. Fish and Wildlife Service
300 Ala Moana Blvd., Rrn. 3-122
Box 50088
Honolulu, Hawai‘i 96813

Comptroller
Department of Accounting and General Services
1151 Punchbowl Street, #426
Honolulu, Hawai‘i 96813

Department of Agriculture
1428 South King Street
Honolulu, Hawai‘i 96814-2512

State of Hawai‘i
Department of Education
P.O. Box 2360
Honolulu, Hawai‘i 96804

Office of Business Services
Department of Education
c/o Kalani High School,
4680 Kalanianaole Highway, #T-BIA
Honolulu, Hawai‘i 96821

Clean Water Branch
State of Hawai‘i
Department of Health
919 Ala Moana Blvd., Room 300
Honolulu, Hawai‘i 96814

Health Program Chief
State of Hawai‘i
Department of Health
54 High Street
Wailuku, Hawai‘i 96793

Environmental Planning Office State of Hawai‘i
Department of Health Office of Planning
919 Ala Moana Blvd., Suite 312 P. O. Box 2359
Honolulu, Hawai‘i 96814

Department of Land and Natural Resources
P. O. Box 621
Honolulu, Hawai‘i 96809

Fire Department
County of Maui
Administrator Department of Fire and Public Safety
200 Dairy Road
Kahului, Hawai‘i 96732

State Historic Preservation Division
601 Kamokila Blvd., Room 555
Kapolei, Hawai‘i 96707

County of Maui
Department of Housing and Human Concerns
One Main Plaza
2200 Main Street, Suite 546
Wailuku, HI. 96793

Department of Parks and Recreation
700 Halia Nakoa Street, Unit 2
Wailuku, Hawai‘i 96793

County of Maui
Department of Planning
250 South High Street
Wailuku, Hawai‘i 96793

Office of Environmental Quality Control
235 S. Beretania Street, Suite 702
Honolulu, Hawai‘i 96813

County of Maui
Police Department
55 Mahalani Street
Wailuku, Hawai‘i 96793

Office of Hawaiian Affairs
560 North Nimitz Highway, Suite 200
Honolulu, Hawai‘i 96817

County of Maui
Department of Public Works
200 South High Street
Wailuku, Hawai‘i 96793

County of Maui
Department of Environmental Management
2050 Main Street, suite 2B
Wailuku, Hawai‘i 96793

County of Maui
Department of Transportation
200 South High Street
Wailuku, Hawai‘i 96793

County of Maui
Department of Water Supply
200 South High Street
Wailuku, Hawai‘i 96793

Maui Electric Company, Ltd.
P.O. Box 398
Kahului, Hawai‘i 96733

Hawaiian Telcom
60 South Church Street
Wailuku, Hawai‘i 96793

APPENDIX ONE

DESCRIPTION OF THE FLORA AND FAUNA

BIOLOGICAL IMPACT

BIOLOGICAL ASSESSMENT
BOTANICAL AND FAUNAL SURVEY
LOWER WAIOHULI TRAIL REALIGNMENT
KULA FOREST RESERVE, MAUI

Prepared By:
FOREST & KIM STARR
STARR ENVIRONMENTAL

Prepared For:
NA ALA HELE
DIVISION OF FORESTRY AND WILDLIFE
DEPARTMENT OF LAND AND NATURAL RESOURCES

MARCH 2017

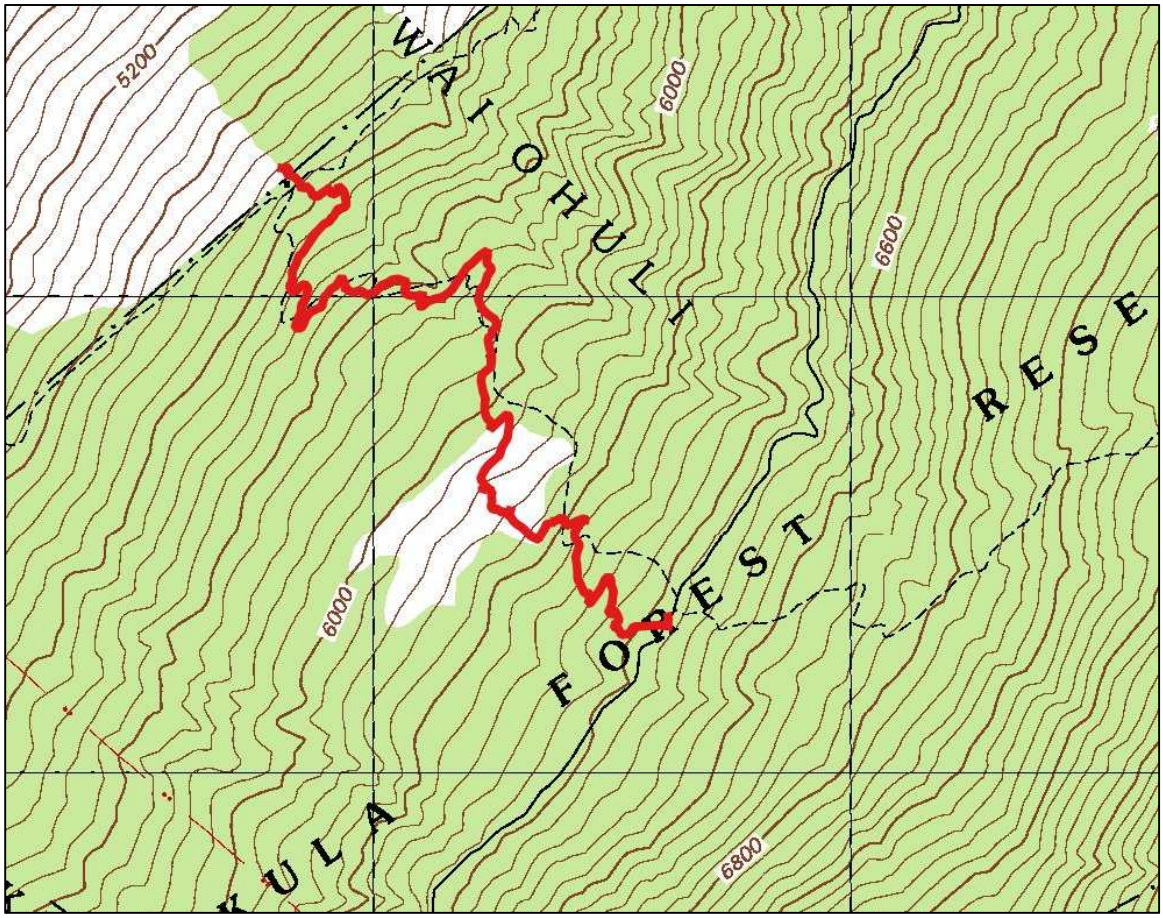
BIOLOGICAL ASSEMSENT
BOTANICAL AND FAUNAL SURVEY
LOWER WAIOHULI TRAIL REALIGNMENT
KULA FOREST RESERVE, MAUI

INTRODUCTION

The Lower Waiohuli Trail traverses about 1.5 miles in the Kula Forest Reserve, Maui, TMK (222007001). The project area is upslope of Keokea, with Waipoli Road marking the mauka (upslope) boundary and the Kula Forest Reserve boundary marking the makai (downslope) boundary. The goal of the project is to realign much of the existing Lower Waiohuli Trail, to a less steep grade. This assessment was initiated to ensure no biological resources would be significantly impacted by the trail realignment.

SITE DESCRIPTION

The project area is situated in the Kula Forest Reserve. Most of the land is relatively steep and vegetated with forestry trees, native plants, and raspberry brambles. The project elevation ranges from 5530 to 6430 feet above sea level. Annual rainfall averages 35 inches. Annual air temperature averages 53 degrees Fahrenheit.



Project site, Lower Waiohuli Trail, Kula Forest Reserve, Maui. Red line is area surveyed.

BIOLOGICAL HISTORY

The original vegetation on the site would have been a diverse mesic to subalpine native forest. Typical canopy species would have included koa (*Acacia koa*), ohia (*Metrosideros polymorpha*), iliahi (*Santalum haleakalae*), and mamane (*Sophora chrysophylla*).

After the arrival of humans, a series of forces including fire, agriculture, forestry, and introduced plants, animals, and diseases transformed the site to predominantly non-native vegetation. Major uses of the land included cattle grazing and forestry plantings.

In 2007 a large fire swept through the mauka portion of the area killing many of the plants. Subsequently, many of the dead large trees were blown down by strong winds during hurricane Iselle and other strong storms, creating a jumble of logs covered in raspberry thickets. The makai portion did not burn and the trees remain standing.

Today, the site is predominantly managed for watershed protection, hunting, and recreation. The bulk of the vegetation on the site is non-native, dominated by forestry trees, aggressive non-native vines, and scattered remnant native plants.

SURVEY OBJECTIVES

The objectives of the survey were to:

- Document what plant and animal species occur on the site or may likely occur in the existing habitat.

- Document the status and abundance of each species.

- Determine the presence or likely occurrence of any native flora and fauna, particularly any that are Federally listed as Threatened or Endangered. If such occur, identify what features of the habitat may be essential for these species.

- Determine if the project area contains any special habitats which if lost or altered might result in a significant negative impact on the flora and fauna in this part of the island.

BOTANICAL SURVEY

SURVEY METHODS

A walk-through botanical survey method was used following an orange flagged route where the proposed trail realignment will occur. The width surveyed varied based on surrounding vegetation, but was generally at least ten feet on either side of the route.

Notes were made on plant species, distribution and abundance. Extra emphasis was placed on areas with high diversity, such as gullies with ferns and other pockets of remnant native plants.

The route was surveyed on February 25 and March 4, 2017.

Taking notes on vegetation, Lower Waiohuli Trail.

DESCRIPTION OF VEGETATION

Vegetation along the reroute is predominantly non-native, with two main habitat types. The mauka section consists of an open canopy pine forest with log jumbles covered by raspberry thickets. The makai section is dominated by redwood trees, with a dense canopy and sparse understory

MAUKA SECTION

A mix of pine species were planted in the higher reaches of the site, including Monterey pine (*Pinus radiata*), Mexican weeping pine (*Pinus patula*), and maritime pine (*Pinus pinaster*). The bulk of these pines were killed during the 2007 fire, and most have since blown over, creating a jumble of logs. However, all of these pine species are regenerating from seed and many are now over 30 feet tall.

Rubus niveus (hill raspberry) is the dominant understory in the mauka portion, creating a virtually impenetrable thicket of spiny vines that sprawl over the ground and log jumbles.

Non-native grasses are prevalent in sunny open sites, especially cocksfoot (*Dactylis glomerata*), red fescue (*Festuca rubra*), and Yorkshire fog (*Holcus lanatus*).

Non-native herbaceous plants in the mauka portion include cranesbill (*Geranium homeanum*), hairy cat's ear (*Hypochoeris radicata*), nipplewort (*Lapsana communis*), lythrum (*Lythrum maritimum*), and oriental hawksbeard (*Youngia japonica*).

Native plants in the mauka portion include mamane, ohelo (*Vaccinium reticulatum*), akala (*Rubus hawaiensis*), and the sedges *Carex macloviana* and *C. wahuensis*.

The mauka portion of the reroute is a mostly open canopy with pine jumbles and raspberry thickets.

MAKAI SECTION

The makai portion of the site is predominantly a large forestry block of redwood trees (*Sequoia sempervirens*). These trees did not burn in the 2007 fire and remain standing, with a dense canopy and sparse understory.

The few trees able to germinate in the dark shade under the redwoods include tropical ash (*Fraxinus uhdei*) and firetree (*Morella faya*). They are generally stunted and spindly.

Native shrubs are trying to grow in the few sunny openings, but also appear stunted. Ohelo is the most common of these. A few small mamane are in the area, along with pukiawe (*Styphelia tameiameiae*) and pilo (*Coprosma ochracea*). A few sunny openings had sparse kukaenene (*Coprosma ernodeoides*) on the ground. There was also a small patch of ohelo papa (*Fragaria chiloensis* subsp. *sandwicensis*).

Ferns and sedges are more common than grasses here. The native laukahi (*Dryopteris wallichiana*) is the most abundant fern in the area. Cretan brake (*Pteris cretica*) is also occasionally present, and less commonly *Polystichum haleakalense*. Some of the lava channels in the area host additional species of ferns, including pakahakaha (*Lepisorus thunbergiana*) and ae (*Polypodium pellucidum*).

The native sedges *Carex wahuensis* and *C. macloviana* are also scattered throughout, as is the native rush (*Luzula hawaiensis*).

Redwood trees dominate the makai portion, with a dense canopy and sparse understory.

DISCUSSION AND RECOMMENDATIONS

Most of the project area has been heavily impacted by previous human disturbances and is currently dominated by hardy non-native plants. The native plant species found on the site are relatively common throughout Hawaii and elsewhere and are of no special conservation concern. No special native plant habitats occur on the project site that are not found elsewhere in this part of the island. The proposed project is not expected to have a significant negative impact on the botanical resources in this part of Maui.

There is an opportunity to revegetate the trail that will be abandoned with native plants. This would help offset the few native plants that likely will be killed during construction, provide native forest birds and insects with food sources, reduce erosion, and help prevent confusion by hikers inadvertently following old sections of the trail. In the mauka portion, mamane, iliahi, aalii (*Dodonaea viscosa*) and koa (*Acacia koa*) would likely do well. In the makai portion, ferns and sedges would probably survive best, and could possibly be directly transplanted from the reroute section before or during construction.

PLANT SPECIES LIST

Following is a checklist of all vascular plant species inventoried during field studies. Taxonomy and nomenclature are in accordance with Wagner et al. (1999).

For each species, the following information is provided:

- Scientific name
- Common English or Hawaiian name.
- Bio-geographical status:
  - Endemic = Native to Hawaii; not naturally occurring anywhere else in the world.
  - Indigenous = Native to Hawaii and also to one or more other geographic area(s).
  - Non-native = Brought to Hawaii intentionally or accidentally by humans.
- Abundance of each species within the project area:
  - Dominant = Forming a major part of the vegetation within the project area.
  - Common = Widely scattered throughout the area or locally abundant within a portion of it.
  - Occasional = Scattered sparsely throughout the area or occurring in a few small patches.
  - Rare = Only a few isolated individuals within the project area.

PLANT SPECIES LIST

Scientific name	Common name	Nativity	Abundance
Acacia mearnsii	Black wattle	Non-native	Occasional
Ageratina adenophora	Maui pamakani	Non-native	Rare
Anagalis arvensis	Scarlet pimpernel	Non-native	Occasional
Anthoxanthum odoratum	Sweet vernal grass	Non-native	Rare
Asplenium adiantum-nigrum	Iwaiwa	Indigenous	Occasional
Asplenium trichomanes subsp. *densum*	Maidenhair spleenwort	Endemic	Rare
Carex macloviana	Carex sedge	Indigenous	Rare
Carex wahuensis	Carex sedge	Endemic	Occasional
Cenchrus clandestinus	Kikuyu grass	Non-native	Rare
Cerastium fontanum subsp. *triviale*	Mouse-eared chickweed	Non-native	Rare
Cirsium vulgare	Bull thistle	Non-native	Occasional
Conyza bonariensis	Hairy horseweed	Non-native	Occasional
Coprosma ernodeoides	Kukaenene	Endemic	Rare
Coprosma montana	Pilo	Endemic	Rare
Coprosma ochracea	Pilo	Endemic	Rare
Cotoneaster pannosus	Cotoneaster	Non-native	Rare
Cupressus macrocarpus	Monterey cypress	Non-native	Rare
Dactylis glomerata	Cocksfoot	Non-native	Common
Dryopteris wallichiana	Laukahi	Non-native	Common
Epilobium ciliatum	Fringed willow herb	Non-native	Occasional
Eucalyptus globosa	Blue gum	Non-native	Occasional
Euphorbia peplus	Petty spurge	Non-native	Rare
Festuca rubra	Red fescue	Non-native	Occasional
Fragaria chiloensis subsp. *sandwicensis*	Ohelo papa	Endemic	Rare
Fraxinus uhdei	Tropical ash	Non-native	Occasional
Geranium dissectum	Cranesbill	Non-native	Occasional
Geranium homeanum	Cranesbill	Non-native	Occasional
Holcus lanatus	Yorkshire fog	Non-native	Common
Hypochoeris radicata	Hairy cat's ear	Non-native	Occasional
Lapsana communis	Nipplewort	Non-native	Occasional
Lepisorus thunbergiana	Pakahakaha	Indigenous	Rare
Leptecophylla tameiameiae	Pukiawe	Indigenous	Occasional
Luzula hawaiiensis	Wood rush	Endemic	Rare
Lythrum maritimum	Lytrhum	Non-native	Occasional
Morella faya	Firetree	Non-native	Common
Oxalis corniculata	Yellow wood sorrel	Non-native	Occasional
Passiflora tarminiana	Banana poka	Non-native	Occasional
Pinus patula	Mexican weeping pine	Non-native	Occasional
Pinus pinaster	Maritime pine	Non-native	Occasional
Pinus radiata	Monterey pine	Non-native	Dominant
Poa annua	Annual bluegrass	Non-native	Rare
Polypodium pellucidum	Ae	Endemic	Rare
Polystichum haleakalense	Polystichum	Endemic	Rare
Prunella vulgaris	Selfheal	Non-native	Occasional

Scientific name	Common name	Nativity	Abundance
Pteris cretica	Cretan brake	Indigenous	Common
Pteris tremula	Australian brake	Non-native	Rare
Rubus hawaiensis	Akala	Endemic	Rare
Rubus niveus	Mysore thorn raspberry	Non-native	Dominant
Senecio madagascariensis	Fireweed	Non-native	Occasional
Senecio sylvaticus	Wood groundsel	Non-native	Rare
Sequoia sempervirens	Redwood	Non-native	Dominant
Sonchus oleraceus	Sow thistle	Non-native	Occasional
Sophora chrysophylla	Mamane	Endemic	Rare
Ulex europaeus	Gorse	Non-native	Rare
Vaccinium reticulatum	Ohelo	Endemic	Occasional
Veronica arvensis	Corn speedwell	Non-native	Occasional
Youngia japonica	Oriental hawksbeard	Non-native	Occasional

Native Hawaiian plants (ohelo papa, pukiawe and kukaenene) in a pocket of remnant natives.

FAUNAL SURVEY

SURVEY METHODS

A walk-through survey method was conducted in conjunction with the botanical survey. Field observations were made with the aid of binoculars and by listening to vocalizations.

Notes were made on species, abundance, activities and location as well as observations of trails, tracks, scat and signs of feeding. Conspicuous insects were noted.

In addition, an evening visit was made to record crepuscular activities and vocalizations and to look for presence of Hawaiian Hoary Bats (*Lasiurus cinereus semotus*). Along with visually scanning the sky for bats, active and passive ultrasonic bat detectors were used to help detect bats.

The site was surveyed on February 25 and March 4, 2017.

Looking for bats at dusk, Lower Waiohuli Trail.

BATS

Hawaiian Hoary Bats are present over all of East Maui, some of their highest numbers occur in forested sections of the mid-elevations, and they have been documented from the Kula Forest Reserve.

No bats were detected during the night survey for this project. However, it is likely they do frequent the area.

Hawaiian Hoary Bats roost in tall trees in sheltered areas, such as on the branch tips of mature *Eucalyptus* trees. The bats give birth to and raise their young in the summer. Avoiding cutting large trees during the summer months will help minimize potential impact to young bats that have not yet learned to fly.

Hawaiian Hoary Bat, Olinda, Maui.

NON-NATIVE MAMMALS

The Lower Waiohuli Trail is within hunting unit C of the Kula Forest Reserve. Game mammals found within this unit include feral pigs (*Sus scrofa*), goats (*Capra hirca*), and axis deer (*Axis axis*).

Pig damage was evident in many places, with the trail and surrounding vegetation and earth dug up. Banana poka (*Passiflora tarminiana*) seedlings were also evident germinating from old pig scat.

Ungulate scat was observed along the trail, likely either goat or axis deer. Dog (*Canis familiaris*) scat was also observed along the trail.

Other mammals likely to utilize this property, but which were not observed or heard include rats (*Rattus* spp.), mice (*Mus domesticus*), cats (*Felis domesticus*) and mongoose (*Herpestes javanicus*).

Ungulate scat, Lower Waiohuli Trail.

BIRDS

Forest birds were common along the entire length of the proposed reroute. Native forest birds present were Amakihi (*Chlorodrepanis virens*), Apapane (*Himatione sanguinea*), Maui Creeper (*Paroreomyza montana*), and Iiwi (*Vestiaria coccinea*).

Non-native birds along the reroute included Red-billed Leiothrix (*Leiothrix lutea*), Japanese Bush-warbler (*Cettia diphone*), Japanese White-eye (*Zosterops japonicus*), House Finch (*Haemorhous mexicanus*), and Northern Cardinal (*Cardinalis cardinalis*).

A Pacific Golden-Plover or Kolea (*Pluvialis fulva*) flushed from the trail.

Nene were not observed, but are known from the Kula Forest Reserve. If Nene breeding is found on the site, specialists within DLNR should be contacted to determine appropriate actions. Generally, this involves minimizing activity around the Nene until the eggs hatch and the Nene are mobile enough to be relocated or leave on their own.

Apapane at nearby Polipoli Spring State Recreation Area.

INSECTS

A complete inventory of the insects was beyond the scope of this survey. Conspicuous insects were noted and special effort was made to look for native insects of conservation concern. In general, there were few insects present along the proposed reroute. Perhaps the cold temperatures and monotypic vegetation contributed to that.

Honey bees (*Apis mellifera*) were one of the most abundant insects. They could be heard buzzing in warm sunny areas and were observed visiting flowers.

The Passion vine Butterfly (*Agraulis vanillae*) was occasionally flitting about. Their larvae likely feed on banana poka vines.

Many of the hill raspberry leaves were damaged by the blackberry skeletonizer (*Schreckensteinia festaliella*), a purposely introduced biocontrol.

A few of the pamakani (*Ageratina adenophora*) had galls from an introduced fly (*Procecidochares utilis*). The pamakani leaves also appeared to be chewed on by the Chinese rose beetle (*Adoretus sinicus*), as did firetree leaves.

No tree tobacco (*Nicotiana glauca*) or other solanaceous plants were encountered. No signs of the endangered Blackburn's Sphinx Moth (*Manduca blackburni*) were observed.

More intensive surveys would undoubtedly turn up many more cryptic native species, though it is unlikely any would be of conservation concern.

Passion vine butterfly sipping nectar from a thistle, Olinda, Maui.

DISCUSSION & RECOMMENDATIONS

Native forest birds are common in the Lower Waiohuli Trail area, and it is anticipated the trail reroute will have negligible impact on them. Nene could possibly visit the site, but likely prefer more open area higher up the mountain.

Hawaiian Hoary Bats likely utilize the site and will be able to continue to do so after the reroute. No signs of the Blackburn's Sphinx Moth or Tree Tobacco were observed.

By contacting DLNR staff if Nene are thought to be nesting, and not cutting large trees during summer months while bats are pupping, the proposed project is not expected to have a significant negative impact on the faunal resources in this part of Maui.

ANIMAL SPECIES LIST

Following is a checklist of the animal species inventoried during the field work. Animal species are arranged within three groups: Birds, Insects, and Mammals. For each species the following information is provided:

- Common name

- Scientific name

- Bio-geographical status:
  - Endemic = Native to Hawaii; not naturally occurring anywhere else in the world.
  - Indigenous = Native to Hawaii and also to one or more other geographic area(s).
  - Non-native = Brought to Hawaii intentionally or accidentally by humans.
  - Migratory = Spending a portion of the year in Hawaii and a portion elsewhere.

- Abundance of each species within the project area:
  - Abundant = Many flocks or individuals seen throughout area at all times of day.
  - Common = A few flocks or well scattered individuals throughout the area.
  - Uncommon = Only one flock or several individuals seen within the project area.
  - Rare = only one or two seen within the project area.

