BENJAMIN J. CAYETANO GOVERNOR STATE OF HAWAII



RAYNARD C. SOON CHAIRMAN RAWAIIAN HOMES COMMISSION

JOBIE M. K. M. YAMAGUCHI

## STATE OF HAWAII DEPARTMENT OF HAWAIIAN HOME LANDS

P.O. BOX 1879 HONOLULU, HAWAII 96800 OCT 27 A10:39

October 25, 2000

OFC OF FACTORICES.

To:

Genevieve Salmonson, Director of OEQC

Department of Health

From:

nonkide Raynard C. Soon, Chairman Hawdiiah Homes Commission

Subject:

Minal Environmental Assessment

Lower Kula and Waiohuli Water System Improvements Tax Map Keys: (2) 2-2-02: 56 (Portion) and 2-3-06: 32

Kula, Island of Maui, Hawaii

The Department of Hawaiian Home Lands has reviewed Environmental Assessment (EA) for the subject project. Based on the analysis of the conditions and impacts presented in the EA, we have concluded that the proposed project will have no significant effect on the environment. Therefore, we are filing a Finding of No Significant Impact (FONSI) for the proposed project.

Please publish this FONSI in the Office of Environmental Quality Control's (OEQC) next issue of The Environmental Notice.

We have enclosed a completed OEQC The Environmental Notice Publication Form and four copies of the EA. Should you have any questions regarding the contents or preparation of the EA, please contact Mr. Kirk Tanaka of the R. T. Tanaka Engineers, Inc. at (808) 242-6861.

Should you have any questions regarding the project itself, please call Gerald Lee of our Design and Construction Branch at 587-6447.

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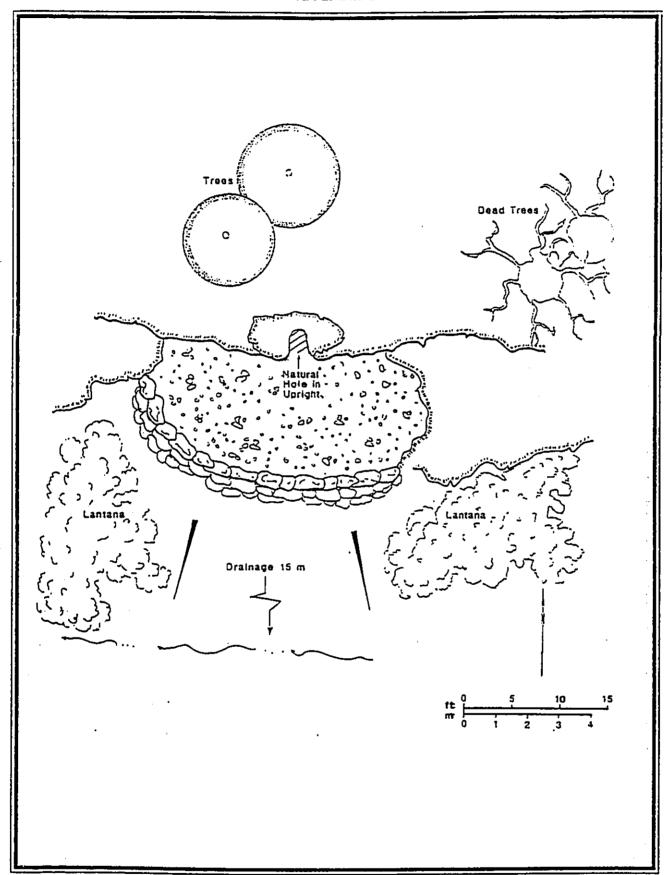