ANIMAL SPECIES LIST

Scientific name	Common name	Status	Abundance
Birds			
Cardinalis cardinalis	Northern Cardinal	Non-native	Occasional
Cettia diphone	Japanese Bush-warbler	Non-native	Common
Chlorodrepanis virens	Amakihi	Endemic	Occasional
Haemorhous mexicanus	House Finch	Non-native	Occasional
Himatione sanguinea	Apapane	Endemic	Occasional
Leiothrix lutea	Red-billed Leiothrix	Non-native	Common
Mimus polyglottos	Northern Mockingbird	Non-native	Rare
Paroreomyza montana	Maui Alauahio or Creeper	Endemic	Occasional
Phasianus colchicus	Ring-necked Pheasant	Non-native	Rare
Pluvius fulva	Kolea	Migratory	Rare
Vestiaria coccinea	Iiwi	Endemic	Occasional
Zosterops japonicus	Japanese White-eye	Non-native	Occasional
Insects			
Adoretus sinicus	Chinese rose beetle	Non-native	Occasional
Agraulis vanillae	Passion butterfly	Non-native	Occasional
Apis mellifera	Honey bee	Non-native	Occasional
Coccinellidae	Lady bird beetle	Non-native	Rare
Procecidochares utilis	Pamakani gall fly	Non-native	Occasional
Schreckensteinia festaliella	Blackberry skeletonizer	Non-native	Common
Vanessa cardui	Painted Lady	Non-native	Rare
Mammals			
Axis axis	Axis Deer	Non-native	Rare
Canis familiaris	Dog	Non-native	Rare
Capra hircus	Goat	Non-native	Rare
Sus scrofa	Pig	Non-native	Common

REFERENCES

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APPENDIX TWO

ARCHAELOGICAL ASSESSMENT

FINAL

ARCHAEOLOGICAL ASSESSMENT OF LOWER WAIOHULI TRAIL IN SUPPORT OF AN ENVIRONMENTAL ASSESSMENT OF ITS PROPOSED REALIGNMENT WAIOHULI AHUPUA‘A, KULA DISTRICT, ISLAND OF MAUI

TMK (2) 2-2-007:001 (portion)

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May 2017

Makai section of Lower Waiohuli Trail, which winds through redwoods and pines, as the Na‘ulu fog rolls in (photograph taken in the late afternoon on 16 March, 2017)

ABSTRACT – EXECUTIVE SUMMARY

TCP Hawai‘i has completed an Archaeological Assessment (AA) of the Lower Waiohuli Trail and a proposed realignment of sections of the existing trail. The approximately 1.5 mile (2.4 km) project area is located in Waiohuli Ahupua‘a, Kula District, Maui Island, in a portion of the Kula Forest Reserve. The trail is in a portion of TMK (2) 2-2-007:001. This AA is intended to serve as a land management tool for Nā Ala Hele. This report does not conform to the State of Hawai‘i’s formal Archaeological Inventory Survey (AIS) rule (HAR § 13-276), but sufficient fieldwork has been conducted to fulfill the basic requirements of an HAR § 13-276 AIS. This document was not prepared in consultation with the State Historic Preservation Division (SHPD). The principal investigator, Chris Monahan, spent one day (on March 16, 2017) conducting archaeological reconnaissance fieldwork in the project area. We identified two recently-constructed (in the 1990s) features (designated with temporary site numbers TCP 1 and TCP 2) and one possible historic property (TCP 3). **TCP 1** is a small, dry-stacked, rock-retaining structure built along a short portion of the edges of the existing trail in the lower (northwest) section of the project area. This modern feature is located a short distance north of the proposed realignment. **TCP 2** is another small, dry-stacked, rock-retaining structure built along a short portion of the edges of the existing trail in the lower (northwest) section of the project area. This modern feature is located right along the proposed realignment. These features were built by Nā Ala Hele staff in the 1990s. **TCP 3** is a small cave-like feature several meters west of the current (existing) trail and immediately adjacent to the proposed realignment. This is not a true cave, nor a lava tube, but rather a section of fractured, uplifted basalt flow that has created an opening and small shelter area underneath. Although this is an entirely natural feature with no evidence of human modification, subsurface testing (excavation) might yield evidence of human occupation and use. For this reason, we believe TCP 3 is most accurately characterized as a *possible* historic property. We recommend the final realignment avoid TCP 3. The other modern features (TCP 1 and TCP 2) do not require any special mitigation since they are not historic properties (they were built in the 1990s). We also recommend additional field inspection by a qualified archaeologist of the upper half of the project area where much of the ground surface is simply not visible, and where it is extremely difficult to walk the precise trail realignment due to abundant downed trees. This work can be conducted in coordination with the downed tree-removal contractor.

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INTRODUCTION

On behalf of the Nā Ala Hele Trails and Access Program (Division of Forestry and Wildlife, Department of Land and Natural Resources, State of Hawai‘i), TCP Hawai‘i, LLC, has completed an Archaeological Assessment (AA) of the Lower Waiohuli Trail and a proposed realignment of sections of the existing trail. The approximately 1.5 mile (2.4 km) project area is located in Waiohuli Ahupua‘a, Kula District, Maui Island, in a portion of the Kula Forest Reserve (Figure 1 and Figure 2). The trail is in a portion of TMK (2) 2-2-007:001. In general, the objective of the proposed project is to realign portions of the existing Lower Waiohuli Trail to a more gradual (less steep) grade, which necessitates the creation of numerous, short switch-backs.

Document Purpose and Scope of Work

The current document is intended to serve as a land management tool for Nā Ala Hele. This report does not conform to the State of Hawai‘i’s formal Archaeological Inventory Survey (AIS) rule (HAR § 13-276), but sufficient fieldwork has been conducted to fulfill the basic requirements of an HAR § 13-276 AIS. This document was not prepared in consultation with the State Historic Preservation Division (SHPD). In our Conclusion and Recommendations section following the presentation of results, we discuss potential regulatory and legal issues as they relate specifically to historic preservation in Hawai‘i.

The overall purpose of this AA, which included archival research and fieldwork, was to gather as much relevant cultural, historical and archaeological data as possible about the project area so that Nā Ala Hele can make an informed decision about the most appropriate trail realignment. The principal investigator, Chris Monahan, spent one day (on March 16, 2017) conducting archaeological reconnaissance fieldwork in the project area. Our specific scope of work is discussed in more detail in the Methods section below. In general, our objective was to provide a condition assessment of the landscape over which the trail and the proposed realignment travel, in particular, noting the character, distribution and significance of archaeological sites and other historic properties, if present, in the project area.

Project Area Description

The Lower Waiohuli Trail begins along the Polipoli State Park Access Road (Figure 3), near the Upper Waiohuli/Waiakoa trailhead; and heads downslope, in the makai[1] direction, until it connects at a T-shaped junction with the Boundary Trail, a cross-slope trail along the lower edge of the Kula Forest Reserve. The terrain over which the trail passes is relatively steep. Mean annual rainfall in the project area is approximately 35 inches (889 mm) (Giambelluca et al. 2013), but it also receives additional precipitation from fog and mist that rolls in many afternoons (see photograph on the title page). Due to its relatively high elevation (~6,400 to 5,520 ft. [1,951 to 1,683 m] above mean sea level), the project area enjoys a cool climate, with a mean annual temperature of 53°F.

A Biological Survey of the project area (Starr and Starr 2017) provides some important information on historic and modern changes to the landscape and vegetation in and around the project area. According to Starr and Starr (2017:2), prior to the arrival of the first humans on Maui, vegetation in and around the project area was a “diverse mesic to subalpine native forest” with a canopy of koa (*Acacia koa*), ‘ōhi‘a (*Mestrosideros polymorpha*), ‘iliahi (*Santalum haleakalae*), and māmane (*Sophora chrysophylla*). Following the start of Hawaiian settlement in the islands, “a series of forces including fires, agriculture, forestry, and introduced plants, animals, and diseases transformed the site [project area] to predominantly non-native vegetation” (ibid.) In historic times, the primary land uses have been cattle grazing and forestry plantings. In 2007, “a large fire swept through the mauka portion of the [project] area killing many of the plants. Subsequently, many of the dead large trees were blown down by strong winds during

[1] Hawaiian words are not italicized in TCP Hawai‘i reports since ‘Ōlelo Hawai‘i (Hawaiian) is an official state language, not a foreign language, and has been since the late 1970s.

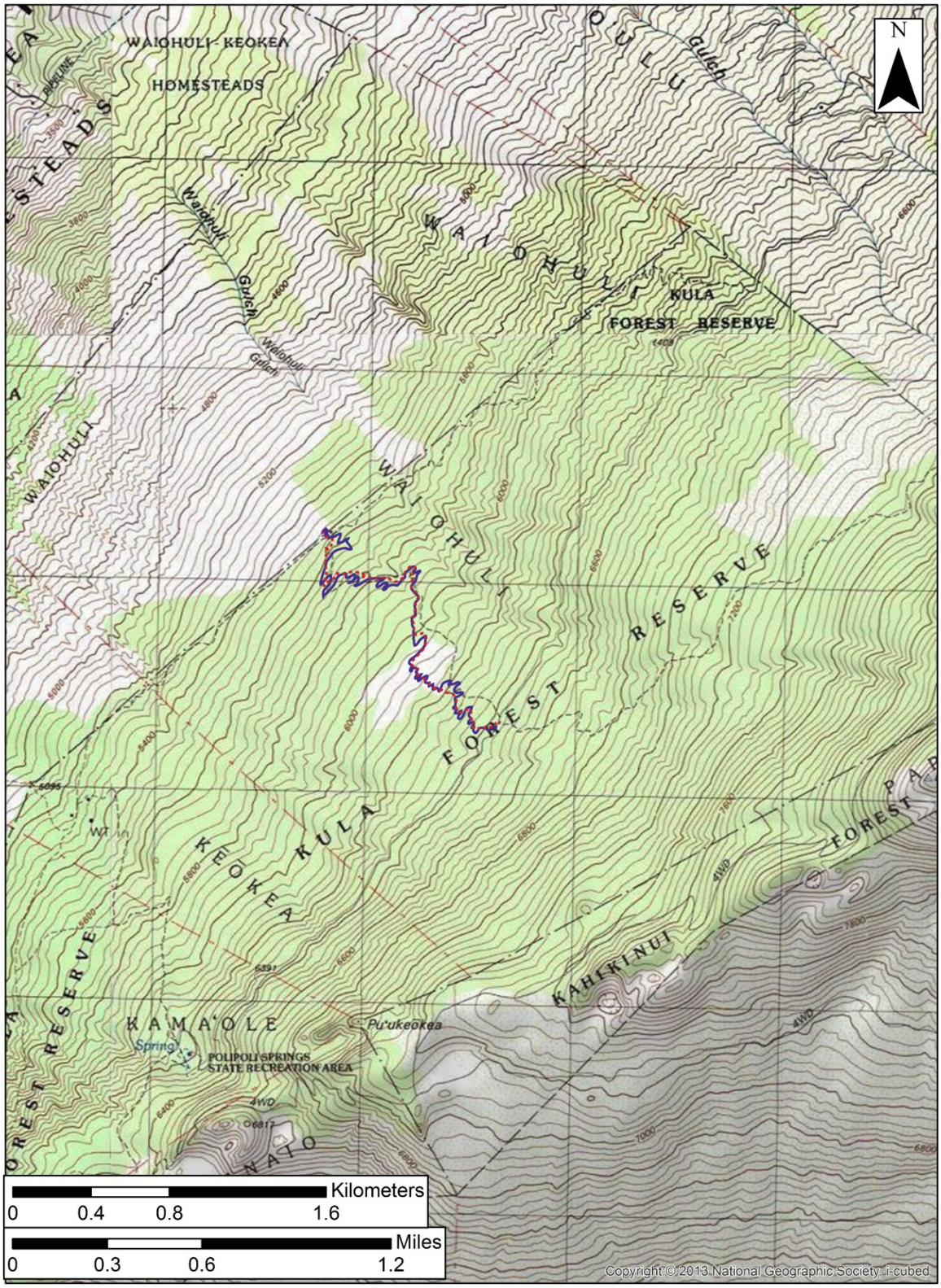

Figure 1. Portion of 1995 USGS topographic (1:24,000 scale) Luala'ilua quadrangle map showing project area/proposed realignment as purple line; current/existing trail is dashed red line; the black dashed line on the USGS map appears to be an earlier version of the trail

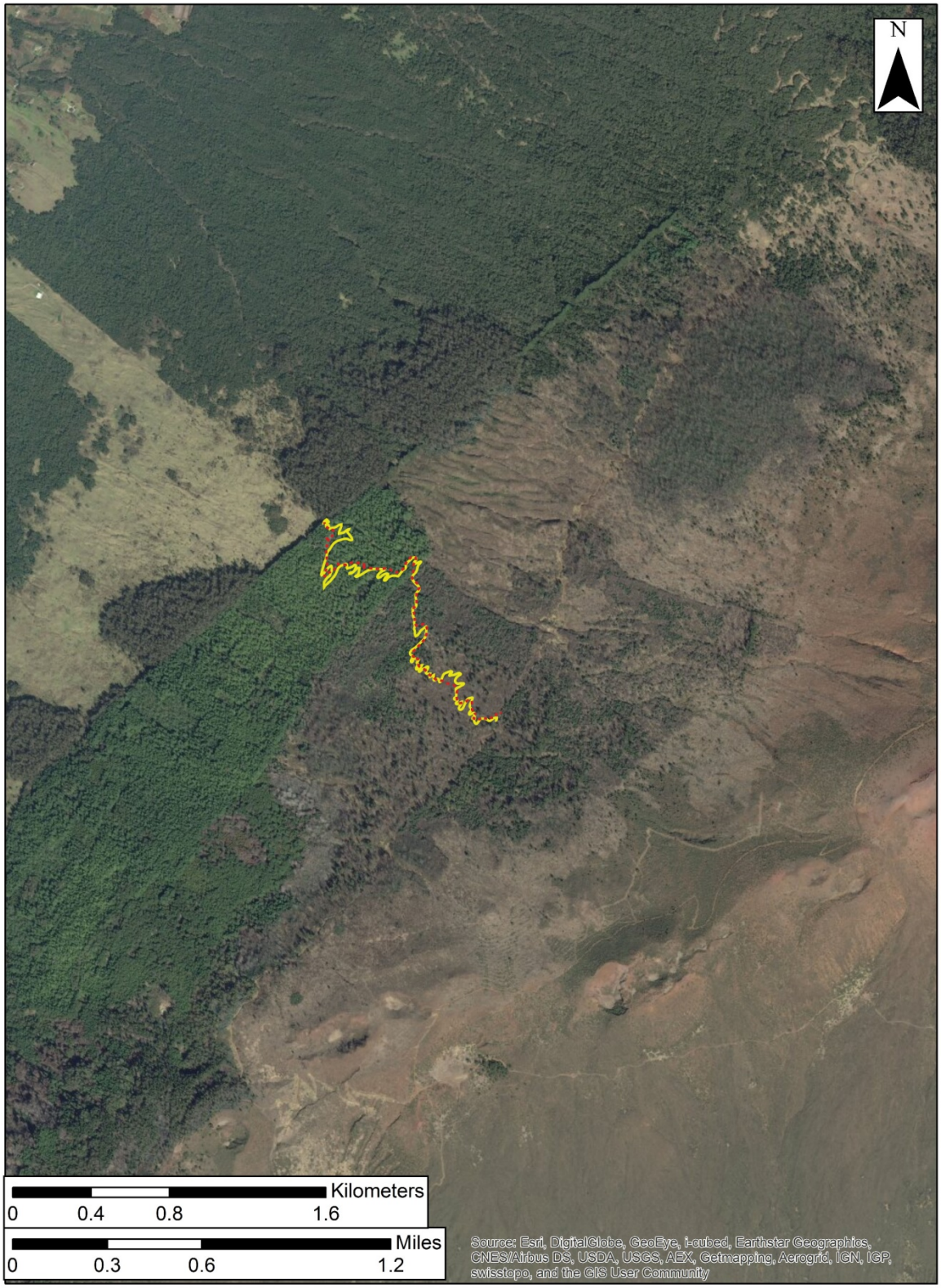

Figure 2. Aerial image showing project area/proposed realignment (yellow line); current/existing trail is depicted as dashed red line

hurricane Iselle and other strong storms, creating a jumble of logs covered in raspberry [blackberry] thickets. The makai portion did not burn and the trees remain standing" (ibid.). Currently, the project area and environs is managed for recreation, hunting and watershed protection purposes. Most of the vegetation is currently invasive.

Figure 4 to Figure 8 show representative photographs of the project area taken on our recent (March, 2017) reconnaissance.

Figure 3. Trail head facing makai along the unimproved (4-WD) road to Polipoli State Park, view west-southwest

Figure 4. View of the proposed realignment where it intersects with the existing trail in its upper (mauka) section; note, orange flagging tape in the background denotes realignment route

Figure 5. Another view of the proposed realignment where it intersects with the existing trail in its upper (mauka) section; note, orange flagging tape in the background (right) denotes realignment route

Figure 6. Example of blackberry bushes that cover major portions of the upper project area and trail realignment; these are an extremely noxious invasive species that were difficult to get through

Figure 7. Example of downed trees in the middle section of the project area

Figure 8. A portion of the existing trail in the lower project area

METHODS

This section briefly describes our methods including (1) pre-fieldwork activities, planning and preparation, (2) archival research and consultation, (3) fieldwork, and (4) post-fieldwork activities.

Pre-fieldwork

We obtained details on the proposed trail realignment and its geospatial location prior to conducting fieldwork. Torrie Nohara (Nā Ala Hele) provided GIS data (shapefiles) of the preliminary trail realignment based on a professional terrain study by a trail designer (consultant) who flagged the route on the ground (using orange surveyors tape). This client-provided data indicated the presence of a cave near the makai end of the trail that we investigated.

Because the Lower Waiohuli Trail is on public land, there were no specific access issues other than the fact that a 4-WD vehicle is needed to reach the trailhead.

Using the GIS data provided by Nā Ala Hele, our GIS Specialist, Todd Tulchin, programmed a Garmin GPS with all relevant information, including project area and TMK boundaries, as well as previous waypoints and track logs. This allowed us to follow the orange-flagged trail realignment using a hand-held GPS device in addition to the "on the ground" markers (orange flags). We also produced topographic and aerial images with the existing trail and proposed realignment for reference in the field (Figure 9 and Figure 10).

Archival Research and Consultation

Prior to going into the field, Monahan utilized TCP Hawai‘i's reference library to obtain some general information about the project area and its environs. Monahan also visited the SHPD's library of archaeological reference materials in Kapolei (no reports of any surveys in or near the project area were found).

We also utilized these on-line databases to obtain cultural, historical and archaeological data:

- OHA's Papakilo database (http://papakilodatabase.com/main/main.php)
- OHA's Kipuka database (http://kipukadatabase.com/kipuka/)
- Bernice P. Bishop Museum archaeological site database (http://has.bishopmuseum.org/index.asp)
- Bishop's Hawaii Ethnological Notes (http://data.bishopmuseum.org/HEN/browse.php?stype=3)
- University of Hawai‘i-Mānoa's digital maps (http://magis.manoa.hawaii.edu/maps/index.html)
- DAGS' State Land Survey (http://ags.hawaii.gov/survey/map-search/)
- Waihona ‘Aina website (www.waihona.com)
- Digital newspaper archive "Chronicling America, Historic American Newspapers" (http://chroniclingamerica.loc.gov/lccn/sn82014681/)
- Hawai‘i State Archives digital collections (http://archives1.dags.hawaii.gov/)

We also consulted with Robert ("Bob") Hobdy, retired Division of Forestry and Wildlife (DOFAW) District Manager, Department of Land and Natural Resources, State of Hawai‘i, by phone on May 1, 2017. Chris Monahan spoke with Mr. Hobdy for about 30 minutes. He had specific knowledge of the project area, including the two small, dry-stacked, rock-retaining structures. The results of consultation are integrated into the background and results section below. We also obtained important information on the trail from Torrie Nohara.

Fieldwork

Chris Monahan, the Principal Investigator, conducted one day of archaeological reconnaissance survey on March 16, 2017. As depicted in the Results section (below), Monahan recorded his GPS track logs showing where he walked.

Field documentation of landscape features of interest and potential historic properties included GPS recordation, photography, field notes and schematic sketches. The GPS device we used (Garmin) is ideal for reconnaissance because of its durability, speed and ability to obtain a signal under the tree canopy. The geospatial resolution (standard error), however, is only about 2-3 m at best. If more accurate geospatial (locational) data are needed for future work on potential historic properties that may be impacted by the proposed realignment, we recommend use of a mapping grade GPS (we use a Trimble), which obtains geospatial accuracy to within 10-20 cm.

Mitigating Factors, Conditions and Caveats

In general, our objective was to walk as precisely as possible the marked trail realignment. In reality, conditions on the ground in the upper half or so of the project area made this a difficult task. As described in the Introduction, a 2007 wildfire that raged through the mauka portion of the project area killed many trees that eventually toppled over in storms such as hurricane Iselle (see Figure 7). This created a jumble of logs covered in extremely hazardous (thorny) blackberry growth (see Figure 6). The result of these recent events is that there are places in the upper half of the project area where the ground surface is simply not visible, where it is currently extremely difficult to walk the precise trail realignment, and where additional archaeological observation should be made in the future once more clearing of downed trees is accomplished (see Conclusion and Recommendations). In the lower half of the project area, ground visibility is generally good to excellent, and one can observe conditions on the ground surface from a distance without having to walk the precise realignment route.

Post-fieldwork

Our GPS data were professionally processed, incorporated into a GIS database, and projected on georeferenced aerial images by our GIS Specialist (Todd Tulchin) using standard ESRI software. Sketch maps of potential historic properties were digitally drafted using Adobe Illustrator.

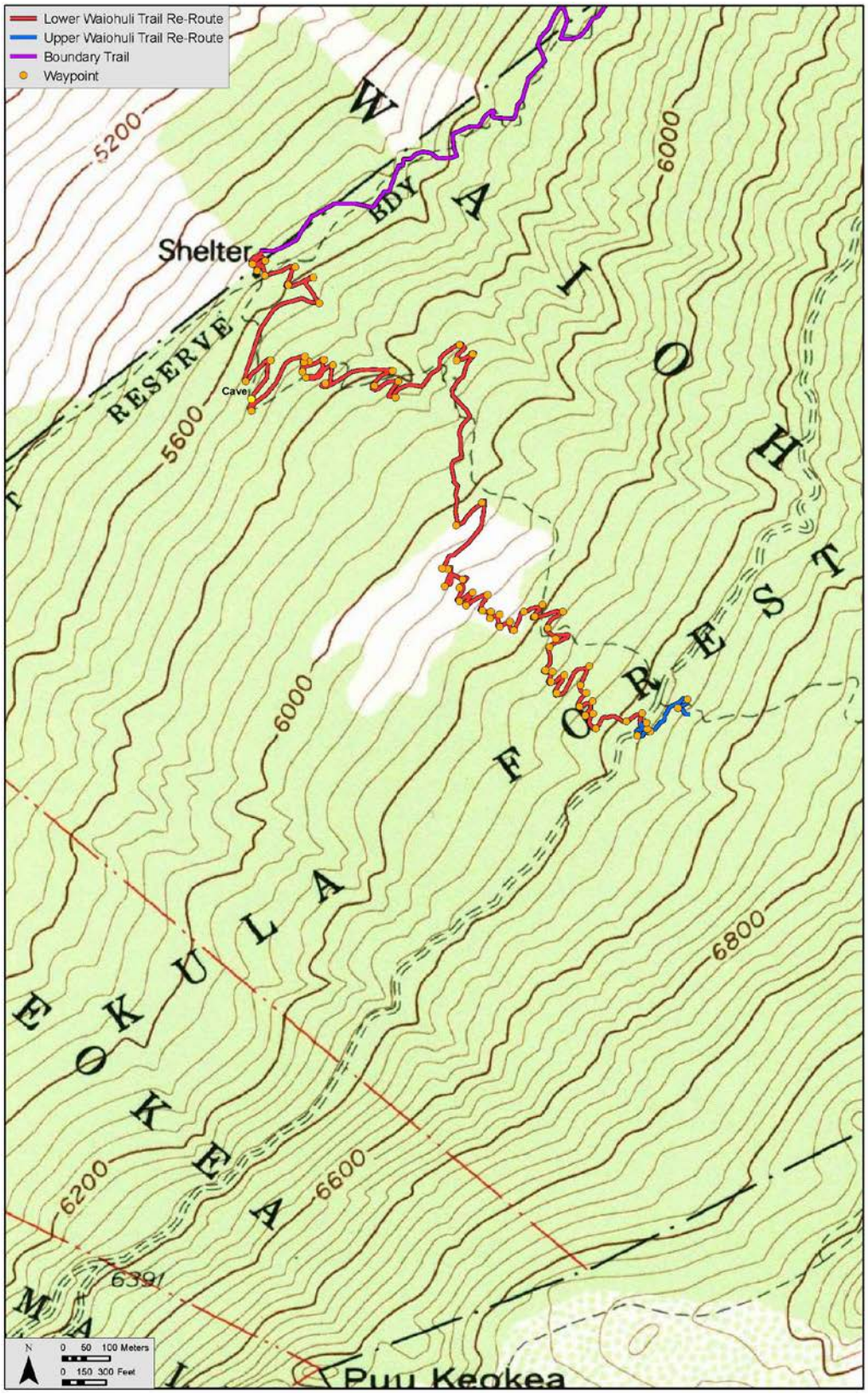

Figure 9. Proposed trail realignment (red line with orange points representing turns) on USGS topographic map, based on client-provided GPS data

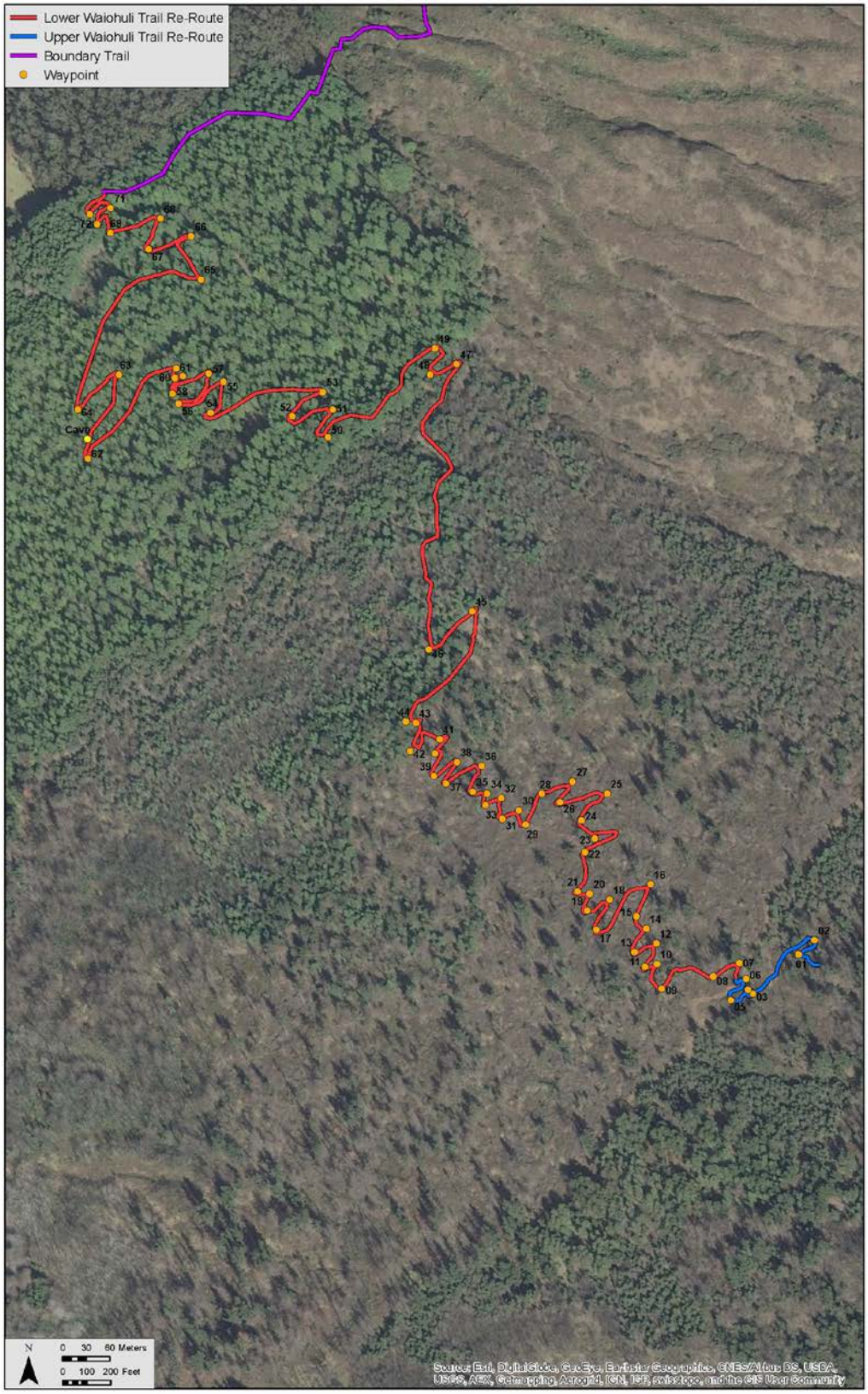

Figure 10. Proposed trail realignment (red line with orange points representing turns) on aerial image, based on client-provided GPS data

HISTORICAL AND CULTURAL CONTEXT OF THE LOWER WAIOHULI TRAIL

This section presents a selection of information related to the project area, including relevant place names and oral history, traditional land uses, known archaeological resources near the project area, historical changes in land uses in and near the project area, and historically-significant features shown on historic maps in and near the project area. As cited appropriately, some of the information provided below is from our discussion with Bob Hobdy.

It is important to note that additional information about some of these topics is presented in more detail in a companion document, a Cultural Impact Assessment (CIA), also prepared by TCP Hawai‘i.

Hawaiian Cultural Landscape: Place Names and Oral History

Hawaiian place names and wahi pana (legendary or storied places) are repositories of oral-historical knowledge, cultural significance and community values about indigenous landscapes. Because Hawaiians did not have a written system of communication prior to the arrival of Captain James Cook in 1778, our understanding of the meaning of Hawaiian place names in based on translations and interpretations from the nineteenth and twentieth century. As such, some places have more than one possible interpretation, which is particularly so since Hawaiians also highly valued both kaona (“hidden meaning”) and huna (“secret meaning”), or “double meanings,” in their poetic description of the natural world.

According to Pukui et al. (1974:226), **Waiohuli** can be translated as “water of change,” but they do not provide any additional interpretation.[2] The adjacent ahupua‘a to the south is **Kēōkea** (“the white sand”). Beyond this, in the next adjacent ahupua‘a of **Kama‘ole** (“childless”), is the famous pūnāwai (fresh-water spring) of **Polipoli**. Pukui et al. (1974:188) list but do not provide a translation of this important wahi pana, which is one of the only known springs in southwestern Maui. Referring to the most authoritative Hawaiian dictionary (Pukui and Elbert 1986), *polipoli* is defined as “a soft, porous stone as used for polishing or for octopus lure sinkers.” Other ahupua‘a to the north are **Kōhoe** (“to show off” or “to twirl”) and **Ka‘ono‘ulu** (“the desire [for] breadfruit”). A small, land-locked ahupua‘a, **Papaanui** (or **Papa‘anui**), is located just mauka of the project area. Pukui et al. (1974) do not list this place name, whose meaning is uncertain. A pu‘u (8,645 ft. elevation) upslope of the project area in Waiohuli Ahupua‘a is called **Kanahau** (“marvelous”).

Hawaiians did not generally construct houses or plant crops above about two or three thousand feet elevation. And, in general, Hawaiian use of the project area environs in pre-Contact (also known as prehistoric) times would have been limited to long-distance travelers passing through this part of Kula Moku (district), perhaps on their way to the summit region of Haleakalā. This journey up the mountain, however, and access to the summit region, in general, was not something carried out by just anyone, and certainly not by maka‘āinana (commoners). Instead, this kind of travel was typically restricted to those in the service of the Ali‘i Nui (high chiefs) or their kāhuna (priests or specialists). Bird hunters would probably have been the most likely type of travelers through this region.

Archaeological Studies and Evidence of Historic Properties

According to our search of the SHPD library, and reference to compendia on Maui archaeological sites (i.e., Walker 1931; Sterling 1998), there are no known, documented sites in or immediately adjacent to the project area. Walker’s (1931) listing of heiau shows numerous traditional Hawaiian temples, both large and small, were once located downslope of the current project area at an elevation of approximately 3,000 ft. (Figure 11). In Waiohuli Ahupua‘a, these heiau included Kaumeheiwa (?) (Site 212), Kaimupeelua (Site 213), and Pauhu (Site 214). This by no means, however, implies there are no historic

[2] The rest of the place name translations in this paragraph, indicated in quotations, are all from Pukui et al. (1974) unless stated otherwise.

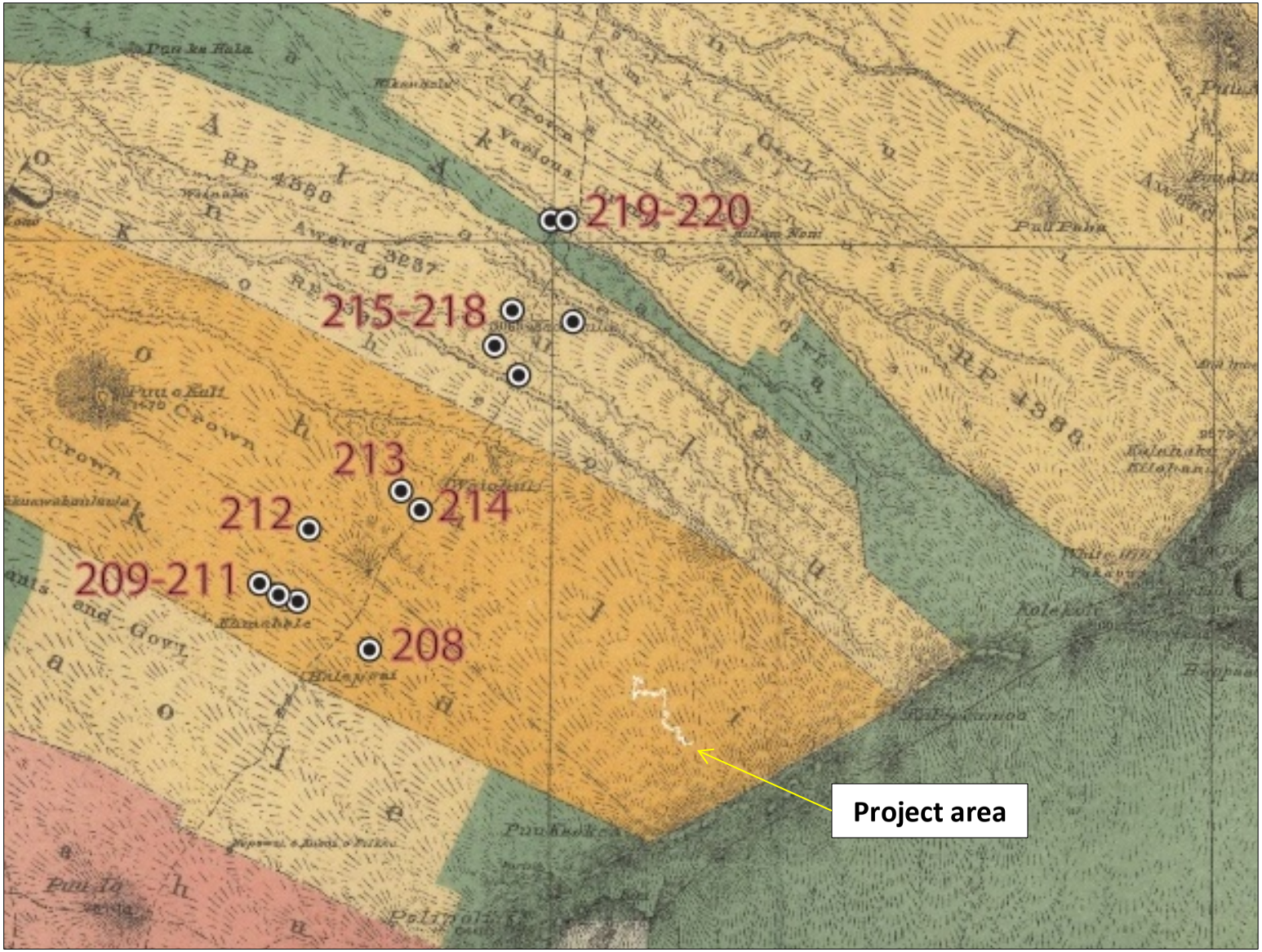

Figure 11. Previously-documented heiau nearest to the current project area (depicted as a white line) projected on an 1885 map by Alexander (base map source UH-Mānoa's digital maps, http://magis.manoa.hawaii.edu/maps/index.html)

properties in or adjacent to the project area, since any structures over 50 years in age qualify as historic properties under Hawai‘i state laws and rules governing historic preservation. There was also the possibility of encountering a fence line or rock wall along the lower boundary of the Lower Waiohuli Trail. There is historical evidence that rock walls were sometimes built by forest rangers along portions of the reserve boundary in the early 1920s to keep cattle out of the forest reserve.

Historical Changes and Map Analysis

Commercial forestry and harvesting of large trees in Hawai‘i began very early in the historic period with the taking of sandalwood (*Santalum* spp.) starting in the 1790s. This fragrant wood was a valuable international trade item, and it connected markets in China with Hawai‘i. By the 1830s, the several species of endemic sandalwood, or ‘iliahi in Hawaiian, were depleted from the archipelago’s forests (Merlin et al. 1990). Starting in the late 1800s, ranchers and sugarcane plantations began replanting efforts to replace trees lost to fire, cattle grazing, and commercial harvesting.

According to Ralph S. Hosmer, Territorial Forester in the early twentieth century, prior to the late 1800s “there was a belt of heavy forest with dense undergrowth” in the Kula district (Hosmer 1912:275). By 1912, overgrazing had resulted in the near complete destruction of the forest to open grass land with the exception of scattered groves of māmane (*Sophora chrysophylla*) and steep-sided gulches that provided protection to pockets of forest from cattle. Kula Forest Reserve, created by Governor’s Proclamation in 1912, was established with the intent to reforest the grasslands. The protection of Polipoli Spring, in particular, was one of the main reasons for creating the Kula Forest Reserve (Hosmer 1912). An intensive planting program began around 1924; and, in the 1930s, the famous Civilian Conservation Corp (CCC) aggressively planted stands of tropical ash (*Fraxinus uhdei*), sugi (*Cryptomeria japonica*), redwood (*Sequoia sempervirens*), maritime pine (*Pinus pinaster*), Monterey pine (*Pinus radiata*) and Monterey cypress (*Cupressus macrocarpa*) (Wong et al. 1969). The redwoods, in particular, have thrived in the current project area. Part of their success is due to their resistance to wildfire, as evidenced by their survival from the recent (2007) fires that swept through this part of Kula.

Hobdy (personal communication) stated that the Polipoli area south of the current project area was the main CCC camp area on the entire island of Maui. Starting in 1927, a ranger station/cabin structure was built at Polipoli, and completed in the 1930s. A major water pipe was built from Polipoli down to the ranchlands by the 1930s.

Figure 12, a portion of 1924 USGS topographic map, shows what appears to be a mauka to makai-oriented ranching wall just north of the current project area in Waiohuli Ahupua‘a. A detailed view of this same map (Figure 13) appears to show a fence line at the location of the lower reaches of the current Lower Waiohuli Trail, along the forest reserve boundary. It is worth noting that there is no evidence of the Lower Waiohuli Trail, itself, at this point in time.

Figure 14, a portion of 1957 USGS topographic map, still does not show any evidence of the Lower Waiohuli Trail, but it does show the upper road to Polipoli in place.

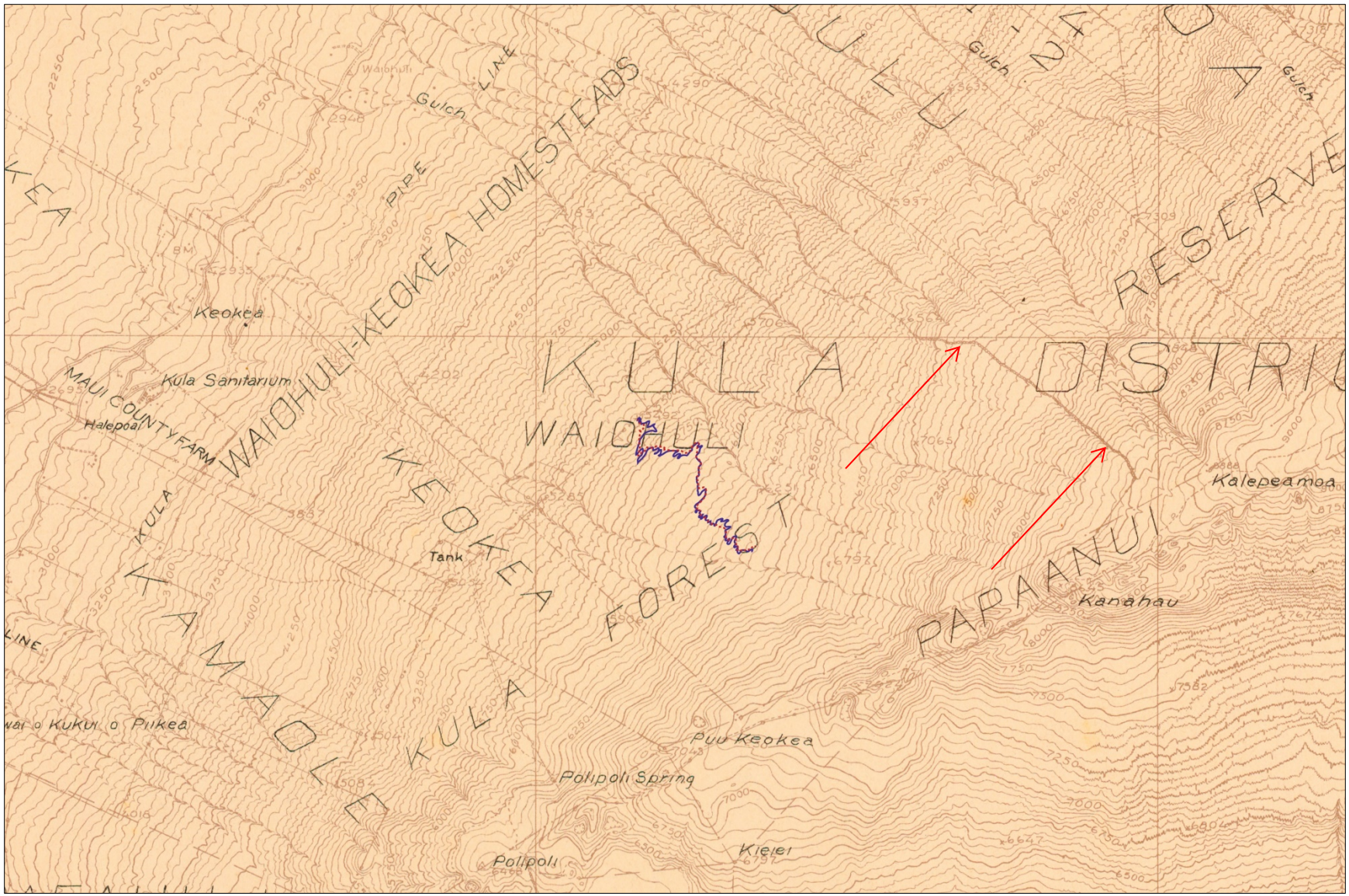

Figure 12. Portion of 1924 USGS topographic map; existing Lower Waiohuli Trail is dashed red line; proposed realignment is purple line; arrows indicate ranching wall (base map source UH-Mānoa's digital maps, http://magis.manoa.hawaii.edu/maps/index.html)

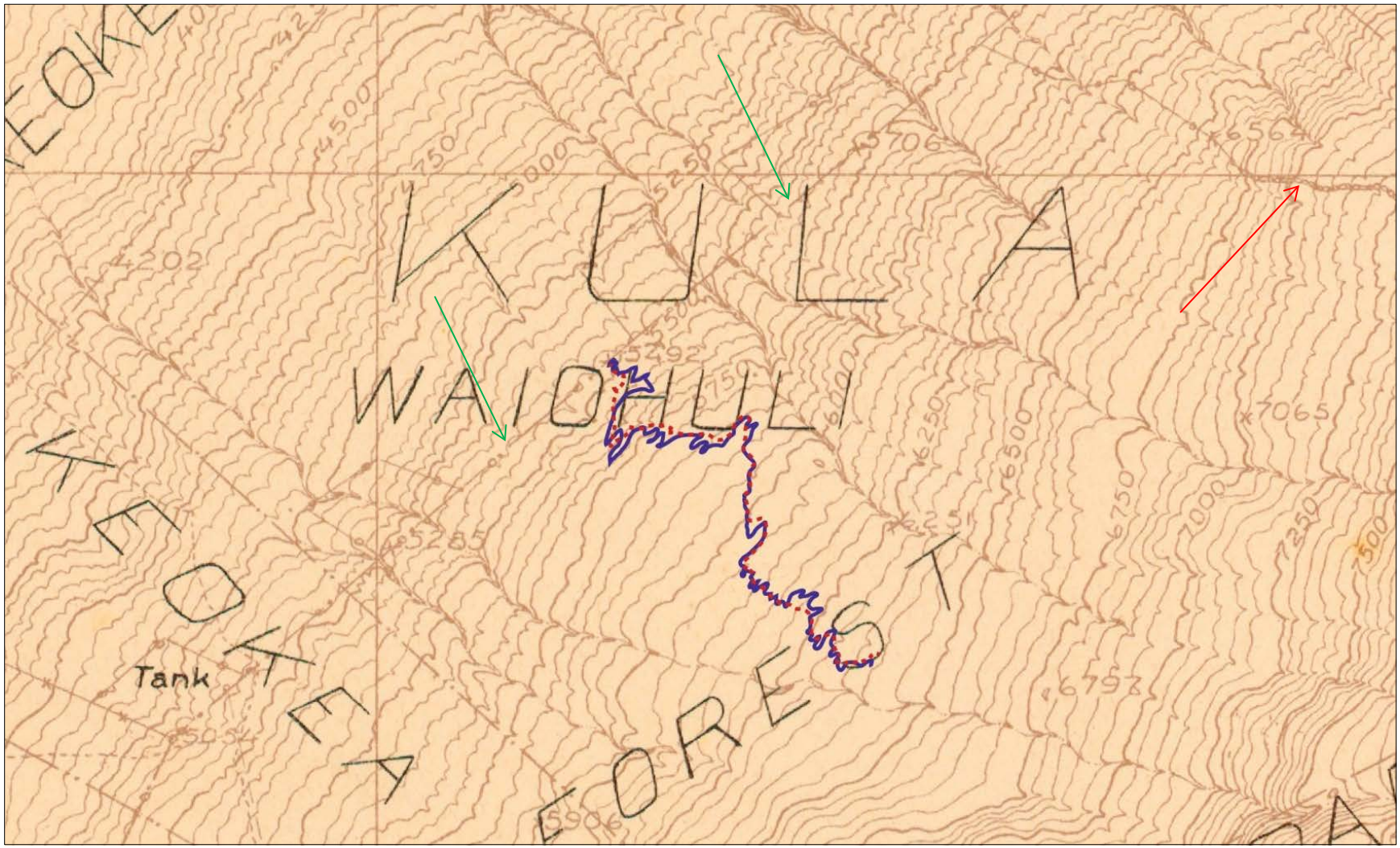

Figure 13. Detail of previous (portion of 1924 USGS topographic) map; existing Lower Waiohuli Trail is dashed red line; proposed realignment is purple line; red arrow indicates ranching wall; green arrows denote probable fence line (base map source UH-Mānoa's digital maps, http://magis.manoa.hawaii.edu/maps/index.html)

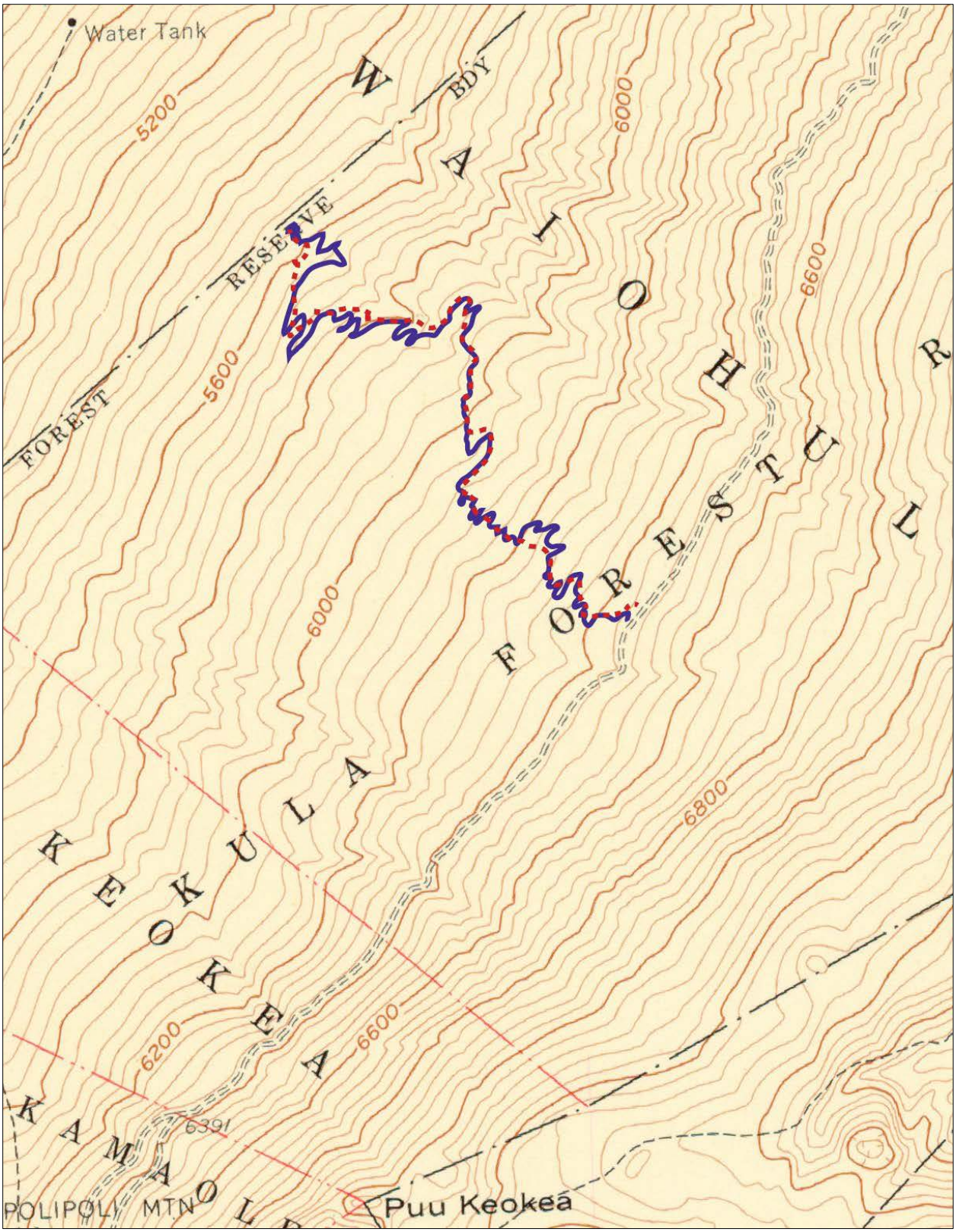

Figure 14. Portion of 1957 USGS topographic map; existing Lower Waiohuli Trail is dashed red line; proposed realignment is purple line

RESULTS OF FIELDWORK

Figure 15 depicts the GPS track log (yellow line) walked by Chris Monahan on March 16, 2017. Two modern features (designated with temporary site numbers TCP 1 and TCP 2) and one possible historic property (TCP 3) were identified during this fieldwork.

TCP 1 (Figure 16) is a small, dry-stacked, rock-retaining structure built along a short portion of the edges of the existing trail in the lower (northwest) section of the project area (see Figure 15). This modern feature is located a short distance north of the proposed realignment. Based on consultation and discussion with Torrie Nohara, we learned that this feature was constructed by Nā Ala Hele staff in the 1990s. The feature consists of an approximately 2.0 meter long section of low (1-2 courses high) stacking along the north edge of the existing trail; and an approximately 4.0 meter long section of low (1-2 courses high) stacking along the south edge of the existing trail. This south edge stacking is discontinuous and grades into a single rock clast alignment in places. The constituent material is mostly small boulders and cobbles of ‘a‘ā. Maximum height of the stacked rocks is approximately 20-30 cm above ground surface. This modern feature is in good to fair physical condition.

TCP 2 (Figure 17) is another small, dry-stacked, rock-retaining structure built along a short portion of the edges of the existing trail in the lower (northwest) section of the project area. This modern feature is located right along the proposed realignment (see Figure 15). We learned that this feature was constructed by Nā Ala Hele staff in the 1990s. The feature consists of an approximately 3.0 meter long section of low (1-2 courses high) stacking along the north edge of the existing trail. A simple earthen cut into the hillside—there is no rock construction—marks the south side of TCP 2. The constituent material is mostly small boulders and cobbles of ‘a‘ā. Maximum height of the stacked rocks is approximately 30-35 cm above ground surface. This modern feature is in good to fair physical condition.