Figure D-6. SITE W-32

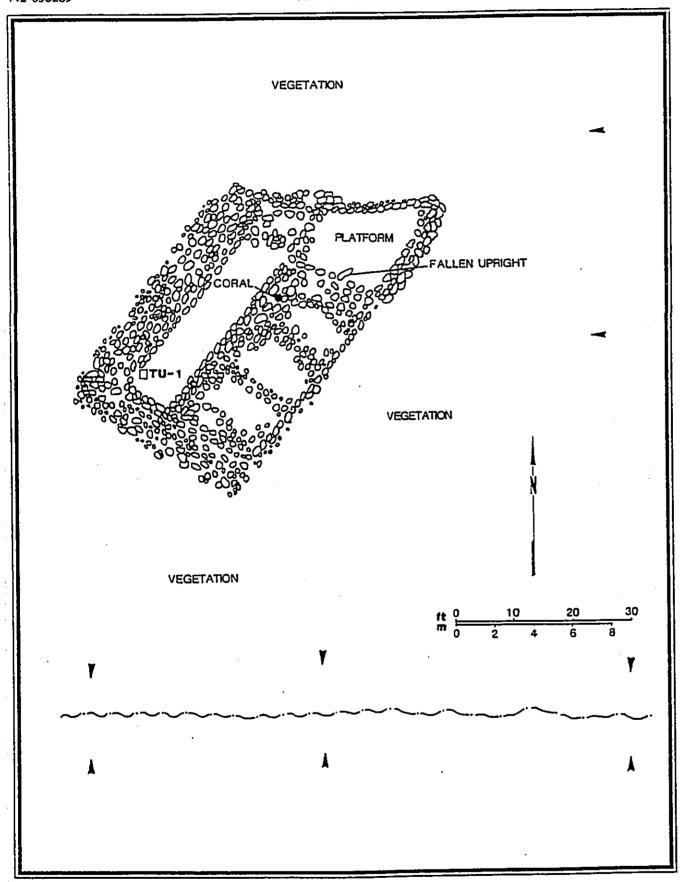


Figure D-7. SITE W-36

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.0 m wide; c. 20 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Circular enclosure with some facing on inside of NE wall, and a U-shaped enclosure. Agricultural features surround this site for distances exceeding 100.0 m.

FEATURE: A

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, and 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.0 m wide; c. 20 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure c. 25 m north of Waiohuli Gulch. Enclosure is thoroughly obscured by lantana and panini. No signs of paving within enclosure. Walls average 75 cm in thickness and 30 cm in height. They are comprised of stacked basalt boulders and cobbles.

FEATURE: B

FORMAL TYPE: U-shaped wall

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle Forest

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 20.0 m long by 17.0 m wide; c. 340 sq m

PROBABLE AGE: Unknown

DESCRIPTION: Discontinuous U-shaped wall faces the south, perpendicular to the slope. The wall consists of one to two courses of large stacked cobbles and boulders.

SITE NOS.: STATE: 2364 PHRI: W-42 BPBM: T-75\*

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, grasses, 'ilima CONDITION: Poor

INTEGRITY: Unaltered

DIMENSIONS: 5.5 m long by 5.2 m wide; c. 29 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

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DESCRIPTION: Oval enclosure and surrounding agricultural terraces. The highest density of terraces is to the east and the south of the enclosure. The enclosure is either poorly constructed or in poor condition. The walls are comprised of stacked basalt cobbles and boulders. Walls average 90 cm in thickness and 20-40 cm in height.

SITE NOS.: STATE: 2044 PHRI: W-45 BPBM: T-72 (Figure D-8)

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 90.0 m long by 65.0 m wide;

c. 5,850 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This complex includes a rectangular enclosure and an oval enclosure amidst extensive agricultural terraces and mounds.

FEATURE: A

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Panini, Lantana, 'ilima, and grasses

CONDITION: Good

INTEGRITY: Altered

DIMENSIONS: 12.0 m long by 12.0 m wide; c. 144 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with an adjoining western terrace. The western edge of the enclosure is defined by a large bedrock outcrop. Walls are comprised of basalt boulders and cobbles stacked to a maximum height of 40 cm.

FEATURE: B

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses.

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 8.0 m long by 7.0 m wide; c. 56 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with high, wide, faced walls. On the inside of the northwest wall there is a step-like feature which averages 1 m in width and is c. 30 cm above the interior surface. The walls of the structure range between 1 and 2 m in thickness and .50 to 1.40 in height. The walls are comprised of stacked boulders and cobbles. A test unit excavated in the interior of the feature revealed a subsurface cultural deposit containing charcoal, marine shell, basalt and volcanic glass flakes an kukui nut shell. A radiocarbon sample from the deposit yielded a calendric age range of AD 1450-1660.