TCP 3 (Figure 18 and Figure 19) is a small cave-like feature (designated TCP 3) located several meters west of the current (existing) trail and immediately adjacent to the proposed realignment (see Figure 15). This is not a true cave, nor a lava tube, but rather a section of fractured, uplifted basalt flow that has created an opening and small shelter area underneath. There are no surface features or humanly-modified structures at TCP 3. The shelter interior measures approximately 4.0 meters long by 2.5 meters wide by 1.5 meters high. Pigs have recently been living and sheltering inside this feature. Although this is an entirely natural feature with no evidence of human modification, subsurface testing (excavation) might yield evidence of human occupation and use. For this reason, we believe TCP 3 is most accurately characterized as a *possible* historic property.

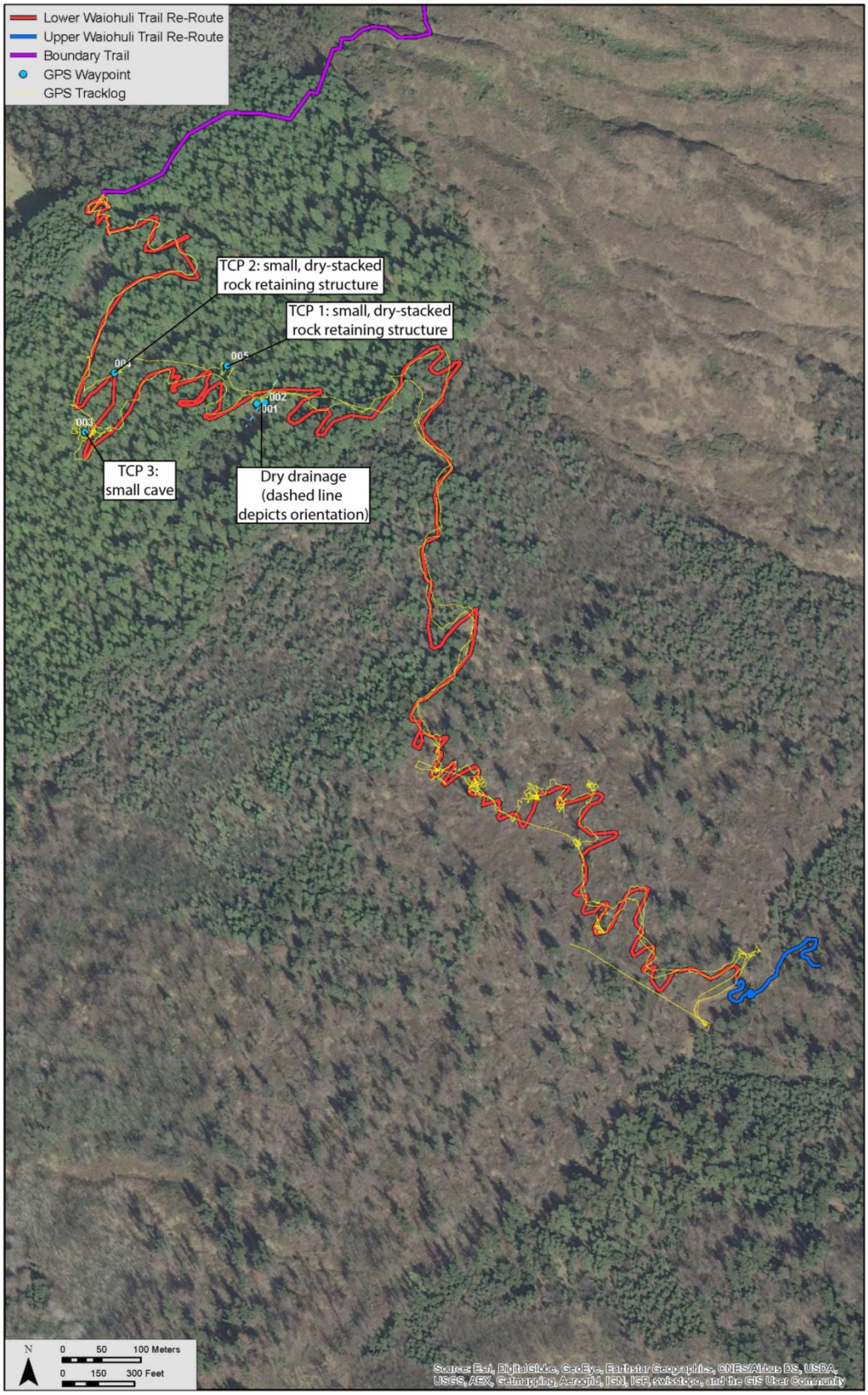

Figure 15. Results of fieldwork depicted on aerial image; TCP 1 and TCP 2 are modern (circa 1990s) features

Figure 16. Small, dry-stacked, rock-retaining structure designated TCP 1 (GPS pt. 005 on the Results maps), view east

Figure 17. Small, dry-stacked, rock-retaining structure designated TCP 2 (GPS pt. 004 on the Results maps), view east

Figure 18. Small cave (designated TCP 3) located along the trail near its lower (makai) end (GPS pt. 003 on the Results maps); measuring tape stretched across the area in front of the entrance to the cave is 3 meters (9.8 feet) long (arrows indicate two ends of the measuring tape)

Figure 19. A closer view of the same cave (TCP 3) entrance; measuring tape is the same as above

CONCLUSION AND RECOMMENDATIONS

TCP Hawai‘i has completed an Archaeological Assessment (AA) of the Lower Waiohuli Trail and a proposed realignment of sections of the existing trail. The approximately 1.5 mile (2.4 km) project area is located in Waiohuli Ahupua‘a, Kula District, Maui Island, in a portion of the Kula Forest Reserve. The trail is in a portion of TMK (2) 2-2-007:001. This AA is intended to serve as a land management tool for Nā Ala Hele. This report does not conform to the State of Hawai‘i’s formal Archaeological Inventory Survey (AIS) rule (HAR § 13-276), but sufficient fieldwork has been conducted to fulfill the basic requirements of an HAR § 13-276 AIS. This document was not prepared in consultation with the State Historic Preservation Division (SHPD).

The principal investigator, Chris Monahan, spent one day (on March 16, 2017) conducting archaeological reconnaissance fieldwork in the project area. In general, our objective was to provide a condition assessment of the landscape over which the trail and the proposed realignment travel, in particular, noting the character, distribution and significance of archaeological sites and other historic properties, if present, in the project area.

We identified two modern features (designated with temporary site numbers TCP 1 and TCP 2) and one possible historic property (TCP 3). **TCP 1** is a small, dry-stacked, rock-retaining structure built along a short portion of the edges of the existing trail in the lower (northwest) section of the project area. This modern feature is located a short distance north of the proposed realignment. **TCP 2** is another small, dry-stacked, rock-retaining structure built along a short portion of the edges of the existing trail in the lower (northwest) section of the project area. This modern feature is located right along the proposed realignment. Based on consultation with Torrie Nohara, we learned that these features (TCP 1 and TCP 2) were constructed by Nā Ala Hele staff in the 1990s. These features are in good to fair physical condition. **TCP 3** is a small cave-like feature several meters west of the current (existing) trail and immediately adjacent to the proposed realignment. This is not a true cave, nor a lava tube, but rather a section of fractured, uplifted basalt flow that has created an opening and small shelter area underneath. Although this is an entirely natural feature with no evidence of human modification, subsurface testing (excavation) might yield evidence of human occupation and use. For this reason, we believe TCP 3 is most accurately characterized as a *possible* historic property.

Recommendations

We recommend the final realignment avoid TCP 3, a small cave-like feature that may represent a historic property. The other modern features (TCP 1 and TCP 2) do not require any special mitigation since they are not historic properties (they were built in the 1990s).

We also recommend additional field inspection by a qualified archaeologist of the upper half of the project area where much of the ground surface is simply not visible, and where it is extremely difficult to walk the precise trail realignment due to abundant downed trees. This work can be conducted in coordination with the downed tree-removal contractor.

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APPENDIX THREE

CULTURAL IMPACT ASSESSMENT

FINAL

CULTURAL IMPACT ASSESSMENT OF LOWER WAIOHULI TRAIL IN SUPPORT OF AN ENVIRONMENTAL ASSESSMENT OF ITS PROPOSED REALIGNMENT WAIOHULI AHUPUA‘A, KULA DISTRICT, ISLAND OF MAUI

TMK (2) 2-2-007:001 (portion)

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May 2017

Makai section of Lower Waiohuli Trail, which winds through redwoods and pines, as the Nāulu fog rolls in (photograph taken in the late afternoon on 16 March, 2017)

ACKNOWLEDGMENTS

Mahalo to Torrie Nohara (Nā Ala Hele Trails and Access Program, Division of Forestry and Wildlife, Department of Land and Natural Resources, State of Hawai‘i) for supporting us during this project. Thanks as well goes out to Mark Howland (WHALE Environmental Services, LLC) for connecting us with Torrie. Bob Hobdy, retired Division of Forestry and Wildlife (DOFAW) District Manager, Department of Land and Natural Resources, State of Hawai‘i, generously shared his time and knowledge with us, and we mahalo him as well. Mahalo to Garret Hew and Sumner Erdman for speaking with us as well.

ABSTRACT – EXECUTIVE SUMMARY

TCP Hawaiʻi has completed a Cultural Impact Assessment (CIA) of the Lower Waiohuli Trail and a proposed realignment of sections of the existing trail. The approximately 1.5 mile (2.4 km) project area is located in Waiohuli Ahupuaʻa, Kula District, Maui Island, in a portion of the Kula Forest Reserve. The trail is in a portion of TMK (2) 2-2-007:001. This CIA is written in accordance with HRS § 343 (law governing Environmental Impact Statements [EIS]) and HAR § 11-200 (rules governing content of EIS and Environmental Assessment [EA] documents) as well as the OEQC's 2012 Guide to the Implementation and Practice of the Hawaii Environmental Policy Act. TCP Hawaiʻi also conducted a companion Archaeological Assessment (AA) of this same project area (Monahan 2017), during which two recently-constructed (in the 1990s) features (designated with temporary site numbers TCP 1 and TCP 2) and one possible historic property (TCP 3) were identified, as discussed in this CIA. We conducted one formal interview with Bob Hobdy for this CIA, and also spoke informally about the proposed project with (1) Garret Hew, who lives makai of the project area in lower Kula, and has worked as a water resource manager on Maui for more than 30 years, and (2) Sumner Erdman of ʻUlupalakua Ranch. The results of this consultation are presented in this CIA along with the findings of our archival research, which included historical map analysis; review of Māhele ʻĀina (Land Commission) records; a consideration of the Hawaiian cultural landscape; nineteenth-century developments in and near the project area; early twentieth-century developments in and near the project area; and the results of our most recent archaeological assessment of the project area. We recommend the final realignment avoid TCP 3, a small cave-like feature that may possibly be a historic property. The other modern features (TCP 1 and TCP 2) do not require any special mitigation since they are not historic properties (they were built in the 1990s). We also recommend additional field inspection by a qualified archaeologist of the upper half of the project area where much of the ground surface is simply not visible, and where it is extremely difficult to walk the precise trail realignment due to abundant downed trees. This work can be conducted in coordination with the downed tree-removal contractor.

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INTRODUCTION

On behalf of the Nā Ala Hele Trails and Access Program (Division of Forestry and Wildlife, Department of Land and Natural Resources, State of Hawai‘i), TCP Hawai‘i, LLC, has completed a Cultural Impact Assessment (CIA) of the Lower Waiohuli Trail and a proposed realignment of sections of the existing trail. The approximately 1.5 mile (2.4 km) project area is located in Waiohuli Ahupua‘a, Kula District, Maui Island, in a portion of the Kula Forest Reserve (Figure 1 and Figure 2). The trail is in a portion of TMK (2) 2-2-007:001. In general, the objective of the proposed project is to realign portions of the existing Lower Waiohuli Trail to a more gradual (less steep) grade, which necessitates the creation of numerous, short switch-backs.

Purpose and Content of Cultural Impact Assessments

This CIA is designed to satisfy HRS § 343 (law governing Environmental Impact Statements [EIS]) and HAR § 11-200 (rules governing content of EIS and Environmental Assessment [EA] documents) as well as the OEQC's 2012 Guide to the Implementation and Practice of the Hawaii Environmental Policy Act (see Appendix A for a relevant excerpt). Interestingly, cultural resources valued by individuals and communities with historical and genealogical ties to a given project area may be different than those deemed significant by "outsiders," including scientists, anthropologists, and other researchers not from the area.[1] Likewise, the same resource may be valued in different ways by "insiders" and "outsiders." A pertinent example in this study is the abundance of redwood (*Sequoia sempervirens*) trees in the project area. This resource may be viewed by those interested in the pre-Contact Hawaiian landscape as invasive species, reflecting the history of deforestation and loss in the upland of Kula; others, for example, may interpret these trees as part of the history of the Civilian Conservation Corps (CCC) in the 1930s. In CIA work, we are interested in both of these perspectives. Our objectives are to identify *all* the various types of cultural resources in and near the project area, to explain why they are important to different individuals or groups, and to recommend ways they can be preserved or protected, if appropriate. We are also interested in expressing the intangible values people attribute to the project area. Maly and Maly (2005), citing Kent et al. (1995), use the term "cultural attachment" to describe this important class of phenomenon:

> "Cultural Attachment" embodies the tangible and intangible values of a culture—how a people identify with, and personify the environment around them. It is the intimate relationship (developed over generations of experiences) that people of a particular culture feel for the sites, features, phenomena, and natural resources etc., that surround them—their sense of place. This attachment is deeply rooted in the beliefs, practices, cultural evolution, and identity of a people. The significance of cultural attachment in a given culture is often overlooked by others whose beliefs and values evolved under a different set of circumstances. (Maly and Maly 2005:3)

In Hawai‘i, commonly identified cultural resources include archaeological sites; burial sites and cemeteries; wahi pana (legendary places associated with oral history); natural landscape features[2] such as pu‘u (e.g., hills, outcrops and other promontories), ridges, and water sources and courses; natural phenomena such as characteristic weather patterns, winds and rain (many of which have place-specific names); and other place names and landscape features that are important to local families. Such resources need not necessarily refer to Hawaiian culture but may also include other ethnic groups.

In our Conclusion following the presentation of results, we present several recommendations as they relate to cultural resource impacts and mitigation.

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[1] Anthropologists have long recognized the value in studying both "insider" and "outsider" perspectives, called "emic" and "etic," respectively, when trying to understand cultural values and significance.

[2] In Hawaiian culture, there is no hard and fast distinction between cultural and natural resources; thus, for example, a clean and healthy kahawai (stream) is just as much a cultural resource—because its existence is crucial to carrying out traditional and customary practices such as irrigated (pond-field) agriculture—as a natural one.

We conducted one formal interview with Bob Hobdy for this CIA, and spoke informally about the proposed project with (1) Garret Hew, who lives makai of the project area in lower Kula around 3,200-ft. elevation; and (2) Sumner Erdman or ʻUlupalakua Ranch. The results of this consultation are presented in this CIA along with the findings of our archival research, which included historical map analysis; review of Māhele ʻĀina (Land Commission) records; information on the Hawaiian cultural landscape; nineteenth-century developments in and near the project area; early twentieth-century developments in and near the project area; and the results of our most recent archaeological assessment of the project area.

Project Area Description

The Lower Waiohuli Trail begins along the Polipoli State Park Access Road (Figure 3), near the Upper Waiohuli/Waiakoa trailhead; and heads downslope, in the makai[3] direction, until it connects at a T-shaped junction with the Boundary Trail, a cross-slope trail along the lower edge of the Kula Forest Reserve. The terrain over which the trail passes is relatively steep. Mean annual rainfall in the project area is approximately 35 inches (889 mm) (Giambelluca et al. 2013), but it also receives additional precipitation from fog and mist that rolls in many afternoons (see photograph on the title page). Due to its relatively high elevation (~6,400 to 5,520 ft. [1,951 to 1,683 m] above mean sea level), the project area enjoys a cool climate, with a mean annual temperature of 53°F.

A Biological Survey of the project area (Starr and Starr 2017) provides some important information on historic and modern changes to the landscape and vegetation in and around the project area. According to Starr and Starr (2017:2), prior to the arrival of the first humans on Maui, vegetation in and around the project area was a "diverse mesic to subalpine native forest" with a canopy of koa (*Acacia koa*), ʻōhiʻa (*Mestrosideros polymorpha*), ʻiliahi (*Santalum haleakalae*), and māmane (*Sophora chrysophylla*). Following the start of Hawaiian settlement in the islands, "a series of forces including fires, agriculture, forestry, and introduced plants, animals, and diseases transformed the site [project area] to predominantly non-native vegetation" (ibid.) In historic times, the primary land uses have been cattle grazing and forestry plantings. In 2007, "a large fire swept through the mauka portion of the [project] area killing many of the plants. Subsequently, many of the dead large trees were blown down by strong winds during hurricane Iselle and other strong storms, creating a jumble of logs covered in raspberry [blackberry] thickets. The makai portion did not burn and the trees remain standing" (ibid.). Currently, the project area and environs is managed for recreation, hunting and watershed protection purposes. Most of the vegetation is currently invasive. Figure 4 to Figure 8 show representative photographs of the project area taken on our recent (March, 2017) reconnaissance.

[3] Hawaiian words are not italicized in TCP Hawaiʻi reports since ʻŌlelo Hawaiʻi (Hawaiian) is an official state language, not a foreign language, and has been since the late 1970s.

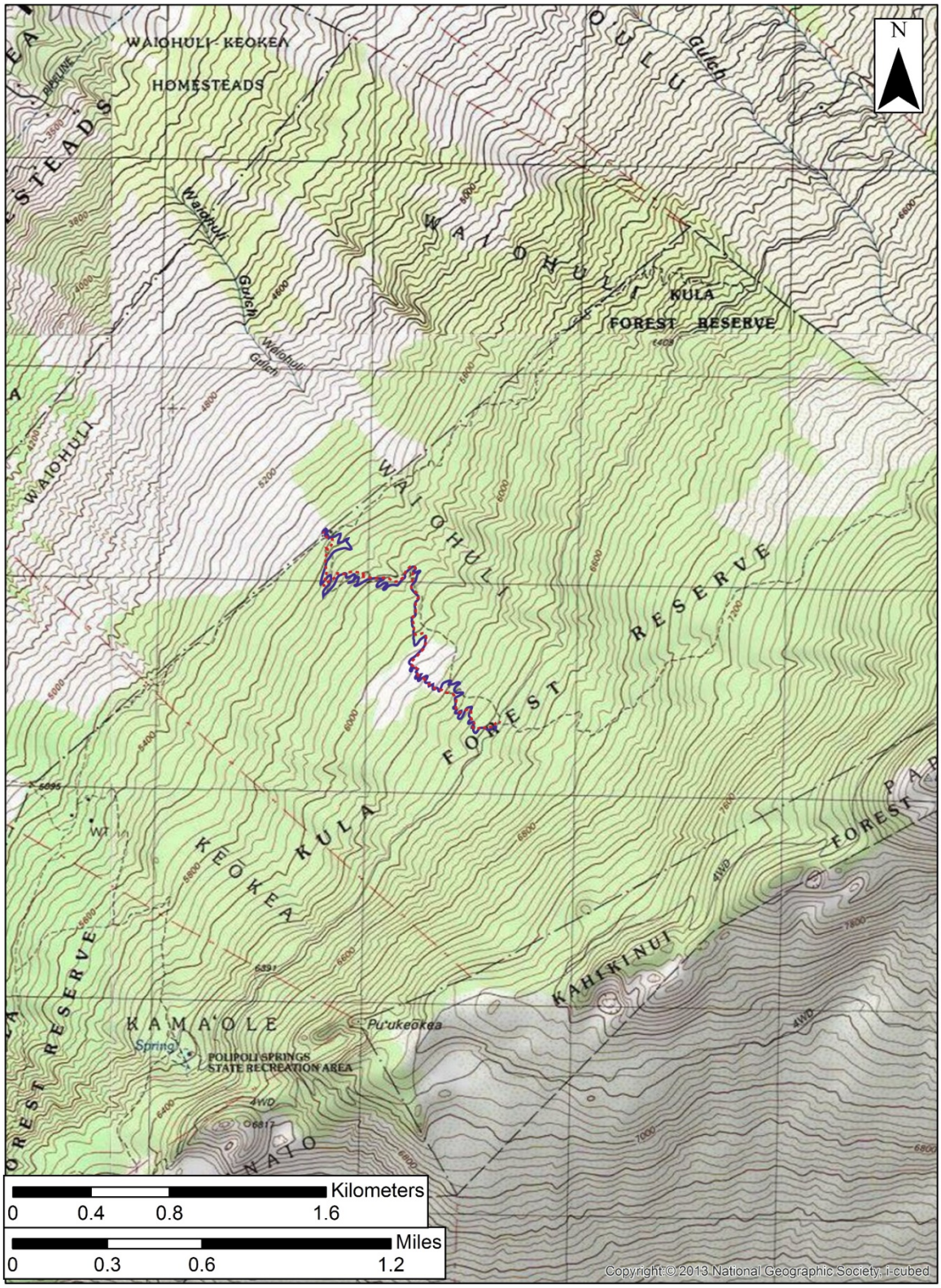

Figure 1. Portion of 1995 USGS topographic (1:24,000 scale) Luala'ilua quadrangle map showing project area/proposed realignment as purple line; current/existing trail is dashed red line; the black dashed line on the USGS map appears to be an earlier version of the trail

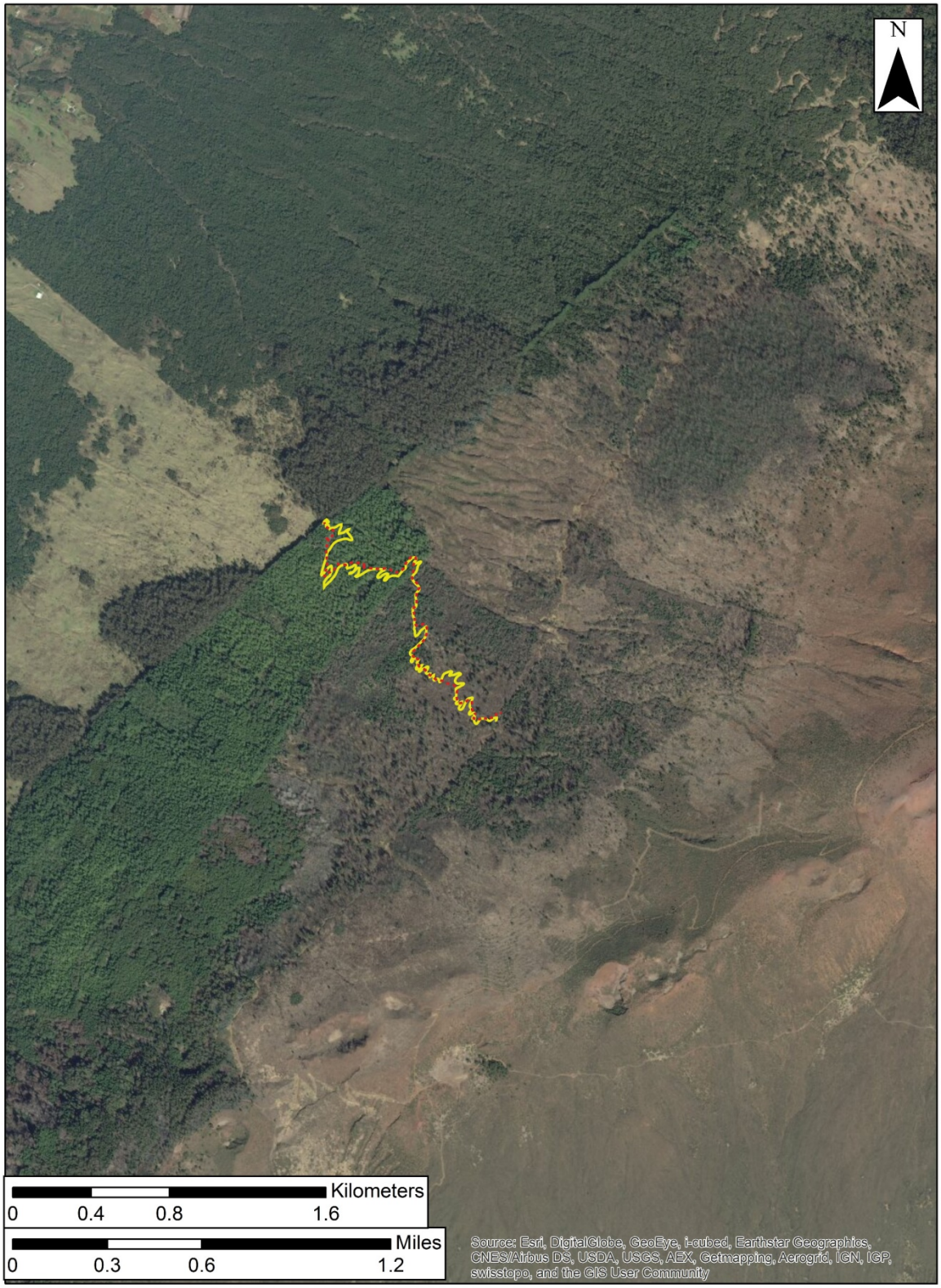

Figure 2. Aerial image showing project area/proposed realignment (yellow line); current/existing trail is depicted as dashed red line

Figure 3. Trail head facing makai along the unimproved (4-WD) road to Polipoli State Park, view west-southwest

Figure 4. View of the proposed realignment where it intersects with the existing trail in its upper (mauka) section; note, orange flagging tape in the background denotes realignment route

Figure 5. Another view of the proposed realignment where it intersects with the existing trail in its upper (mauka) section; note, orange flagging tape in the background (right) denotes realignment route

Figure 6. Example of blackberry bushes that cover major portions of the upper project area and trail realignment; these are an extremely noxious invasive species that were difficult to get through

Figure 7. Example of downed trees in the middle section of the project area

Figure 8. A portion of the existing trail in the lower project area

METHODS

This section describes the methods of a field inspection, archival research, consultation/interviews, and report writing activities for this project.