SITE NOS.: STATE: 2365 PHRI: W-46 BPBM: T-71

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, wantle, 'ilima, and grasses

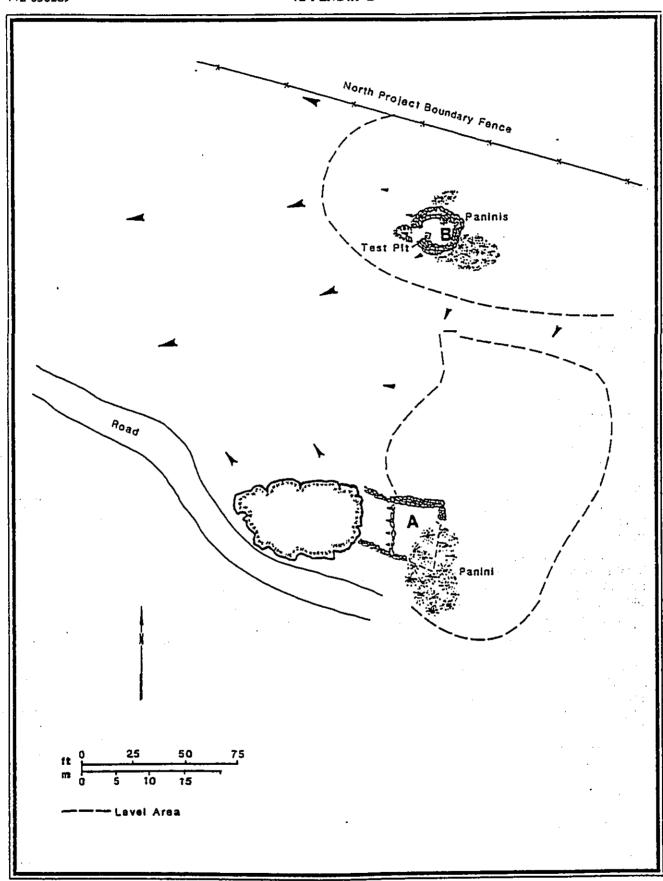


Figure D-8. SITE W-45

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 14.5 m long by 9.5 m wide; c. 138 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Trapezoidal enclosure surrounded by agricultural features. There is an opening in the northwest comer of the structure. The walls, comprised of stacked basalt boulders and cobble, average 1.0 m in thickness and 50 cm in height.

SITE NOS.: STATE: 2366 PHRI: W-47 BPBM: T-107

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima and grasses

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 39.0 m long by 25.0 m wide; c.975 sq m

PROBABLE AGE: Historic\*

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Large rectangular enclosure. Wing walls extend off NE and NW corners. Some facing on the south and north sides and on the east wing wall. Walls are comprised of stacked boulders and cobbles. The walls average 80 cm in thickness and 1.0 m in height.

SITE NOS.: STATE: 2367 PHRI: W-48 BPBM: T-108

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 20.0 m long by 38.0 m wide; c. 760 sq m

PROBABLE AGE: Prehistoric\*

FUNCTIONAL INTERPRETATION: Agriculture DESCRIPTION: Large U-shaped wall; western wall retains a terrace. Wall is comprised of stacked basalt boulders and cobbles. Wall ranges in height from 40 to 100 cm.

SITE NOS.: STATE: 2368 PHRI: W-49 BPBM: —

FORMAL TYPE: Terraces

TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 12.0 m wide; c. 156 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: Alignment connecting two parallel agricultural terraces. Agricultural terraces are extensive in this area, extending c. 150.0 m east to the edge of the project

area.

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SITE NOS.: STATE: 2369 PHRI: W-55 BPBM: --

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle, grasses, lantana, and Silky Oak

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 4.0 m long by 3.5 m wide; c. 14 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Temporary

Habitation\*

DESCRIPTION: Site is an overhang with a wall in front partially blocking the entrance. The enclosed area measures 4.0 m wide by 3.5 m deep 2.0 m high. The wall covers 1.4 m of the entrance. The overhang is filled with historic trash. The wall is composed of stacked basalt boulders.

SITE NOS.: STATE: 2370 PHRI: W-57 BPBM: —

FORMAL TYPE: Upright slab

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, lantana, and grasses.

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 0.03 m long by 0.10 m wide; c. 300 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: Single upright slab with a few possibly associated boulders. Possible remnant of a wall or terrace because evidence of bulldozer disturbance surrounds.

SITE NOS.: STATE: 2371 PHRI: W-58 BPBM: -

FORMAL TYPE: Walls

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima, and grasses

**CONDITION:** Fair INTEGRITY: Altered

DIMENSIONS: 30.0 m long by 1.0 m wide; c. 30 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Two wall segments which were probably connected before bulldozing of area. Walls run perpendicular to slope segments comprised of stacked basalt boulders and cobbles averaging 60 cm high. Probable remnant of cattle wall...