Field Inspection

We obtained details on the proposed trail realignment and its geospatial location prior to conducting a field inspection for this CIA. Torrie Nohara (Nā Ala Hele) provided GIS data (shapefiles) of the preliminary trail realignment based on a professional terrain study by a trail designer (consultant) who flagged the route on the ground (using orange surveyors tape). This client-provided data indicated the presence of a cave near the makai end of the trail that we investigated.

Because the Lower Waiohuli Trail is on public land, there were no specific access issues other than the fact that a 4-WD vehicle is needed to reach the trailhead.

Using the GIS data provided by Nā Ala Hele, our GIS Specialist, Todd Tulchin, programmed a Garmin GPS with all relevant information, including project area and TMK boundaries, as well as previous waypoints and track logs. This allowed us to follow the orange-flagged trail realignment using a hand-held GPS device in addition to the "on the ground" markers (orange flags). We also produced topographic and aerial images with the existing trail and proposed realignment for reference in the field (Figure 9 and Figure 10).

Field documentation of landscape features of interest and potential historic properties included GPS recordation, photography, field notes and schematic sketches. The GPS device we used (Garmin) is ideal for reconnaissance because of its durability, speed and ability to obtain a signal under the tree canopy. The geospatial resolution (standard error), however, is only about 2-3 m at best. If more accurate geospatial (locational) data are needed for future work on potential historic properties that may be impacted by the proposed realignment, we recommend use of a mapping grade GPS (we use a Trimble), which obtains geospatial accuracy to within 10-20 cm.

Mitigating Factors, Conditions and Caveats

In general, our objective was to walk as precisely as possible the marked trail realignment. In reality, conditions on the ground in the upper half or so of the project area made this a difficult task. As described in the Introduction, a 2007 wildfire that raged through the mauka portion of the project area killed many trees that eventually toppled over in storms such as hurricane Iselle (see Figure 7). This created a jumble of logs covered in extremely hazardous (thorny) blackberry growth (see Figure 6). The result of these recent events is that there are places in the upper half of the project area where the ground surface is simply not visible, where it is currently impossible to walk the precise trail realignment, and where additional archaeological observation should be made in the future once more clearing of downed trees is accomplished (see Conclusion). In the lower half of the project area, ground visibility is generally good to excellent, and one can observe conditions on the ground surface from a distance without having to walk the precise realignment route.

Archival Research

Prior to going into the field, Monahan utilized TCP Hawai‘i's reference library to obtain some general information about the project area and its environs. Monahan also visited the State Historic Preservation Division's (SHPD) library of reference materials in Kapolei (no reports of any previous archaeological studies in or near the project area were found).

We also utilized these on-line databases to obtain cultural, historical and archaeological data:

- OHA's Papakilo database (http://papakilodatabase.com/main/main.php)

- OHA's Kipuka database (http://kipukadatabase.com/kipuka/)
- Bernice P. Bishop Museum archaeological site database (http://has.bishopmuseum.org/index.asp)
- Bishop's Hawaii Ethnological Notes (http://data.bishopmuseum.org/HEN/browse.php?stype=3)
- University of Hawai'i-Mānoa's digital maps (http://magis.manoa.hawaii.edu/maps/index.html)
- DAGS' State Land Survey (http://ags.hawaii.gov/survey/map-search/)
- Waihona 'Aina website (www.waihona.com)
- Digital newspaper archive "Chronicling America, Historic American Newspapers" (http://chroniclingamerica.loc.gov/lccn/sn82014681/)
- US Library of Congress digital maps (https://www.loc.gov/maps/)
- Hawai'i State Archives digital collections (http://archives1.dags.hawaii.gov/)

Consultation/Interviews

In addition to consulting with Torrie Nohara, who has direct knowledge of the project area, we also consulted with Robert ("Bob") Hobdy, retired Division of Forestry and Wildlife (DOFAW) District Manager, Department of Land and Natural Resource, State of Hawai'i, by phone on May 1, 2017. Chris Monahan spoke with Mr. Hobdy for about 30 minutes. He had specific knowledge of the project area and environs In addition to Mr. Hobdy, Chris Monahan also spoke informally by phone on May 24, 2017, with Garret Hew, a small-time rancher born and raised on Maui, and a water resource management professional with over 30 years of experience who lives makai of the project area in lower Kula. Finally, on May 25, 2017, Chris Monahan also spoke informally by phone with Sumner Erdman of 'Ulupalakua Ranch.

Report Writing Activities

Our GPS data were professionally processed, incorporated into a GIS database, and projected on georeferenced aerial images by our GIS Specialist (Todd Tulchin) using standard ESRI software.

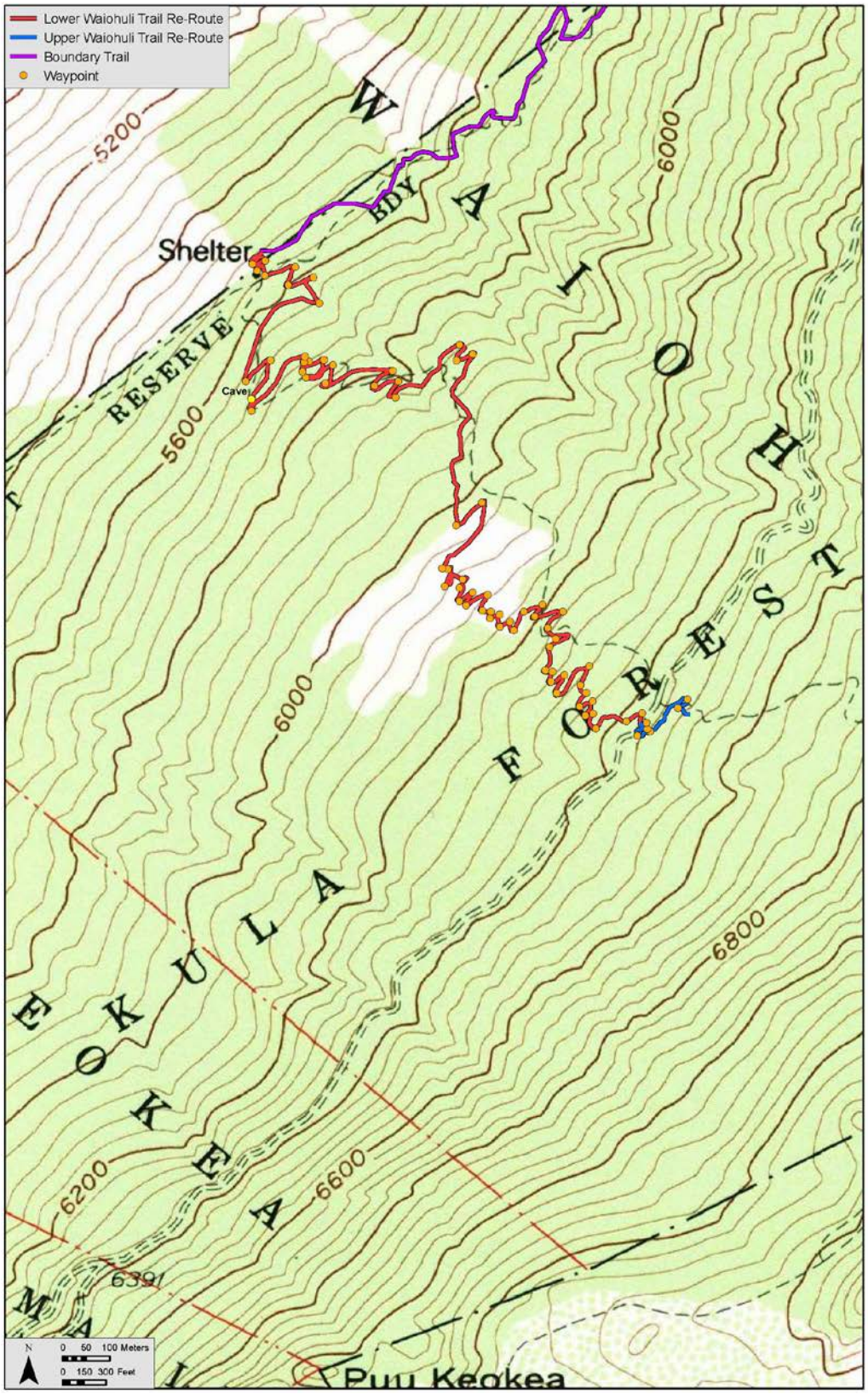

Figure 9. Proposed trail realignment (red line with orange points representing turns) on portion of 1995 USGS topographic map, based on client-provided GPS data

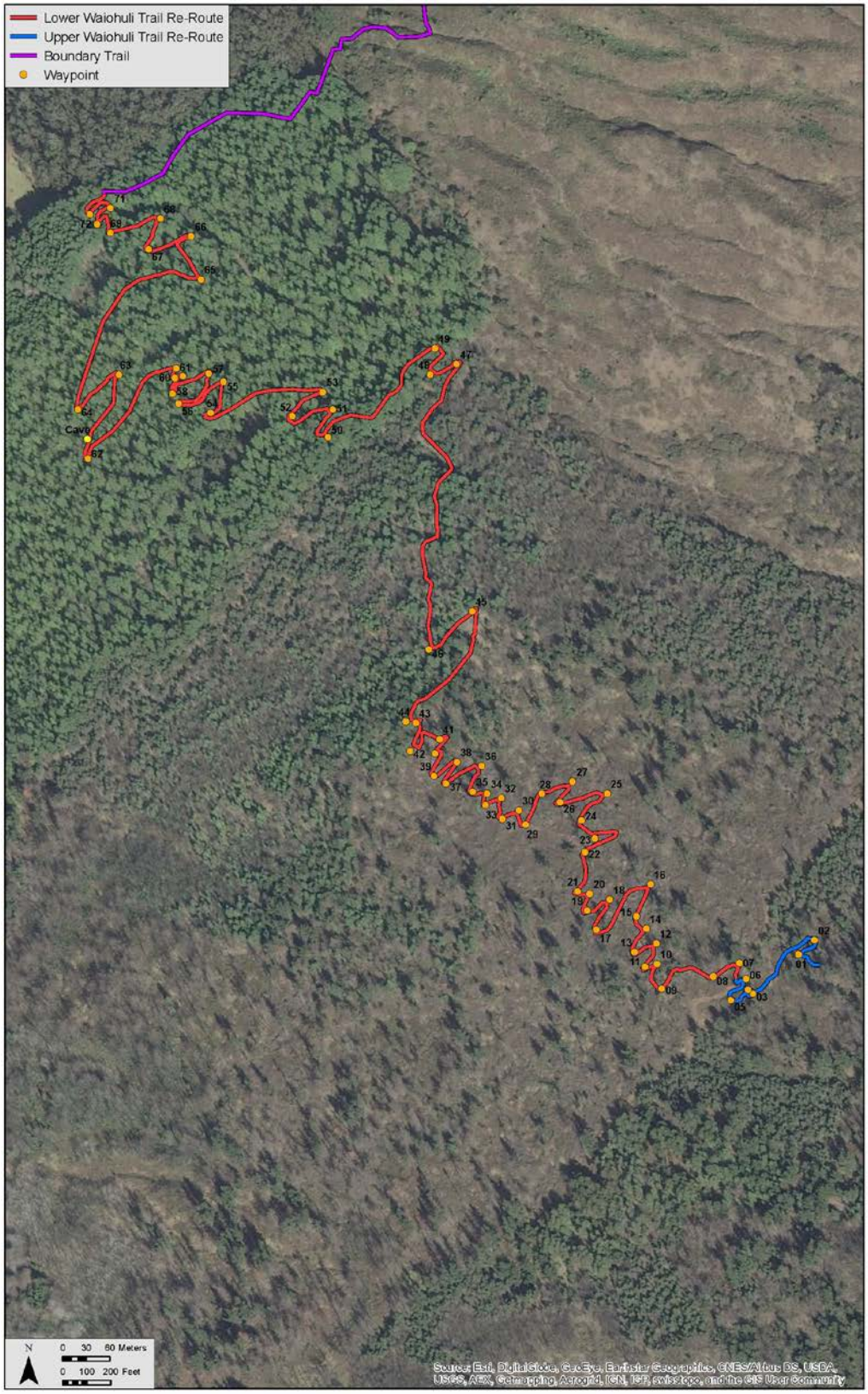

Figure 10. Proposed trail realignment (red line with orange points representing turns) on aerial image, based on client-provided GPS data

HISTORICAL AND CULTURAL CONTEXT OF THE LOWER WAIOHULI TRAIL

This section presents a selection of information related to the project area, including relevant place names and oral history, traditional land uses, historical changes in land uses in and near the project area, and historically-significant features shown on historic maps in and near the project area. As cited appropriately, some of the information provided below is from our discussion with Bob Hobdy.

Hawaiian Cultural Landscape: Place Names and Oral History

Hawaiian place names and wahi pana (legendary or storied places) are repositories of oral-historical knowledge, cultural significance and community values about indigenous landscapes. Because Hawaiians did not have a written system of communication prior to the arrival of Captain James Cook in 1778, our understanding of the meaning of Hawaiian place names in based on translations and interpretations from the nineteenth and twentieth century. As such, some places have more than one possible interpretation, which is particularly so since Hawaiians also highly valued both kaona ("hidden meaning") and huna ("secret meaning"), or "double meanings," in their poetic description of the natural world.

According to Pukui et al. (1974:226), **Waiohuli** can be translated as "water of change," but they do not provide any additional interpretation.[4] The adjacent ahupuaʻa to the south is **Kēōkea** ("the white sand"). Beyond this, in the next adjacent ahupuaʻa of **Kamaʻole** ("childless"), is the famous pūnāwai (fresh-water spring) of **Polipoli**. Pukui et al. (1974:188) list but do not provide a translation of this important wahi pana, which is one of the only known springs in southwestern Maui. Referring to the most authoritative Hawaiian dictionary (Pukui and Elbert 1986), *polipoli* is defined as "a soft, porous stone as used for polishing or for octopus lure sinkers." Other ahupuaʻa to the north are **Kōhoe** ("to show off" or "to twirl") and **Kaʻonoʻulu** ("the desire [for] breadfruit"). A small, land-locked ahupuaʻa, **Papaanui** (or **Papaʻanui**), is located just mauka of the project area. Pukui et al. (1974) do not list this place name, whose meaning is uncertain. A puʻu (8,645 ft. elevation) upslope of the project area in Waiohuli Ahupuaʻa is called **Kanahau** ("marvelous").

Hawaiians did not generally construct houses or plant crops above about two or three thousand feet elevation. And, in general, Hawaiian use of the project area environs in pre-Contact (also known as prehistoric) times would have been limited to long-distance travelers passing through this part of Kula Moku (district), perhaps on their way to the summit region of Haleakalā. This journey up the mountain, however, and access to the summit region, in general, was not something carried out by just anyone, and certainly not by makaʻāinana (commoners). Instead, this kind of travel was typically restricted to those in the service of the Aliʻi Nui (high chiefs) or their kāhuna (priests or specialists). Bird hunters would probably have been the most likely type of travelers through this region.

Historical Changes and Map Analysis

Commercial forestry and harvesting of large trees in Hawaiʻi began very early in the historic period with the taking of sandalwood (*Santalum* spp.) starting in the 1790s. This fragrant wood was a valuable international trade item, and it connected markets in China with Hawaiʻi. By the 1830s, the several species of endemic sandalwood, or ʻiliahi in Hawaiian, were depleted from the archipelago's forests (Merlin et al. 1990). Starting in the late 1800s, ranchers and sugarcane plantations began replanting efforts to replace trees lost to fire, cattle grazing, and commercial harvesting.

According to Ralph S. Hosmer, Territorial Forester in the early twentieth century, prior to the late 1800s "there was a belt of heavy forest with dense undergrowth" in the Kula district (Hosmer 1912:275). By 1912, overgrazing had resulted in the near complete destruction of the forest to open grass land with the exception of scattered groves of māmane (*Sophora chrysophylla*) and steep-sided gulches that provided

[4] The rest of the place name translations in this paragraph, indicated in quotations, are all from Pukui et al. (1974) unless stated otherwise.

protection to pockets of forest from cattle. Kula Forest Reserve, created by Governor's Proclamation in 1912, was established with the intent to reforest the grasslands. The protection of Polipoli Spring, in particular, was one of the main reasons for creating the Kula Forest Reserve (Hosmer 1912). An intensive planting program began around 1924; and, in the 1930s, the famous Civilian Conservation Corp (CCC) aggressively planted stands of tropical ash (*Fraxinus uhdei*), sugi (*Cryptomeria japonica*), redwood (*Sequoia sempervirens*), maritime pine (*Pinus pinaster*), Monterey pine (*Pinus radiata*) and Monterey cypress (*Cupressus macrocarpa*) (Wong et al. 1969). The redwoods, in particular, have thrived in the current project area. Part of their success is due to their resistance to wildfire, as evidenced by their survival from the recent (2007) fires that swept through this part of Kula.

Hobdy (personal communication) stated that the Polipoli area south of the current project area was the main CCC camp area on the entire island of Maui. Starting in 1927, a ranger station/cabin structure was built at Polipoli, and completed in the 1930s. A major water pipe was built from Polipoli down to the ranchlands by the 1930s.

Figure 11, a portion of 1885 Hawaiian Kingdom map with the current project area georeferenced, shows no features in or near the Lower Waiohuli Trail, and no evidence of any trails nearby, but it does depict several residential structures downslope along the government belt road.

Figure 12, a portion of 1903 (annotated from an 1885 base map) map, again shows no features or trails nearby the current project area. It labels what would later (in the 1920s) become the Waiohuli-Keokea Homesteads with "Good Agricultural Lands."

Figure 13, a portion of 1911 map that appears to have been produced in association with the establishment of the Kula Forest Reserve, shows no trails or feature near the current project area, but it does depict an extensive network of trials south of Waiohuli in Keokea and down to the Polipoli area. This is significant as it suggests the absence of trails in the Lower Waiohuli Trail area is probably a true reflection of there not being one there at this time. In other words, this map evidence argues the Lower Waiohuli Trail is no older than the twentieth century.

Figure 14, a portion of 1924 USGS topographic map, shows what appears to be a mauka to makai-oriented ranching wall just north of the current project area in Waiohuli Ahupuaʻa. A detailed view of this same map (Figure 15) appears to show a fence line at the location of the lower reaches of the current Lower Waiohuli Trail, along the forest reserve boundary. It is worth noting that there is still no evidence of the Lower Waiohuli Trail, itself, at this point in time, although a portion of trail network can be seen in Keokea (see Figure 15).

Figure 16, a portion of 1929 map, shows much the same evidence as the 1924 maps. Interestingly, this map shows another spring, labeled Waihou, just south-southwest of Polipoli. In our brief consultation/ discussion with Sumner Erdman, he mentioned knowing about another spring in this general area (see below).

Figure 17, a portion of 1957 USGS topographic map, still does not show any evidence of the Lower Waiohuli Trail, but it does show the upper road to Polipoli in place. This absence of the trail as late as 1957 is consistent with the conclusion that the trail is not a historic property.

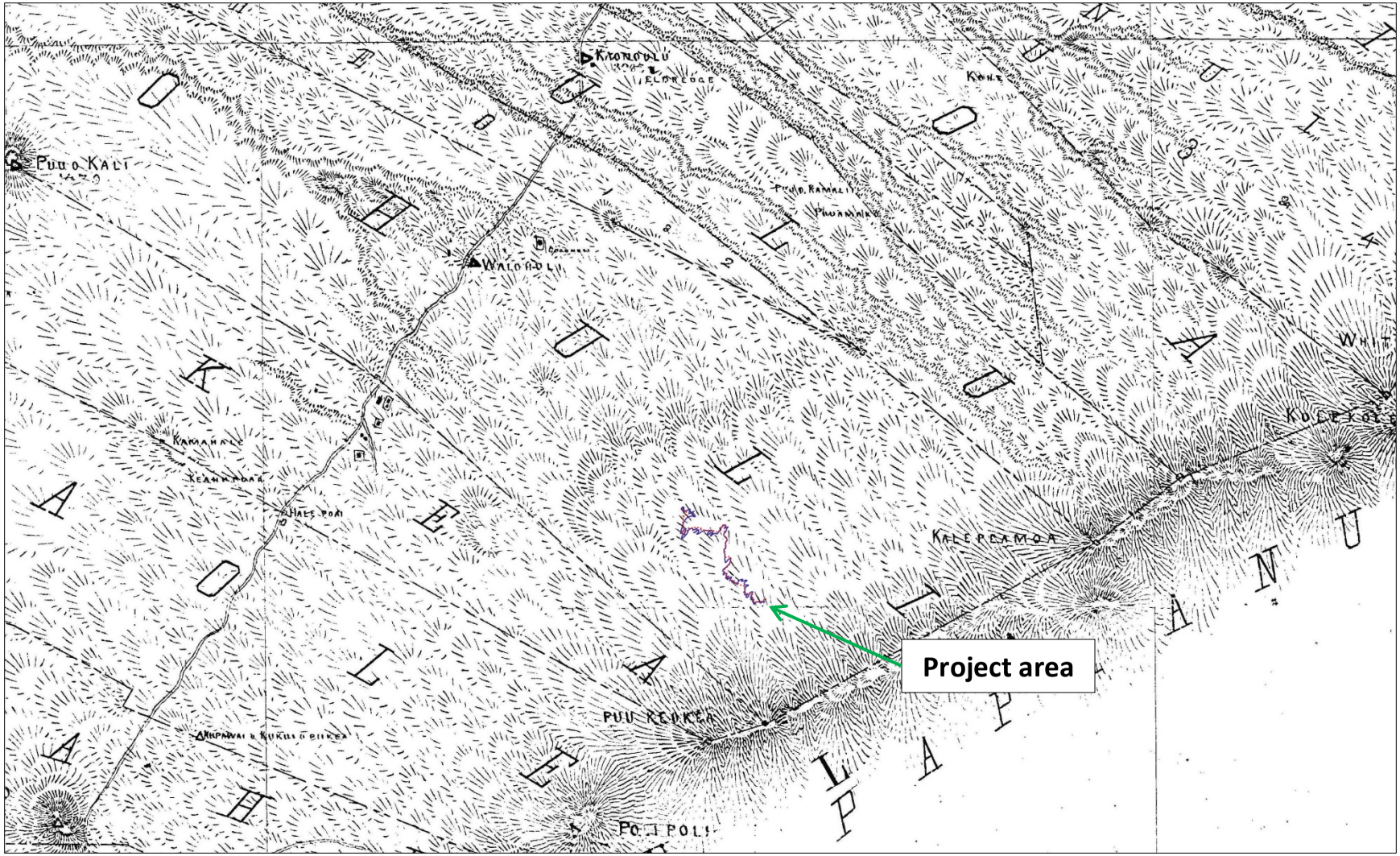

Figure 11. Portion of an 1885 Hawaiian Kingdom map (Registered Map 1269) (base map source Hawai‘i State Land Survey, DAGS digital collection); note houses down slope along the government road

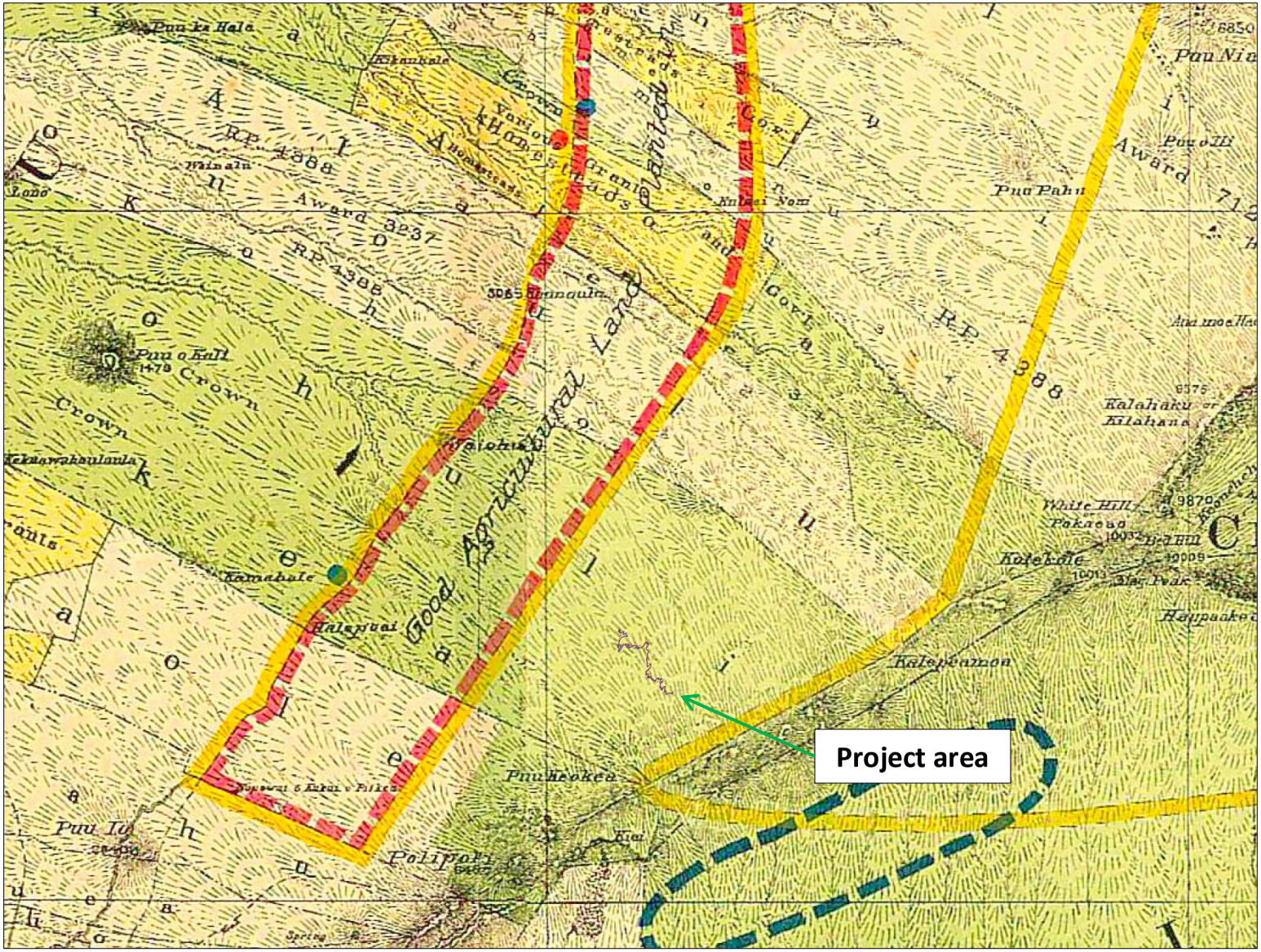

Figure 12. Portion of a 1903 Territorial map (annotated by John M. Donn) based on a Hawaiian Kingdom map from 1885 by W.D. Alexander (Registered Map 1268) (base map source Hawai‘i State Land Survey, DAGS digital collection)