SITE NOS.: STATE: 2372 PHRI: W-59 BPBM: T-81

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima, grasses

CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 24.0 m long by 1.0 m wide; c. 24 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Transportation

DESCRIPTION: Historic road retaining wall. The wall is FEATURE: A in good condition and well-faced. It retains an abandoned road overlooking a drainage.

SITE NOS.: STATE: 2373 PHRI: W-60 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle and grasses

CONDITION: Poor INTEGRITY: Altered

DIMENSIONS: 25.0 m long by 0.4 m wide; c. 10 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Intermittent wall with some facing on the south side of the east end. The wall runs mauka-makai perpendicular to slope. Wall id 25 m long, 40 cm thick, and 1.0 m high. It is constructed of stacked basalt boulders and cobbles. Probably part of some wall represented at site 58.

SITE NOS.: STATE: 2374 PHRI: W-65 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Silky Oak, wattle, lantana, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 26.0 m long by 12.0 m wide; c. 312 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Semi-rectangular enclosure and terraces. The NE and NW walls of this enclosure consist of modified bedrock. Facing is in the SE interior corner. A 10.0 m long terrace alignment situated just upslope from the structure. Enclosed walls average 75 cm in thickness and 40 cm in height. The enclosure is 8.4. m long and 5.6 m wide.

SITE NOS.: STATE: 2375 PHRI: W-67 BPBM: — (Figure D-9)

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, panini, 'ilima

**CONDITION:** Good INTEGRITY: Altered

DIMENSIONS: 18.0 m long by 12.0 m wide; c. 216 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Consists of one trapezoidal enclosure and two close parallel waiis. Walls may represent a collapsed structure or two adjacent terraces. Several agricultural mounds noted in the vicinity.

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, panini, 'ilima

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 12.0 m long by 11.0 m wide; c. 132 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Trapezoidal enclosure. The east wall has been built around bedrock. The south wall is faced with eight upright slabs. There are also upright slabs in the NE and NW corners. A wing wall extends off the southwest corner. The wall averages 40 cm in height and is composed of stacked basait boulders and cobbles.

FEATURE: B

FORMAL TYPE: Enclosure (?)

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, panini, 'ilima

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 9.0 m long by 4.0 m wide; c. 36 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two parallel walls two meters apart extending for c. 7.8 m. Walls are joined at NW end by relatively large rocks. The other end is partially enclosed by larger rocks but they do not completely close off the structure. Formally the walls resemble terraces; however' it is likely they represent the disturbed remnants of a smaller enclosed rectangular terrace.

SITE NOS.: STATE: 2376 PHRI: W-71 BPBM: T-101

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, panini, wattle, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 22.0 m long by 18.0 m wide; c. 396 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: Triangular enclosure with associated agricultural features. The structure has a small wall in the eastern end. Agricultural features extend west for c. 120.0 m along the side of a hill. Enclosure walls average 25 cm in height and are comprised of stacked boulders and cobbles.

SITE NOS.: STATE: 2377 PHRI: W-73 BPBM: —

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FORMAL TYPE: Walls

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle and grasses

CONDITION: Fair INTEGRITY: Altered

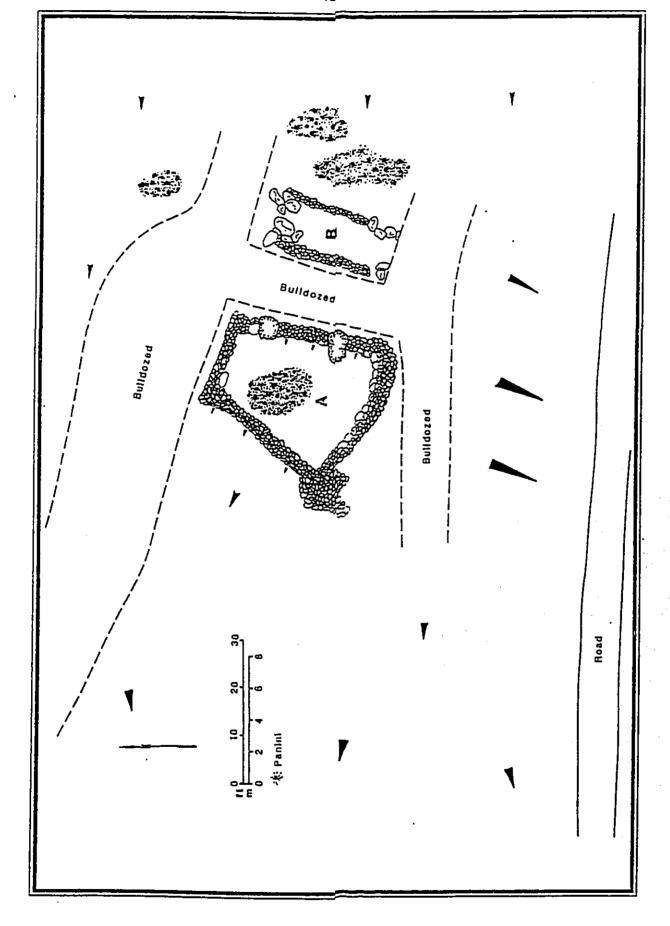


Figure D-9. SITE W-67

DIMENSIONS: 170.0 m long by 75.0 m wide;

c. 12,750 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: Terraces and walls. In this area there are two larger terraces and numerous smaller ones. The wall runs perpendicular to the slope. Terraces are retained by either short retaining walls or alignments.

**SITE NOS.: STATE: 2378 PHRI: W-75 BPBM: T-87-86** 

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle and grasses

CCNDITION: Good INTEGRITY: Altered

DIMENSIONS: 100:0 m long by 0.5 m wide; c. 50 sq m

PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Habitation/Agriculture

DESCRIPTION: L-shaped wall, the north-south wall of which retains a terrace. The east-west wall is short and free standing. There are terraces in the area. There is also a water trough made from a cut half-boiler. The L-shaped wall appears to be the disturbed remnant of a rectangular enclosure. The wall has a maximum height of 50 cm and is composed of stacked basalt boulders and cobbles.

SITE NOS.: STATE: 2379 PHRI: W-77 BPBM: — (Figures D-10, D-11)

FORMAL TYPE: Enciosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle, lantana, koa haole, 'ilima, and

grasses

CONDITION: Good
INTEGRITY: Altered

DIMENSIONS: 30.0 m long by 20.0 m wide; c. 600 sq m

PROBABLE AGE: Prehistoric\*

FUNCTIONAL INTERPRETATION: Agriculture DESCRIPTION: Irregular-shaped enclosure; uses a bedrock outcrop. Very low wall on NW side. The enclosure is situated in a swale. Wall is poorly preserved composed of stacked basalt boulders and cobbles. A test unit of this feature did not reveal any cultural remains.

SITE NOS.: STATE: 2380 PHRI: W-80 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle, Silky Oak, lantana, 'ilima, panini,

grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 400.0 m long by 1.0 m wide; c. 400 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Long wail runs perpendicular to the slope. The wall runs parallel to and close to the south side of a deep ravine and as such may be part of the system of walls at Site W-4. Some segments of the wall are collapsed or have been destroyed by cows and bulldozers.

SITE NOS.: STATE: 2381 PHRI: W-82 BPBM: —

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair

INTEGRITY: Altered

DIMENSIONS: 9.3 m long by 5.5 m wide: c. 51 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Possible rectangle habitation terrace in a large area of many scattered agricultural terraces. Consists of a U-shaped alignment of boulders and cobbles, the interior of which is relatively level compared to the adjacent slope.

SITE NOS.: STATE: 2382 PHRI: W-83 BPBM: ---

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 5.0 m long by 3.5 m wide; c. 18 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Small rectangular enclosure; NW corner faced on interior and exterior; also facing on the interior of the SW corner. Walls have a maximum height of 30 cm and are composed of stacked cobbles and boulders. Agricultural features are present in the vicinity.

SITE NOS.: STATE: 2383 PHRI: W-88 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle and grasses

CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 15.0 m long by 1.1 m wide; c. 17 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Transportation DESCRIPTION: Road retaining wall. This wall is in good condition and is faced. The wall holds up a bend in an old road situated on the edge of a drainage. The road is almost certainly the same road that crosses the bridge (Site

R\*1

W-101) just up stream.