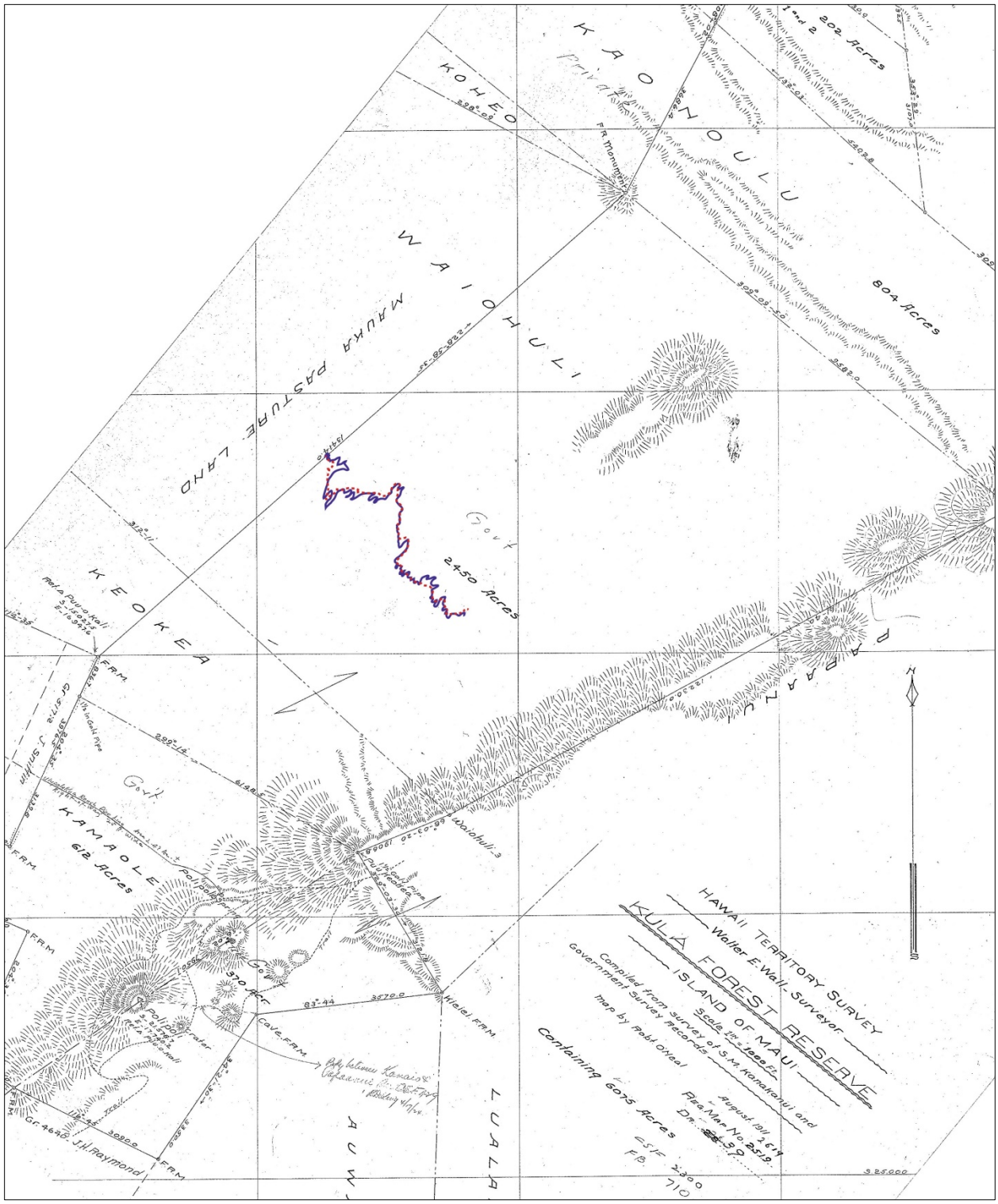

Figure 13. Portion of a 1911 land survey map (Registered Map 2519) (source: Hawai'i State Land Survey, DAGS digital collection)

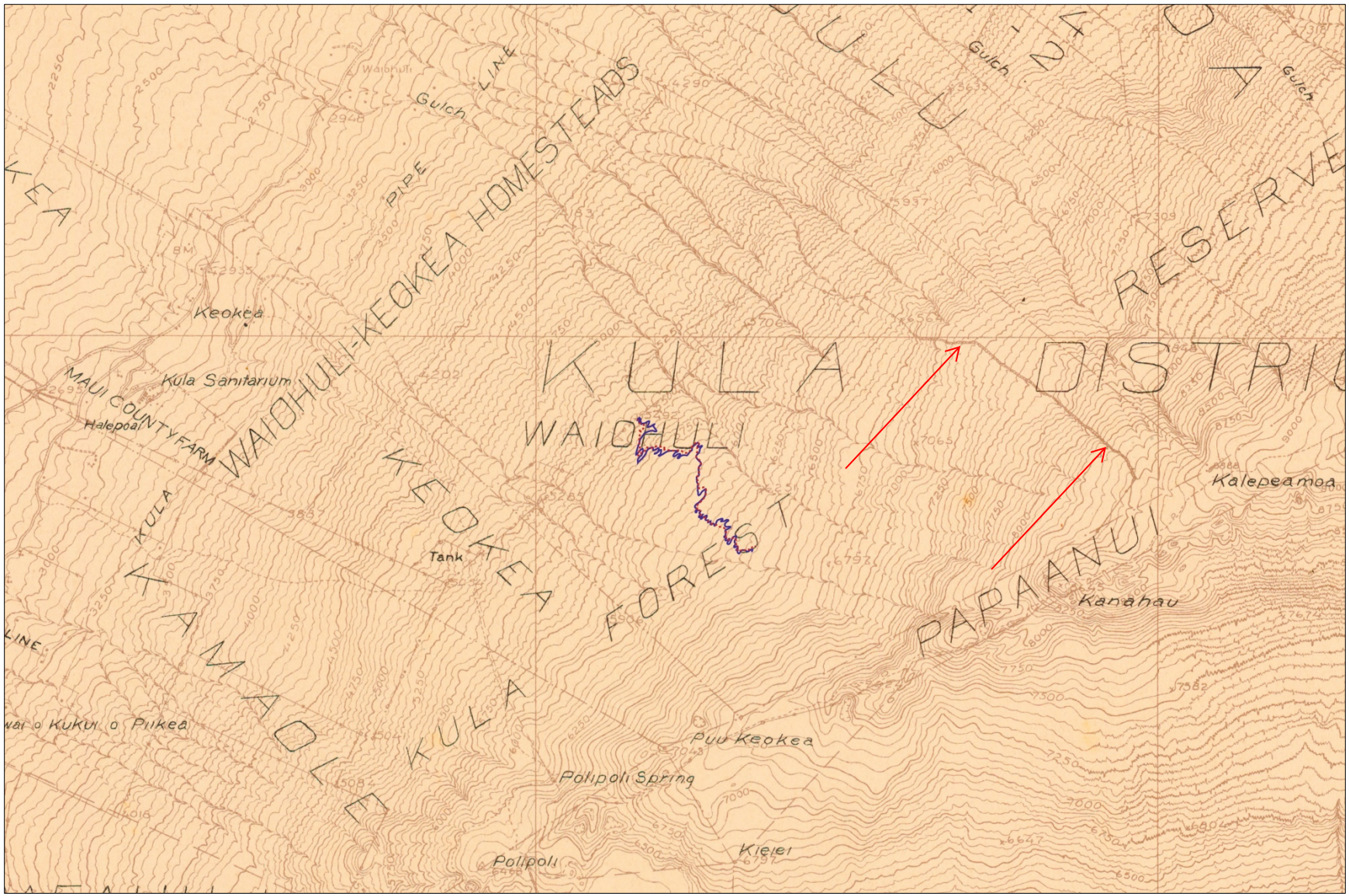

Figure 14. Portion of 1924 USGS topographic map; existing Lower Waiohuli Trail is dashed red line; proposed realignment is purple line; arrows indicate ranching wall (base map source UH-Mānoa's digital maps)

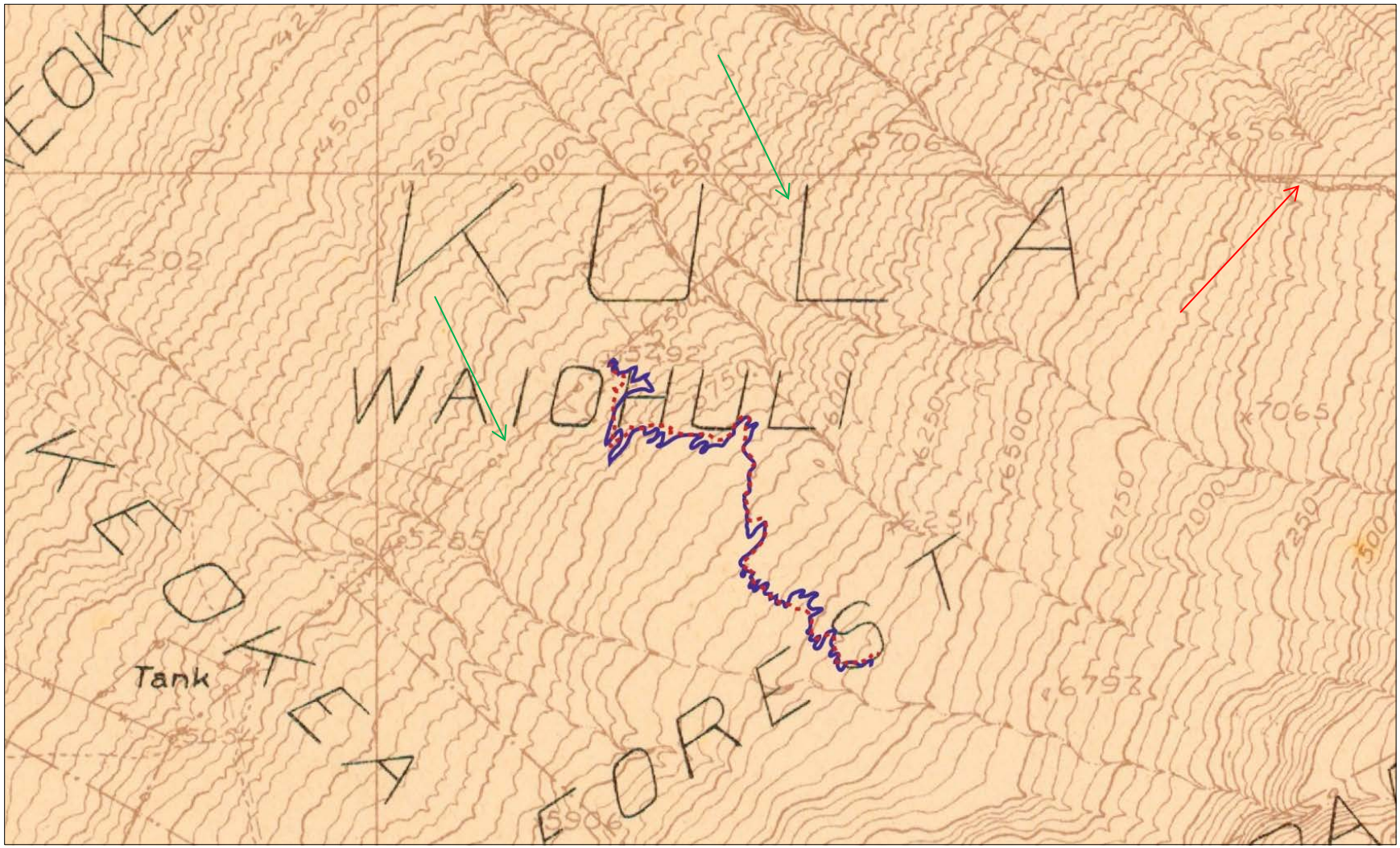

Figure 15. Detail of previous (portion of 1924 USGS topographic) map; existing Lower Waiohuli Trail is dashed red line; proposed realignment is purple line; red arrow indicates ranching wall; green arrows denote probable fence line (base map source UH-Mānoa's digital maps)

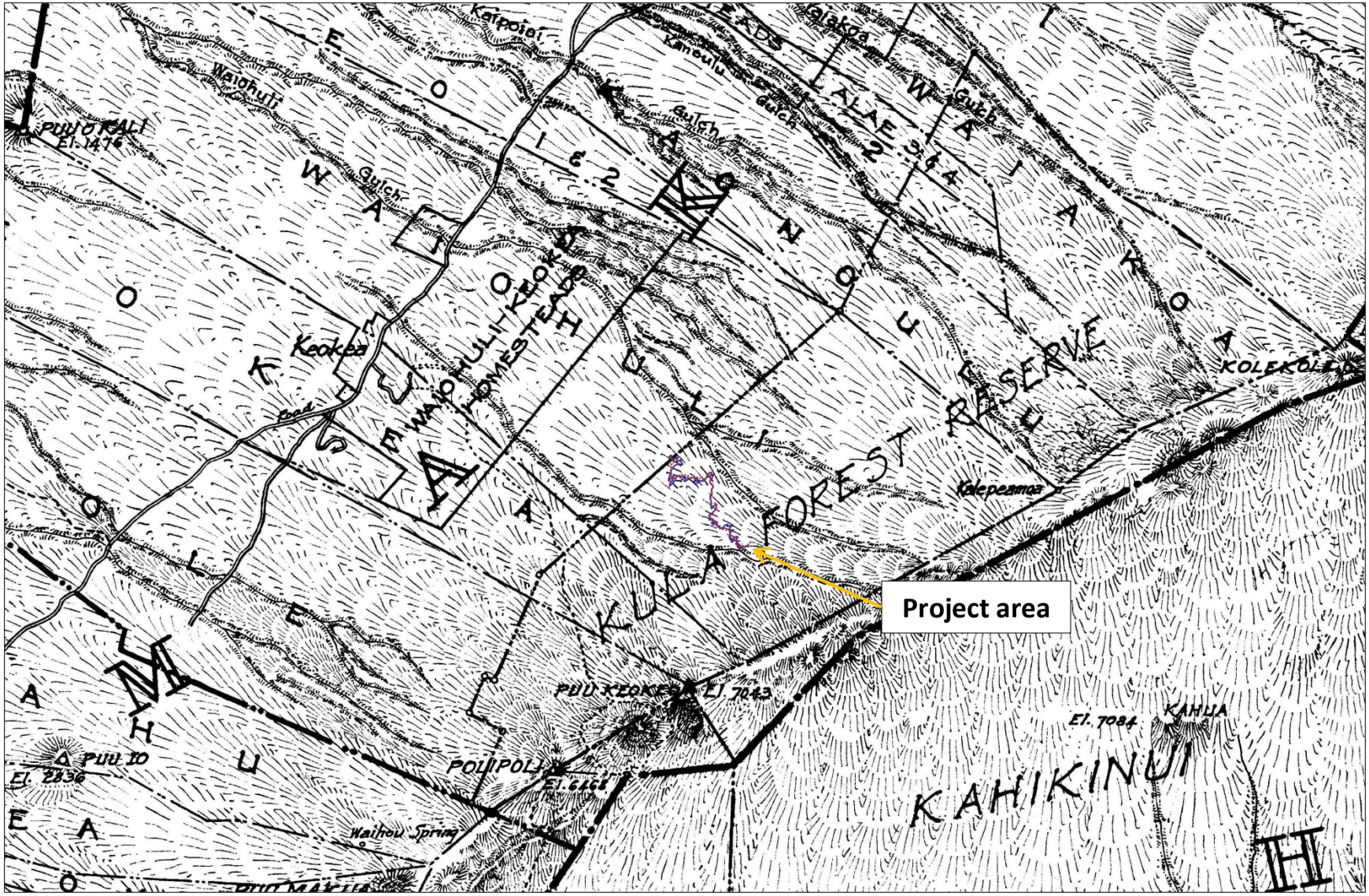

Figure 16. Portion of 1929 Territory of Hawai'i (W.E. Wall) map; note dashed black line from Puu Keokea and other dashed lines around Polipoli are trails, and that none are located in the current project area (base map source UH-Mānoa's digital maps)

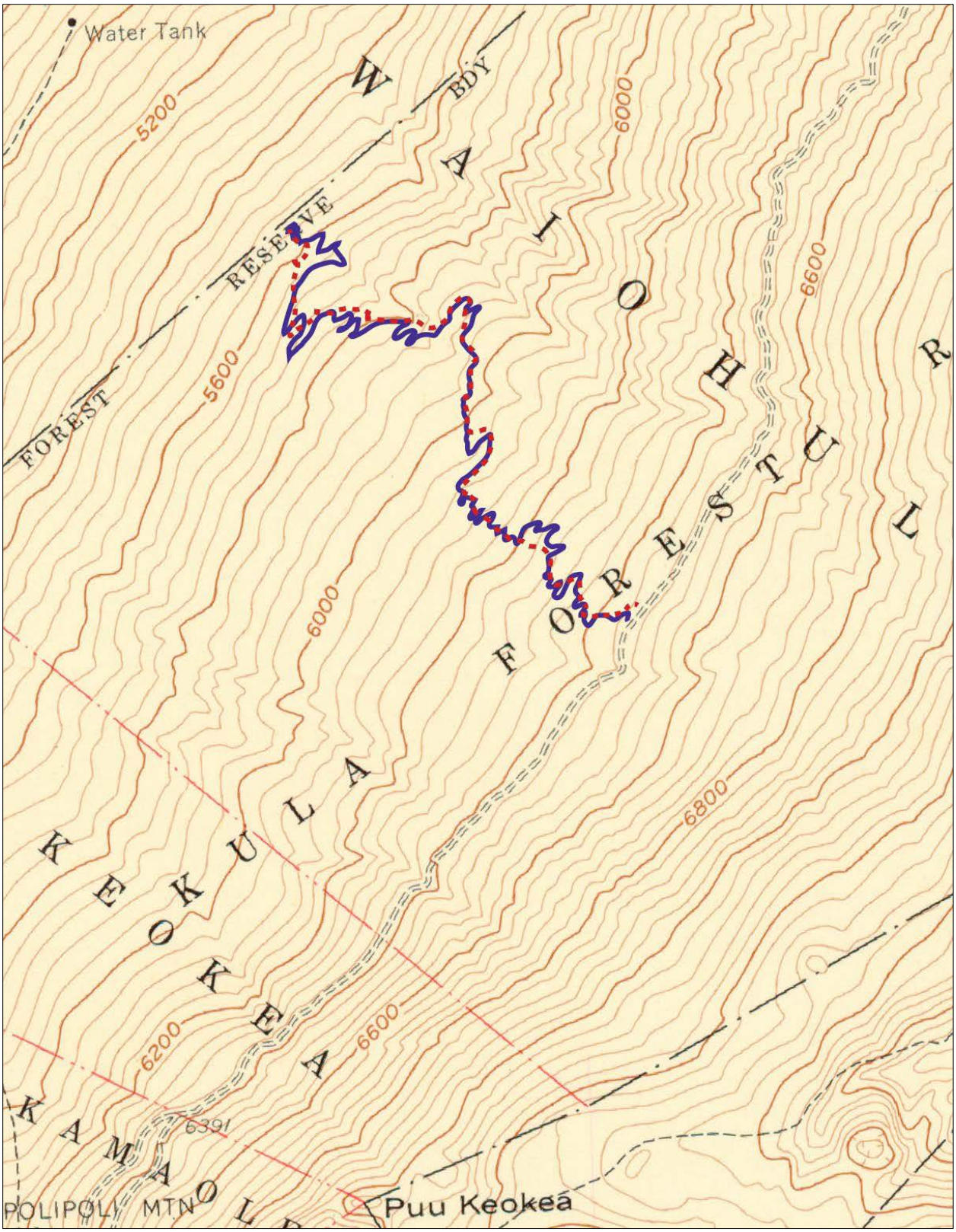

Figure 17. Portion of 1957 USGS topographic map; existing Lower Waiohuli Trail is dashed red line; proposed realignment is purple line; note, there is no depiction of the Lower Waiohuli Trail

ARCHAEOLOGICAL RESOURCES IN AND NEAR THE PROJECT AREA

Given the relative remoteness and high elevation of the project area, we did not expect to find many, or any, previous archaeological studies of the project area. This section first presents some information on the closest known archaeological sites to the project area. The second part of this section presents the results of our recent Archaeological Assessment (AA) of the Lower Waiohuli Trail (Monahan 2017).

Previous Studies of the Vicinity of the Project Area

According to our search of the SHPD library, and reference to compendia on Maui archaeological sites (i.e., Walker 1931; Sterling 1998), there are no known sites in or immediately adjacent to the project area. Walker's (1931) listing of heiau shows numerous traditional Hawaiian temples, both large and small, once located downslope of the current project area at an elevation of approximately 3,000 ft. (Figure 14). In Waiohuli Ahupuaʻa, these heiau included Kaumeheiwa (?) (Site 212), Kaimupeelua (Site 213), and Pauhu (Site 214). This by no means, however, implies there are no historic properties in or adjacent to the project area, since any structures over 50 years in age qualify as historic properties under Hawaiʻi state laws and rules governing historic preservation. Closer to the current project area, at similar elevations, we expected to possibly encounter fence lines or rock walls along the lower boundary of the Lower Waiohuli Trail. There is historical evidence that rock walls were sometimes built by forest rangers along portions of the reserve boundary in the early 1920s to keep cattle out of the forest reserve.

Results from the Current Project Area

Figure 19 depicts the GPS track log (yellow line) walked by Chris Monahan on March 16, 2017. Two modern features (designated with temporary site numbers TCP 1 and TCP 2) and one possible historic property (TCP 3) were identified during this fieldwork.

TCP 1 (Figure 20) is a small, dry-stacked, rock-retaining structure built along a short portion of the edges of the existing trail in the lower project area (see Figure 19). *Based on consultation and discussion with Torrie Nohara, we learned that this feature was constructed by Nā Ala Hele staff in the 1990s.* The feature consists of an approximately 2.0 meter long section of low (1-2 courses high) stacking along the north edge of the existing trail; and an approximately 4.0 meter long section of low (1-2 courses high) stacking along the south edge of the existing trail. This south edge stacking is discontinuous and grades into a single rock clast alignment in places. The constituent material is mostly small boulders and cobbles of ʻaʻā. Maximum height of the stacked rocks is approximately 20-30 cm above ground surface.

TCP 2 (Figure 21) is another small, dry-stacked, rock-retaining structure built along a short portion of the edges of the existing trail in the lower (northwest) section of the project area (see Figure 19). *We learned that this feature was constructed by Nā Ala Hele staff in the 1990s*. The feature consists of an approximately 3.0 meter long section of low (1-2 courses high) stacking along the north edge of the existing trail. A simple earthen cut into the hillside—there is no rock construction—marks the south side of TCP 2. The constituent material is mostly small boulders and cobbles of ʻaʻā. Maximum height of the stacked rocks is approximately 30-35 cm above ground surface.

TCP 3 (Figure 22 and Figure 23) is a small cave-like feature (designated TCP 3) located several meters west of the current (existing) trail and immediately adjacent to the proposed realignment (see Figure 19). This is not a true cave, nor a lava tube, but rather a section of fractured, uplifted basalt flow that has created an opening and small shelter area underneath. There are no surface features or humanly-modified structures at TCP 3. The shelter interior measures approximately 4.0 meters long by 2.5 meters wide by 1.5 meters high. Pigs have recently been living and sheltering inside this feature. Although this is an entirely natural feature with no evidence of human modification, subsurface testing (excavation) might yield evidence of human occupation and use. For this reason, we believe TCP 3 is most accurately characterized as a *possible* historic property.

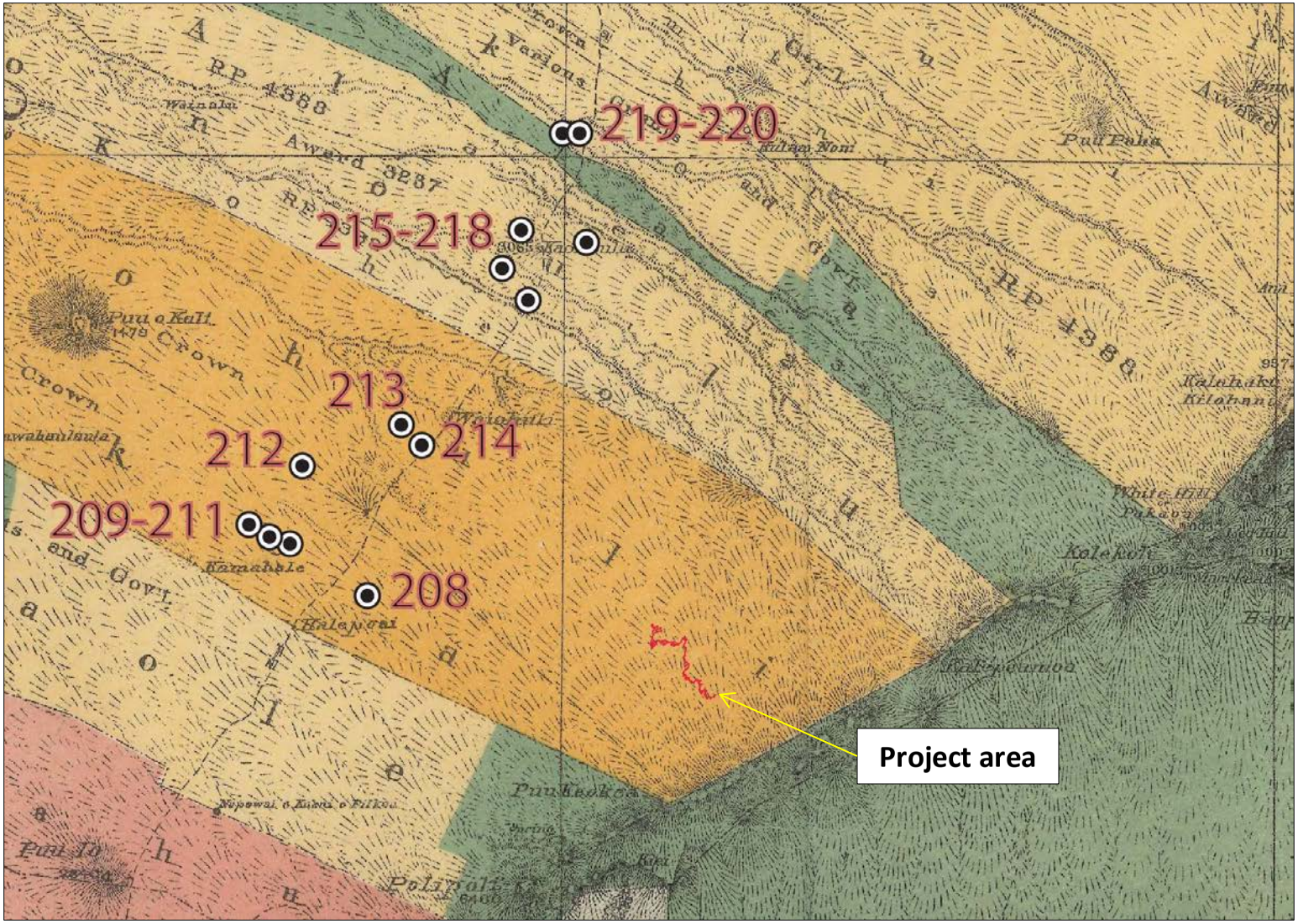

Figure 18. Previously-documented heiau nearest to the current project area (depicted as a white line) projected on an 1885 map by Alexander (base map source UH-Mānoa's digital maps)

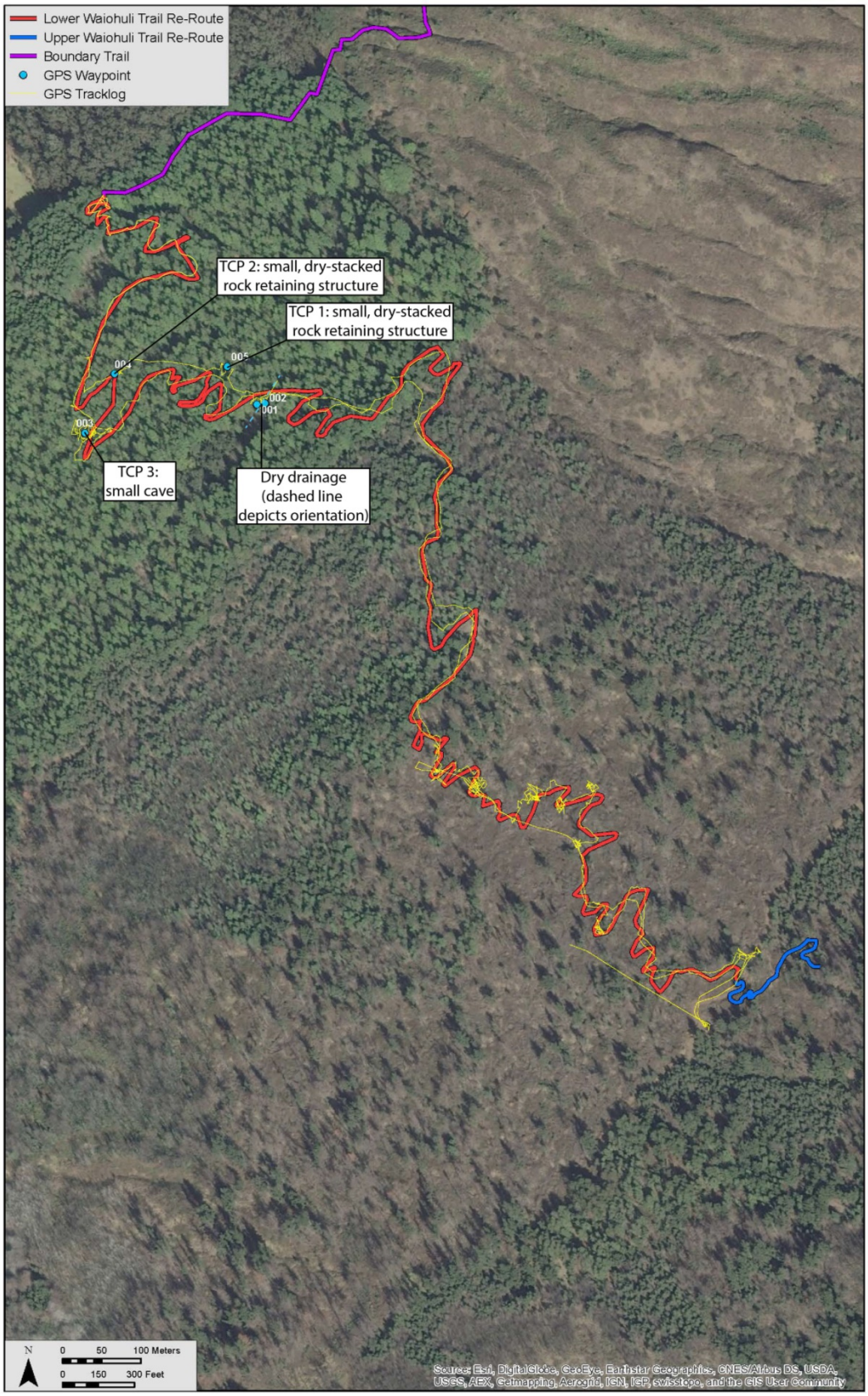

Figure 19. Results of fieldwork depicted on aerial image; TCP 1 and TCP 2 are modern (circa 1990s) features

Figure 20. Small, dry-stacked, rock-retaining structure designated TCP 1 (GPS pt. 005 on the Results maps), view east

Figure 21. Small, dry-stacked, rock-retaining structure designated TCP 2 (GPS pt. 004 on the Results maps), view east

Figure 22. Small cave (designated TCP 3) located along the trail near its lower (makai) end (GPS pt. 003 on the Results maps); measuring tape stretched across the area in front of the entrance to the cave is 3 meters (9.8 feet) long (arrows indicate two ends of the measuring tape)

Figure 23. A closer view of the same cave (TCP 3) entrance; measuring tape is the same as above

INTERVIEW/CONSULTATION SUMMARIES

As explained in the Methods section, we reached out to a few people to ask if they would like to participate in interviews for this CIA. One of these individuals (Mr. Robert Hobdy) agreed to be formally interviewed. We also consulted informally by phone with (1) Garret Hew, a longtime water resource manager and small-time rancher who lives downslope from the project area; and (2) Sumner Erdman of ʻUlupalakua Ranch.

Robert Hobdy Interview

Chris Monahan interviewed Bob Hobdy by phone for about 30 minutes on May 1, 2017.

Biographical Notes

Born in 1942, and having earned a Bachelor's degree in Forestry from Oregon State University in 1965, Bob Hobdy worked for the Division of Forestry and Wildlife (DOFAW), Department of Land and Natural Resources, State of Hawaiʻi, for more than 37 years. He retired as the District Manager for Maui County in 2004 but has continued to work as an environmental consultant.

Narrative Notes of Interview/Discussion

He began by talking about how the Kula Forest Reserve (KFR) was established in 1912, and that the Upper Road to Polipoli and the Skyline Road were not there when the Civilian Conservation Corps (CCC) did its work in the 1930s. In response to a specific question from Chris Monahan about the two, small, dry-stacked rock-retaining features along the Lower Waiohuli Trail (designated TCP 1 and TCP 2, and described in the previous section), he suggested they might have been built by the CCC workers.[5]

He discussed a useful article by Hosmer, written in 1912, about the reasons and justification for the establishment of the KFR. According to Hosmer (1912), prior to the 1880s or perhaps the 1890s, there was largely a native forest in and around the current project area.

He talked about how the main CCC camp for the entire island of Maui was a Polipoli Spring, just south of the Lower Waiohuli Trail. He described a 1927 photograph that showed the ranger cabin at Polipoli under construction. There was a water pipe installed from Polipoli Spring that fed down the slopes by the 1930s.

By the 1920s, photographs show the entire mountain slopes in and around the current project area were utterly barren and devoid of trees.

The CCC workers planted many redwoods, eucalyptus, ash and various conifers.

Turning to considerations of Native Hawaiian ideas of cultural significance of the project area, he mentioned that the famous mists and fog that roll into the area practically every day is called Nāulu. He learned this information from Nalani Kanahele, who indicated it referred to both the Big Island and Maui, possibly a reference to the fact that breadfruit (ʻulu) trees grew well in such settings. He described this weather phenomenon as an inversion effect that created a fog cloud in which koʻa, ʻōhiʻa, and ferns originally grew. Today, there are only extremely small remnants of this original forest in certain deep gulches and drainages.

He stated that deforestation by around the turn of the twentieth century (1900) was primarily caused by uncontrolled ungulate grazing that killed some trees, opened up areas for invasive grass growth, and a feedback effect that eventually led to grasses swamping out the trees.

In response to a question by Chris Monahan, he stated a shelter at the bottom of the Lower Waiohuli Trail was built in the 1980s.

[5] It is worth noting that our analysis of existing maps shows no evidence of a trail in the current project area on a 1957 USGS map. It first shows up on a USGS map from the 1990s.

Finally, Bob Hobdy talked about other places—away from the current project area—where he has seen historic properties/possible archaeological sites over the years: (1) Up the Skyline Road, in small craters, he has seen historic period, paniolo ("cowboy") campfire features; (2) along the Upper Waiohuli Trail, he knows of a cinder cone with a cave on the side and a small rock wall within the may be a burial; and (3) he knows of another cave in a gulch containing a wooden board with knife cuts on it, as well as a fragment of lauhala mat.

Garret Hew Consultation

Chris Monahan spoke informally with Garret Hew by phone for about 15 minutes on May 24, 2017.

Biographical Notes

Born and raised on Maui and having earned a Bachelor's degree in Horticulture from Oregon State University in 1978, Garret Hew first worked in truck farming, then, for more than 30 years, worked as a water resource manager for EMI (East Maui Irrigation, Co., Ltd.), a subsidiary of Alexander & Baldwin, Inc., and also, since 2008, for HC&S (Hawaiian Commercial & Sugar Company).

Discussion Notes

Garret Hew began by saying that he is not that knowledgeable about the project area, and that speaking with Bob Hobdy would probably give me good information as any for this study. Garret Hew lives at approximately 3,200 ft. elevation, makai of the project area. He says he keeps a few head of cattle, but is not a big rancher by any means.

He asked if the project area was in Conservation land, and, if so, why the proposed trail realignment would even need an Environmental Assessment (EA). Chris Monahan responded that he was not sure of the answers to these questions.

When asked how old he thought the Lower Waiohuli Trail was, when it was first built, Garret Hew said he was not sure, but that the State should know. He mentioned that my point of contact, Torrie Nohara, might know, and that John Medeiros, who also works for the State, should know.

Chris Monahan shared with Garret Hew our findings regarding the historical map analysis, which is consistent with the interpretation that the Lower Waiohuli Trail does not appear to be a historic property (i.e., more than 50 years in age). But he said we should check with others as to a final answer on this question of the age of the trail in the current project area.

Sumner Erdman Consultation

Chris Monahan spoke informally with Sumner Erdman by phone for about 15 minutes on May 25, 2017.

Biographical Notes

Born and raised in upcountry Maui and a second-generation cattle rancher, Sumner Erdman is currently President of 'Ulupalakua Ranch, which was founded by his father, C. Pardee Erdman in 1963. At the ranch's peak, it was approximately 40,000 acres in size, and currently is about 18,000 acres. The Erdmans are very familiar with the landscape and natural features around Polipoli Spring, in particular, because this is where they obtain their water.

Discussion Notes

Our brief discussion started with Sumner Erdman saying that he did not have any specific knowledge of the Lower Waiohuli Trail, per se, but did know quite a lot about the area to the south, particularly around Polipoli Spring, since this is one of the only known upcountry sources of fresh water. He mentioned that, prior to the (then) Territorial establishment of the Kula Forest Reserve around 1911 or 1912, there was a court case regarding use rights of the water from Polipoli.

We also discussed the age of the original construction of the Lower Waiohuli Trail. Sumner Erdman suggested two possibilities. First, that is may be related to the old historic-period practice of driving cattle around the uplands on cross-slope trails from places as far away as Hāmākua, instead of taking them down along the hot, arid Kīhei coast, in order to get them to the landing at Mākena. The second possibility was that it is related to the CCC.

He also mentioned another fresh water spring south of Polipoli that the old cowboys knew about, but that no longer flows, and has likely been blocked or plugged up for many decades now. As mentioned above (see discussion related to Figure 16, page 19), there is a 1929 map that shows a spring named Waihou in this general area. This may be the spring Mr. Erdman mentioned.

CONCLUSION

TCP Hawai‘i has completed a Cultural Impact Assessment (CIA) of the Lower Waiohuli Trail and a proposed realignment of sections of the existing trail. The approximately 1.5 mile (2.4 km) project area is located in Waiohuli Ahupua‘a, Kula District, Maui Island, in a portion of the Kula Forest Reserve. The trail is in a portion of TMK (2) 2-2-007:001. This CIA was written in accordance with HRS § 343 (law governing Environmental Impact Statements [EIS]) and HAR § 11-200 (rules governing content of EIS and Environmental Assessment [EA] documents) as well as the OEQC’s 2012 Guide to the Implementation and Practice of the Hawaii Environmental Policy Act.

TCP Hawai‘i also conducted a companion Archaeological Assessment (AA) of this same project area (Monahan 2017), during which two recently-constructed (in the 1990s) features (designated with temporary site numbers TCP 1 and TCP 2) and one possible historic property (TCP 3) were identified, as documented and discussed in the Archaeological Resources section above.

We conducted one formal interview with Bob Hobdy for this CIA, and also spoke informally about the proposed project with (1) Garret Hew, who lives makai of the project area in lower Kula, and has worked as a water resource manager on Maui for more than 30 years; and (2) Sumner Erdman of ‘Ulupalakua Ranch. The results of this consultation are presented in the preceding section. In general, the people with whom we spoke had no objections or specific concerns about the proposed project or its impact on cultural resources at the Lower Waiohuli Trail.

Our archival research included historical map analysis; review of Māhele ‘Āina (Land Commission) records; a consideration of the Hawaiian cultural landscape; nineteenth-century developments in and near the project area; early twentieth-century developments in and near the project area; and the results of our most recent archaeological assessment of the project area. The main result of all of this archival research was that we do not believe the Lower Waiohuli Trail is a historic property. It appears to have built by the State sometime after the 1960s.

Recommendations

We recommend the final realignment avoid TCP 3, a small cave-like feature that may possibly be a historic property. The other modern features (TCP 1 and TCP 2) do not require any special mitigation since they are not historic properties (they were built in the 1990s).

We also recommend additional field inspection by a qualified archaeologist of the upper half of the project area where much of the ground surface is simply not visible, and where it is extremely difficult to walk the precise trail realignment due to abundant downed trees. This work can be conducted in coordination with the downed tree-removal contractor.

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APPENDIX A: State OEQC Guidelines for Assessing Cultural Impacts

Excerpt (pp. 11–13) from *Guide to the Implementation and Practice of the Hawaii Environmental Policy Act*, 2012 Edition, State of Hawai‘i, Office of Environmental Quality Control (available online at http://oeqc.doh.hawaii.gov/Shared%20Documents/Misc_Documents/Guide%20to%20the%20Implementation%20and%20Practice%20of%20the%20HEPA.pdf)

GUIDELINES FOR ASSESSING CULTURAL IMPACTS

(Adopted by the Environmental Council, State of Hawaii, November 19, 1997)

I. INTRODUCTION

It is the policy of the State of Hawaii under Chapter 343, HRS, to alert decision makers through the environmental assessment process about significant environmental effects which may result from the implementation of certain actions. An environmental assessment of cultural impacts gathers information about cultural practices and cultural features that may be affected by actions subject to Chapter 343, and promotes responsible decision-making.

Articles IX and XII of the State Constitution, other state laws and the courts of the state require government agencies to promote and preserve cultural beliefs, practices, and resources of native Hawaiians and other ethnic groups. Chapter 343 also requires environmental assessment of cultural resources, in determining the significance of a proposed project.

The Environmental Council encourages preparers of environmental assessments and environmental impact statements to analyze the impact of a proposed action on cultural practices and features associated with the project area. The Council provides the following methodology and content protocol as guidance for any assessment of a project that may significantly affect cultural resources.

II. CULTURAL IMPACT ASSESSMENT METHODOLOGY

Cultural impacts differ from other types of impacts assessed in environmental assessments or environmental impact statements. A cultural impact assessment includes information relating to the practices and beliefs of a particular cultural or ethnic group or groups.

Such information may be obtained through scoping community meetings, ethnographic interviews and oral histories. Information provided by knowledgeable informants, including traditional cultural practitioners, can be applied to the analysis of cultural impacts in conjunction with information concerning cultural practices and features obtained through consultation and from documentary research.

In scoping the cultural portion of an environmental assessment, the geographical extent of the inquiry should, in most instances, be greater than the area over which the proposed action will take place. This is to ensure that cultural practices which may not occur within the boundaries of the project area, but which may nonetheless be affected, are included in the assessment. Thus, for example, a proposed action that may not physically alter gathering practices, but may affect access to gathering areas would be included in the assessment. An ahupua'a is usually the appropriate geographical unit to begin an assessment of cultural impacts of a proposed action, particularly if it includes all of the types of cultural practices associated with the project area. In some cases, cultural practices are likely to extend beyond the ahupua'a and the geographical extent of the study area should take into account those cultural practices.

The historical period studied in a cultural impact assessment should commence with the initial presence in the area of the particular group whose cultural practices and features are being assessed. The types of cultural practices and beliefs subject to assessment may

include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs.

The types of cultural resources subject to assessment may include traditional cultural properties or other types of historic sites, both man made and natural, including submerged cultural resources, which support such cultural practices and beliefs.

If the subject area is in a developed urban setting, cultural impacts must still be assessed. Many incorrectly assume that the presence of urban infrastructure effectively precludes consideration of current cultural factors. For example, persons are known to gather kauna`oa, `ilima, `uhaloa, noni or ki on the grassy slopes and ramps of the H-1 freeway and some state highways on the neighbor islands. Certain landmarks and physical features are used by Hawaiian navigators for sailing, and the lines of sight from landmarks to the coast by fisherman to locate certain fishing spots. Blocking these features by the construction of buildings or tanks may constitute an adverse cultural impact.

The Environmental Council recommends that preparers of assessments analyzing cultural impacts adopt the following protocol:

A. Identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g. district or ahupua'a;
B. Identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;
C. Receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;
D. Conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;
E. Identify and describe the cultural resources, practices, and beliefs located within the potentially affected area; and
F. Assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

Interviews and oral histories with knowledgeable individuals may be recorded, if consent is given, and field visits by preparers accompanied by informants are encouraged. Persons interviewed should be afforded an opportunity to review the record of the interview, and consent to publish the record should be obtained whenever possible. For example, the precise location of human burials is likely to be withheld from a cultural impact assessment, but it is important that the document identify the impact a project would have on the burials. At times an informant may provide information only on the condition that it remains in confidence. The wishes of the informant should be respected.

Primary source materials reviewed and analyzed may include, as appropriate: Mahele, land court, census and tax records including testimonies; vital statistics records; family histories and genealogies; previously published or recorded ethnographic interviews and oral histories; community studies, old maps and photographs; and other archival documents, including correspondence, newspaper or almanac articles, and visitor journals. Secondary source materials such as historical, sociological and anthropological texts manuscripts, and similar materials published and unpublished, should also be consulted. Other materials, which should be examined, include prior land use proposals, decisions, and rulings, which pertain to the study area.

III. CULTURAL IMPACT ASSESSMENT CONTENTS

In addition to the content requirements for environmental assessments and environmental impact statements, which are set out in HAR §11-200-10 and 16 through 18, the portion of the assessment concerning cultural impacts should address, but not necessarily be limited to, the following matters:

A. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.
B. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.
C. Ethnographic and oral history interview procedures, including the circumstances under which the interviews were conducted, and any constraints or limitations which might have affected the quality of the information obtained.
D. Biographical information concerning the individuals and organizations consulted, their particular expertise, and their historical and genealogical relationship to the project area, as well as information concerning the persons submitting information or interviewed, their particular knowledge and cultural expertise, if any, and their historical and genealogical relationship to the project area.
E. A discussion concerning historical and cultural source materials consulted, the institutions and repositories searched and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.
F. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.
G. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area affected directly or indirectly by the proposed project.
H. An explanation of confidential information that has been withheld from public disclosure in the assessment.
I. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.
J. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.
K. A bibliography of references, and attached records of interviews which were allowed to be disclosed. The inclusion of this information will help make environmental assessments and environmental impact statements complete and meet the requirements of Chapter 343, HRS. If you have any questions, please call 586-4185. You may ask OEQC if a directory of cultural impacts assessment providers is available.

APPENDIX FOUR

DESCRIPTION OF BEST MANAGEMENT PRACTICES (BMP)

AND

SITE SPECIFIC POLLUTION PREVENTION PROCEDURES (SSPPP)

Lower Waiohuli Trail

Improvements and Maintenance

Best Management Practices (BMP)
and
Site Specific Pollution Prevention Procedures (SSPPP)

prepared by:

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...with the assistance of: Trails Unlimited

BEST MANAGEMENT PRACTICES (BMP), and

SITE SPECIFIC POLLUTION PREVENTION PROCEDURES (SSPPP)

This document is prepared for the Lower Waiohuli Trail Improvements in support of a Draft Environmental Assessment (EA) prepared by WHALE Environmental Services LLC for the Department of Natural Resources, Division of Forestry and Wildlife (DOFAW). This document was created with the assistance of Ms. Torrie Nohara, Nā Ala Hele, Trails and Access Specialist for DOFAW.

There are two main types of practices that lend to environmental protection during construction projects. The first is programmatic objectives which outline program guidance and installation objectives and are referred to as *Best Management Practices (BMP).* The second type is predetermined site-specific objectives for site conditions and capabilities and is known as Site Specific Pollution Prevention Procedures (SWPPP).

Introduction

The following Environmental BMP Plan is designed to provide the various BMPs (Best Management Practices) as related to the Lower Waiohuli Trail Improvements on Maui, HI. This document is intended to serve as the BMP Plan, the Pollution Prevention Plan, and the Erosion and Stormwater Control Plan for submission under NHDES permit needs, EPA, ACOE, USFW, and NRCS project reviews. The following submission is intended to serve as a general BMP plan for the overall project, showing all the possible BMPs that may be selected during the construction process. Site specific BMP plans have been develop for construction showing BMPs selected. BMPs selected for the construction period as shown as section 2 (SSPPP) site specific BMPs in this document.

Success is defined by:

- how effective best management practices (BMPs) are at controlling physical aspects of the land environment (e.g., erosion, vegetative cover) and
- how effective the project is at restoring and maintaining trail areas that are capable of meeting recreational requirements.

A BMP, as discussed in this document, is a category of one or more techniques that could be used to accomplish the restoration or improvement at a site. For example, the "Clearing and Thinning" BMP is described as a way to accomplish clearing and/or thinning of vegetation. Several different techniques can be used to implement the 'Clearing and Thinning' BMP, which include, but is not limited to: mowing, hand

grubbing, dozer grubbing, burning, herbicide application, etc. Each of these techniques document implementation steps and site design to determine if it is best suited to implement the "Clearing and Thinning" BMP at a potential project site.

Section One – General BMP(s).

General BMP(s) include *Good Housekeeping Practices*. To distinguish between General BMP(s) which include Good Housekeeping Practices from Site Specific Pollution Prevention Procedures, simply think that General BMP(s) address potential actions, and Site Specific measures cover predicted implementation.

For General BMP(s), it is necessary to think about potential pollutants. For any project, they may be:

Potential Sources of Pollution

Potential sources of sediment to stormwater runoff are:

- Clearing, grading, excavating, and un-stabilized areas
- Paving operations
- Demolition and debris disposal
- De-watering operations
- Drilling and blasting
- Material delivery and storage
- Landscaping Operations

Potential pollutants and sources, other than sediment, to stormwater runoff are:

Pollutants:

- Nutrients
- Heavy metals
- pH level in soil (acidic or base)
- pesticides or herbicides
- oils and greases
- bacteria and viruses
- trash, debris, and solid wastes

- other toxic chemicals

Potential Sources are:

- Clearing, grading, excavating, and un-stabilized areas
- Paving operations
- Concrete wash-out and waste
- Structure construction (i.e.) culverts, headwalls, curbing
- Demolition and debris disposal
- De-watering operations
- Drilling and blasting
- Material delivery and storage
- Material use during construction
- Solid waste
- Hazardous waste
- Contaminated spills
- Sanitary/septic waste
- Vehicle use/fueling/storage
- Landscaping operations

In general, the following are concepts that BMP(s) must embrace:

- Minimize Disturbed Area and Protect Natural Features and Soil
- Control Stormwater Flowing onto and through the Project
- Stabilize Soils
- Protect Slopes
- Protect Storm Drain Inlets
- Establish Perimeter Controls and Sediment Barriers
- Retain Sediment On-Site
- Establish Stabilized Construction Exits
- Additional BMPs (if needed)

GOOD HOUSEKEEPING BMPS

The good housekeeping and pollution prevention BMP(s) that will be implemented to control pollutants in stormwater. There are seven categories:

3.1 Material Handling and Waste Management
3.2 Establish Proper Building Material Staging Areas
3.3 Designate Washout Areas
3.4 Establish Proper Equipment/Vehicle Fueling and Maintenance Practices
3.5 Allowable Non-Stormwater Discharges and Control Equipment/Vehicle Washing
3.6 Spill Prevention and Control Plan
3.7 Any Additional BMPs

SECTION 2 – Site Specific Pollution Prevention Procedures for the Lower Waiohuli Trail Improvements.

There are 5 (five) site specific planned BMP(s) that related to this project and will be utilized to prevent pollution. They are:

Clearing and Thinning

1. Definition

Any activity that removes or thins the vegetative surface cover to support trail use. Clearing natural or man-made material to open land recreational activities.

2. Applicability

Specific site conditions will determine equipment or herbicide use.

- Heavy equipment includes, but is not limited to, dozers, tractors and crawlers equipped with a variety of blades, including multi-purpose blades, pushing blades, cutting blades and stacking blades; windrowing/blade scarification; free-mounted VBlades, V-Rakes; treecutters; grubber or rootcutters.
- Light equipment includes, but is not limited to, brush cutters, and root plows
- Herbicides will involve specific application directions and requirements.

Advantages/Benefits

Cleared woody vegetation may be chipped on site and used as mulch. Clearing woody vegetation enhances access and improves line-of-sight. Properly disposing of debris from clearing may support the site's fire management plan.

Disadvantages/Limitations
Most mechanical methods are ineffective on wet soils, steep slopes, and rocky soils. Bulldozing, rootplowing and disking excessively disturbs soil surfaces and may result in erosion. Using heavy equipment may result in soil compaction or the scalping of the organic and richer top soil layers. Heavy equipment may cause damage to roots. Herbicide use may kill desirable plant species. There are specific herbicides that should be used in areas susceptible to surface water contamination. Unremoved stumps pose hazards to hikers and trail users.

3. Planning/Design Limitations

Effectiveness
Planning should be based upon desired result for the cleared or thinned area: site access, line-of sight use for viewplanes, trail access, native species growth, and habitat restoration.

Clearing and thinning is best applied on relatively level terrain to prevent erosion. Some sites and vegetation may require multiple clearing or thinning iterations. Using large equipment is an effective technique for soils that contain rocks that are less than 40 cm in diameter.

Herbicides are an alternative to disturbing the soil surface with a plow. Proper selection and timing of application should kill the undesirable plants and not harm the young plants the following planting season.

Other factors to consider when preparing for site activities include:
- Seasonal and weather variations and conditions,
- Contractor management,
- Local union restrictions,
- Building code requirements,
- Availability of adequate energy, skilled labor, and building materials,
- Safety requirements,
- Traffic control,
- Environmental considerations, and
- Regulatory requirements and restrictions

4. Construction Considerations

Determine site area for disturbance in order to accommodate heavy equipment. Pay special attention to sensitive areas, such as steep slopes, highly erodible soils, and surface water during construction activities. Re-stabilize disturbed areas immediately after or in conjunction with clearing activities. Customize the proper technique for the targeted species to be removed.

5. Monitoring and Maintenance Considerations

An active long-term monitoring and maintenance plan should be established for the site to complement routine maintenance measures that may be compromised due to intensive land use activities at the site. The long-term plan should be comprised of four components, which are the four following types of monitoring:

- **Routine:** Standard and seasonal monitoring at set intervals to ensure the BMP is stable and working properly. This may be done weekly, monthly, or quarterly depending on the area size, the objective, and the BMP. Monitoring may include visual inventory to document progress or lack thereof. Monitor clearing and thinning techniques as necessary, to ensure re-growth of the targeted species does not occur. Native vegetation should re-establish without invasive species. Monitor during the regional growing season. Conduct visual/windshield inspections to assess if re-growth of the targeted species has occurred. Reapply applicable clearing and thinning measures as needed.

- **Event driven:** Inspect BMP after significant training or weather events (e.g., heavy rain, flooding events). Monitoring may include sampling, measuring, or visual inventory of the restoration site. Maintain areas by removing hazardous snags or stumps.

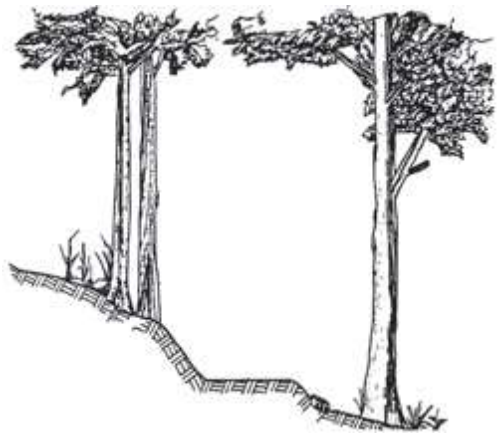
- **Random:** Periodic inspections normally done out of convenience if the staff is in the area of concern for another purpose. Any failures found in BMP(s) should be noted and communicated to the trail manager immediately for resolution. Inspect cleared or thinned areas for invasive species that thrive in disturbed habitats.
- **Quantitative:** Scientific monitoring of BMP(s) to determine success relative to performance goals. Normally performed by the DOFAW staff. Quantitative monitoring requires proper communication to maximize efficiencies. For BMPs establishing vegetation, there should be routine monitoring, and use applicable quantitative monitoring to supplement project site data.

6. Applications for Trail Operations

- *Safety:* Clearing and thinning should not leave behind hazardous roots and tree stumps.
- *Interactions with BMP operation:* Vehicle or foot traffic in cleared areas can lead to re-emergence of stumps cleared previously below hazard levels. Traffic from hikers can compact soils around stumps lowering the ground-level relative to the stump height.
- *Season and duration considerations that interact with scheduling trail use:* Vegetative clearing and thinning takes place in the areas desired specifically for recreational activities. In some cases clearing and thinning may be delayed to accommodate seasonal trail use during high tourism or seasonal use.
- *Environmental encroachment concerns:* Ensure that clearing activities are cleared with environmental authorities to ensure no adverse impacts on endangered, threatened, or species of interest which inhabit the site have impacts from vegetative clearing and thinning.

Examples defining clearing and thinning activities are seen as follows:

The trail corridor includes the trail tread and the area above and to the sides of the tread. Trail standards typically define the edges of the trail corridor as the clearing limits (figure 21). Vegetation is trimmed back and obstacles, such as boulders and fallen trees, are removed from the trail corridor to make it possible to ride or walk on the tread.



The dimensions of the corridor are determined by the needs of the target users and the challenge of the trail. For example, in the Northern Rockies, trail corridors for traditional pack stock are cleared 2.5 meters (8 feet) wide and 3 meters (10 feet) high. Hiking trails are cleared 2 meters (6 feet) wide and 2.5 meters (8 feet) high. Check with your local trail manager to determine the appropriate dimensions for each of your trails.

Clearing and Brushing

Working to wipe out your trail is no less than that power in the sky– the sun. The sun and photosynthesis convert dirt and water into a new plant. No sooner is a trail corridor cleared of plants than new ones rush toward this avenue of sunlight.

Plants growing into trail corridors or trees falling across them are a significant threat to trail integrity. Brush is a major culprit. Other encroaching plants such as thistles or dense ferns may make travel unpleasant or even hide the trail completely. If people have trouble traveling the trail tread, they move over, usually along the lower edge, or make their own trail. This result is a changing trail path with increase environmental impact, which explains why clearing and thinning is vital and needs to be done correctly and maintained.

In level terrain, the corridor is cleared an equal distance on either side of the tread centerline. For a hiking trail, this means that the corridor is cleared for a distance of 1 meter (3 feet) either side of center. Within 300 millimeters (1 foot) of the edge of the tread, plant material and debris should be cleared all the way to the ground. Farther than 500 millimeters (1.5 feet) from the trail edge, plants do not have to be cleared unless they are taller than 500 millimeters (1.5 feet) or so. Fallen logs usually are removed to the clearing limit.

On moderate to steep side slopes, a different strategy may be useful. Travel along the lower (outer) edge of the tread is a common cause of tread failure. You can use trailside material to help hold traffic to the center of the tread. A downed log cut nearly flush with the downhill edge of the trail will encourage travelers to move up to avoid it. Rocks, limbed trees and the like can all be left near the lower edge of the tread to guide traffic back to the center so long as the guide material does not prevent water from draining off the trail.

Remember that the scorched earth look created by a vegetation-cleared corridor with straight “slash and hack” edges is not very pleasing to the eye. Work with natural vegetation patterns to feather or meander the edges of the clearing work do not leave straight lines. Cutting intruding brush back at the base of the plant rather than in midair gives a better clearing limit boundary. Cut all plant stems close to the ground. Scatter the resulting debris as far as practical. Toss stems and branches so the cut ends lie away from the trail. A carefully trimmed corridor can give a trail a special look, one that encourages users to return.

Removing Trees

Usually, trees growing within the corridor should be removed. Seedlings will eventually grow into trail hindering adolescent trees. They are a lot easier to pull up by the roots when they are small than they are to lop when they grow up.

Prune limbs close to the tree trunk. For a clean cut, make a shallow undercut first, then follow with the top cut. This prevents the limb from peeling bark off the tree as it falls.

Cut fallen trees out as wide as your normal clearing limits on the uphill side, but closer to the trail on the downhill side. Roll the log pieces off the trail and outside the clearing limits on the downhill side. Never leave them across ditches or waterbar outflows. If you leave logs on the uphill side of the trail, turn or bury them so they will not roll or slide onto the trail.

It is hard to decide whether or not to remove leaners, trees that have not fallen but are leaning across the trail. If a leaner is within the trail clearing zone, it should be removed. Beyond that, it is a matter of discretion whether a leaner needs to be cut. You need to consider the amount of use on the trail, how long it will be before the trail is maintained again, the soundness of the tree, and the potential hazard the leaner is creating.

Grade Stabilization Structures

1. Definition

A structure used to stabilize the grade or to control head cutting in natural or artificial channels. Commonly utilized grade stabilizations structures include toe walls and drop spillways. A toe wall is a mechanical system that functions like a weir and contains a non-enclosed water over fall. A drop spillway is a mechanical system, which lowers water through a box or pipe structure. This system internally dissipates most of the energy produced by the water. Concrete catch basins, plastic drop pipes, and steel slopes culverts are all examples of drop spillways.

2. Applicability

Advantages/Benefits

Grade stabilization structures benefit sites where:

- The capability of earth and/or vegetative BMP measures cannot adequately handle the velocity of water flow through an area;
- Excessive grades or overfall conditions are encountered; or
- Water is to be lowered structurally from one elevation to another.

Grade stabilization structures are used to control the velocity of runoff in a natural or artificial channel by lowering the water from one level to another. Essentially, grade stabilization structures establish a series of shorter and lower reaches within a steeper and erosive reach, thus establishing a permanent base elevation below which an eroding channel cannot lower the channel floor. Drop spillways and toe walls control the channel grade not only at the spillway crest, but also through the ponded reach upstream.

Disadvantages/Limitations
Grade stabilization structures should only be installed in a straight section of channel with a minimum of 100 feet of straight channel upstream and downstream of the structure. Additionally, grade stabilization structures should only be used where the grade below the structure is stable or can be stabilized.

Toe wall structures are limited to area where the vertical drop is less than 4 feet, flows are intermittent, downstream grades are stable, and tail water depth and design is equal to or greater than one-third the height of the overfall. Similarly, drop spillways should not be utilized in areas where the vertical drop is greater than 10 feet.

3. Planning/Design Limitations
Effectiveness: A wide of range of alternative types of structures are available for this practice, and an intensive site investigation is required to plan and design an appropriate grade stabilization structure for a specific site.

This BMP is effective in natural or artificial channels where the concentration and flow velocity of water require structures to stabilize the grade or to prevent the advancement of gullies and headcuts. A grade stabilization structure may be used where a permanent, low maintenance, easily constructed, and very stable structure is required.

Drop spillways are specified for drops of less than 10 feet. Toe walls are specific for drop of less than 4 feet. They are used where a permanent low maintenance, easily constructed, and very stable structure is required. The type of spillway or toe wall is only applicable where the grade below the structure is stable or can be stabilized

- For grade stabilization in the lower reaches of channels and outlets.

- Erosion control for protection of fields, roads, ditches, and other areas subject to gully erosion.
- Grade control for stabilizing ditches or gullies.
- Outlets for culverts or surface runoff at the upper end along drainage ditches.
- Control of tail water at the outlet of a spillway or culvert.
- Protect the outlet end of grassed waterways and chutes.

4. Construction Considerations

Grade stabilization structures must be designed for stability after installation. Thus, the crest of the inlet should be constructed at an elevation that stabilizes upstream headcutting. Only work on disturbed, cleared, or graded areas necessary for construction and flag areas that should not be disturbed.

Excavated material should be stored or disposed of outside of the floodplain.
Account for seasonal and mission constraints that construction activities must coincide with.

Additionally, construction should not occur during fish spawning or migration periods. Construction vehicles and equipment should not be driven, operated, fueled, cleaned, maintained, or stored in the wet or dry portions of channel where wetland vegetation, riparian vegetation, or aquatic organisms may be destroyed. The exterior of vehicles and equipment that will encroach on the channel should be maintained free of grease, oil, fuel, and residues.

1. Long Term Monitoring and Maintenance Considerations

An active long-term monitoring and maintenance plan should be established for the site to complement routine maintenance measures that may be compromised due to intensive land use activities at site. (Please see previous section).

Specific designed BMPs for the Lower Waiohuli Trail Improvements are as follows:

Sediment Basin

Definition and Purpose

A sediment basin is a shallow depression installed at the outlet of a trail rolling dip to capture sediment eroded from the trail. During trail maintenance the captured sediment is recycled back into the rolling dip structure or into the trail tread. Use of sediment

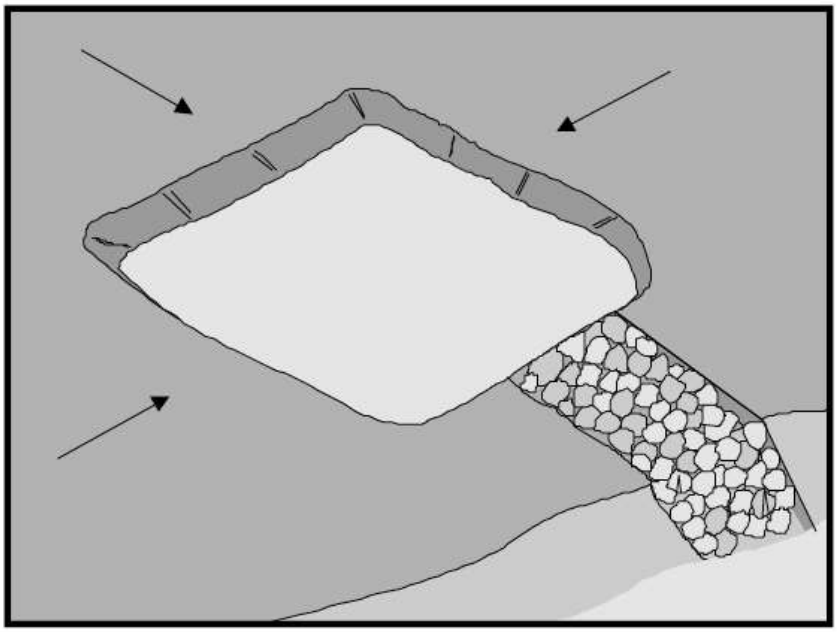
basins is a sediment control practice that also reduces connectivity and sediment delivery to watercourses.

Application

Sediment basins can be installed at rolling dip outlets where the trail prism is wide enough, or where slope gradients below the trail are not too steep. At critical sites, or as necessary, sediment basins may be supplemented by one or more practices such as a spillway, an energy dissipater at the base of the spillway, a hay bale or straw wattle sediment trap, or enhanced infiltration using humic acids.

Implementation

Planning and Design



On new construction, and during reconstruction, locate water breaks to allow the construction and maintenance of sediment basins. Size the basins for 1.2 times the anticipated amount of sediment they will normally collect between maintenance cycles and for xx% of the flow expected from a xx-year xx-hour storm. A qualified watershed specialist should be consulted when sizing sediment basins. (*design criteria for sizing basins inputs percentage of flow {xx may be equal to 50% of flow}, and xx year represents storm event {i.e. – 5, 10, 25, 50, or 100 year storm event}, and xx-hour represents inches per hour {i.e. – 1, 2, 3 inches per hour*).

Inspection and Maintenance

Inspect for sediment capture capacity. Capacity should be adequate to handle the sediment that is expected before the next scheduled maintenance. If the basin needs to

be emptied before the next scheduled maintenance, and conditions are too dry for cycling the sediment back into the trail, store the sediment in a location that will keep it moist or allow remoistening before recycling into the trail. Inspect the basin overflow outlet and energy dissipater for function and wear, especially piping and incipient erosion. Inspect any sediment traps (straw wattles) located below the energy dissipater and repair as needed. On the slope below the sediment trap or energy dissipater, examine litter the soil surface under the duff and litter for evidence of un-trapped sediment and trace it as far as it goes. Maintain overflow outlet, energy dissipater, and sediment traps as needed.

Notes

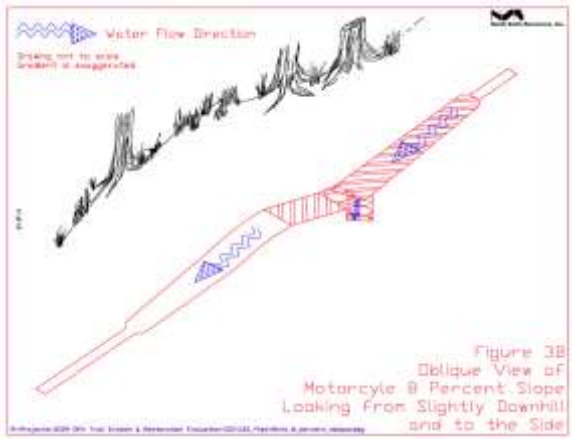
On wider trails where the side slope below the trail is too steep for a sediment basin, narrowing the trail by pulling in the berms and fill material can sometimes create space for a small sediment basin.

Trail Rolling Dip

Definition and Purpose

A trail rolling dip is a water control structure designed to control erosion by diverting runoff from the trail. Trail rolling dips consist of a shallow dip or undulation, out-sloped and installed diagonally across the trail, and a broad convex hump, high enough to assure all runoff is diverted from the trail. Rolling dips are installed at frequent intervals to prevent runoff from accumulating to a volume that causes excessive tread erosion. Where possible, trail rolling dips should include a sediment basin to allow recycling soil back into the drainage structure and trail tread.

Application



Trail rolling dips are used to disperse runoff from existing trails, especially trails that were originally roads, and to disperse runoff from steeper trails with long continuous grades. Trails properly designed and constructed as OHV recreational trails usually are drained by frequent breaks in grade, and generally have less need for

trail rolling dips than trails that originated as roads or that were poorly located and designed.

Implementation

Planning and Design

Location is key to proper function of these water breaks. Locate where all the other associated structures (sediment basin, overflow outlet, sediment trap, etc.) can be installed, and where runoff diverted from the trail will not reach a watercourse. Do not locate on outside turns because normal traffic will develop a berm that blocks free drainage of the outlet.

Key elements of trail rolling dip design are making it broad and long, with convex shoulders and top, and a well out-sloped drain bottom, and high enough to have a reverse grade to divert all runoff from the trail. A good location is more important than following a rigid spacing rule, but generally rolling dips should be 50 to 100 feet apart. If this spacing is not close enough, the trail probably has other issues that need to be looked into.

Installation

Trail rolling dips need to be constructed and maintained when soil moisture is sufficient to allow good compaction.

Inspection and Maintenance

Inspect to assure the outlet is open so water does not pond at the bottom of the dip outlet. Inspect for wear at the top of the diversion structure and on the shoulder coming up and out of the low point or drain bottom. If this shoulder is too short or too concave, it will create a wear point. On a well-designed rolling dip regular maintenance with a rock rake will keep the outlet open.

This is a way to force water off existing trails with the rolling grade dip. A rolling grade dip is used on steeper sections of trail. It also works well to drain water off the lower edge of contour trails. A rolling grade dip is a long ramp about 4 meters (15 feet) built on the

downhill side of a trail descending at a greater than 5-percent grade. A rolling grade dip includes:

- A short climb of 3 to 5 meters (10 to 20 feet) at 3 percent close and barrier
- A return to the descent (figure 16).

Water running down the trail cannot climb over the short rise and will run off the out-sloped tread at the bottom of the outflow. There is nothing to rot or be dislodged. Maintenance is simple.

Minor Tread Relocation

Definition and Purpose

This erosion control practice is relocation of trail tread within an existing road/trail prism or a defined trail corridor, to avoid trail sections that have excessive erosion, or problems related to drainage or sediment delivery.

Application

Short segments of trail with chronic problems such as excessive grade, wetness, or connectivity that need minor tread relocation. In many cases minor tread relocation of short trail segments can be more cost-effective than a complete reroute.

Implementation

Planning and Design

Identify the real source of the problem and evaluate the site to verify that the replacement segment will actually correct the problem, not merely move it elsewhere. Locate and design water control structures that will effectively control and disperse runoff on both the replacement trail segment and the decommissioned trail segment. If the relocation is outside the existing trail/road prism, verify that the replacement segment is within the allowable corridor.

Installation

Construct the replacement route and install the necessary water control structures. Restore the abandoned segment to provide water control and effective ground cover.

Install traffic barriers and signing as necessary to exclude traffic from the restored segment.

Inspection and Maintenance

Inspect for proper water control on both the replacement and restored segments. Inspect for reestablishment of ground cover on the restored segment. Maintain any barriers or signs used to keep traffic off of the restored segment. Provide normal maintenance for the TSs used in the reroute (for example rolling dip, sediment basin, etc.).

Reroutes are short sections of newly constructed trail. These incorporate design features of a rolling contour trail that encourages water to sheet across the trail.

- Locating the new section of trail on a sideslope
- Keeping the trail grade less than half of the grade of the hillside
- Building with a full bench cut to create a solid, durable tread
- Constructing plenty of grade reversals
- Outsloping the tread
- Compacting the entire trail tread

Make sure the new section that connects to the old trail has nice smooth transitions–no abrupt turns.

Drain Dips/Nicks (Aprons and Takeoff Channels)

1. Definition:

Turnouts and aprons are transitions from flow diversions or channels that convey concentrated, high-velocity flows to discharges into undisturbed areas with low-velocity non-erosive flows. Turnouts and aprons are designed to convert concentrated flow into sheet flow - NOT to filter or retain sediments. Turnouts may be a ditch, trench, or other conveyance used to divert stormwater runoff away from a road surface or adjacent ditch into undisturbed areas of vegetation. Turnouts may be used in conjunction with aprons or with level spreaders. Aprons consist of permanent layers of loose angular stones or aggregate material with a filter fabric or granular underlining placed over an erodible soil surface. In higher flow events, turnouts may require diversion to a catch basin.

Drain dips or nicks are water control structures utilized where trails are incised and need drainage feature to control erosion, and are designed to control erosion by diverting water from the trail so runoff does not accumulate to a volume that causes excessive tread erosion. Drain dips are inexpensive to construct and maintain and should be used as frequently as possible.

2. Applicability

Advantages/Benefits

Both turnouts and aprons convert the concentrated flow in diversions and channels to non-erosive sheet flow. They reduce the energy of flowing water, thus reducing its erosive scouring and sediment load-carrying capacity.

Turnouts prevent channel bottom incision or prevent gully development by diverting the flow of erosive volumes of runoff in the channel to stable, well vegetated, and/or undisturbed areas before the initiation of down-cutting occurs. Aprons provide low cost and easily constructed energy dissipation. They serve as a transitional structure to reduce the erosive energy of concentrated runoff at discharge outlets allowing the safe conveyance of low energy water to vegetated slopes or waterways.

Disadvantages/Limitations

Outlets at the top of cuts or on slopes steeper than 10 percent cannot typically be protected by aprons due to re-concentration of flows and high velocities encountered after the flow leaves the apron. Drain dips are typically installed on gentle trail gradients where the potential for sediment production and runoff volume is low. Drain Dips are typically installed with a grade reversal, and may be supplemented with an energy dissipater or a sediment trap.

Implementation

Planning and Design

When locating new trails, identify sites where drain dips may be used. Drain dips are not capable of handling large amounts of runoff, so they need to be located where the length of drained trail is not too long and the volume of runoff is low.

Installation

Shape the "cone" portion of the knick and construct a 10 to 15 percent out-slope. Make sure the transition to the outlet can handle the runoff without creating a gully, or armor the outlet.

Inspection and Maintenance

Inspect to see the outlet is open and the out-slope is maintained. The most common cause of failure is a blocked outlet. The slight outside berm that develops with traffic is enough to block flow from the outlet and to cause ponding. Traffic when the outlet is wet causes rutting, which accelerates failure. Frequent trail maintenance with a rock rake can help keep drain dips open and functional.

Energy Dissipater

Definition and Purpose

An energy dissipater is a structure designed to control erosion by dispersing, absorbing, or deflecting the energy of concentrated running water at the outlet of a drainage structure or water conveyance structure. Energy dissipaters generally work by reducing the velocity of flow or by spreading out the flow to reduce its energy.

Application

Energy dissipaters are typically used at the outlets of spillways, overside drains, culverts, French drains, diversion ditches, or other conduits or pipes that concentrate runoff. At a smaller scale, they may also be used at the outlets of trail rolling dips, enhanced reverse grades, and Drain Dips/Knicks/Takeoff Channels .

Implementation

Planning and Design

When water is concentrated into a conveyance such as an over-side drain, culvert, etc. it accumulates energy, especially if there is a steep drop involved.

Installation

Use rock large enough so that it will not be dislodged by the concentrated runoff.

Inspection and Maintenance

Inspect the area for evidence of rills or gullies below the dissipater. If necessary, increase the size of the rock area or use larger rocks.