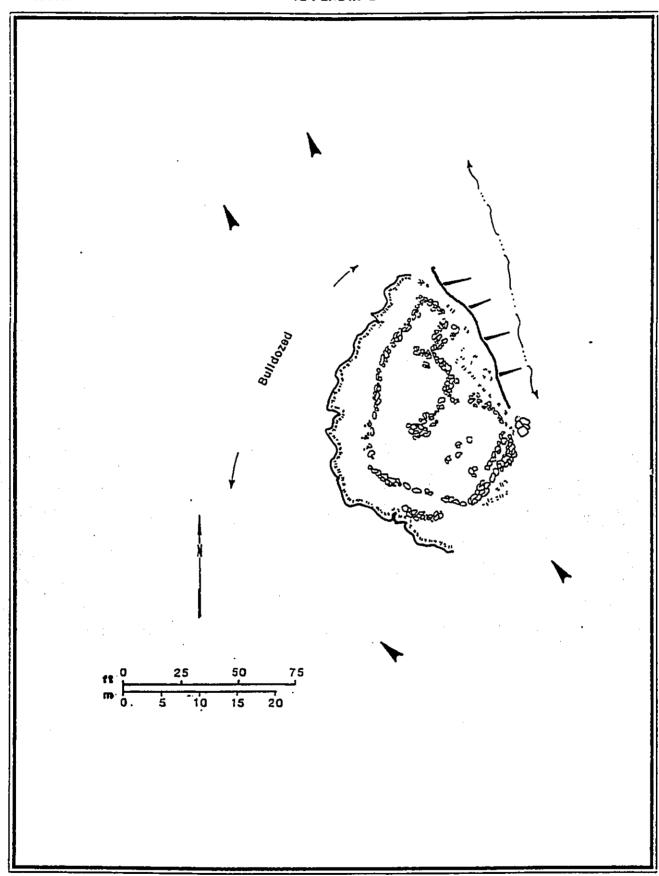


Figure D-10. SITE W-77

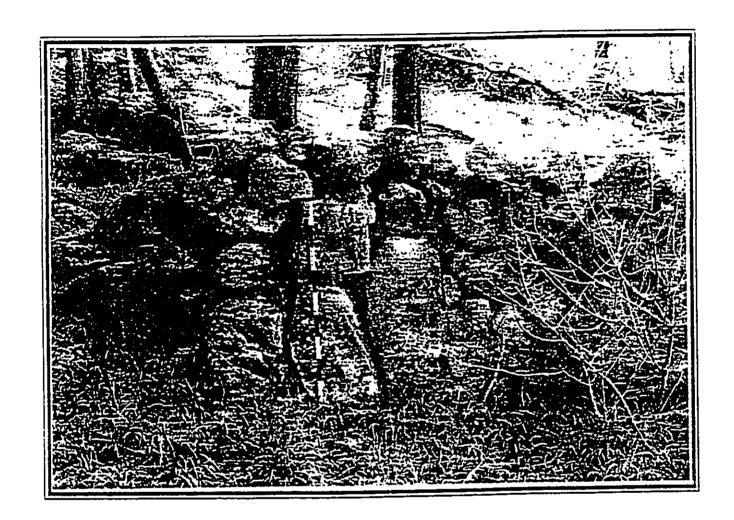


Figure D-11. SITE W-77, WALL WITH UPRIGHTS. View to South. (PHRI Neg.1143-36)

APPENDIX D D-22

SITE NOS.: STATE: 2384 PHRI: W-90 BPBM: — (Figure D-12)

FORMAL TYPE: Cave

TOPOGRAPHY: Stream-cut basalt cliff

VEGETATION: Wattle, lantana, 'ilima, and grasses

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 8.0 m long by 0.8 m wide; c. 6 sq m

PROBABLE AGE: Historic

**FUNCTIONAL INTERPRETATION: Burial** 

DESCRIPTION: Small lava tube which extends into the face of a tall cliff face; at least two burials present in tube. The tube extends inward for more than 8.0 m; bends slightly to left. Bones are scattered throughout the tube; a concentration of bones is situated c. 6.0 m from the opening. Entrance to tube is partially walled. Elements present include rib, long bones, possible skull fragment and other post-cranial remains. A glass bead and shell button noted among the bones.

SITE NOS.: STATE: 2385 PHRI: W-96 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 9.2 m wide; c. 92 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: U-shaped wall with an internal mound. Site is situated in a large agricultural area. The mound is c. 1.5 m in diameter and 0.5 m high. U-shape opens to the NW. Wall ranges from 35 to 60 cm in height and is comprised of stacked cobbles and boulders. Sub-surface probes indicate that no cultural remains are present in fill, thus probably the feature is agricultural in nature.

SITE NOS.: STATE: 2386 PHRI: W-97 BPBM: ---

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

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DIMENSIONS: 12.0 m long by 10.0 m wide; c. 120 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure with short internal wall parallel to the east wall. The walls are very thick (c. 2 m). All walls have large flat boulders on top. There is a 15.0 m long wall extending northeast to the gulch. The 70 cm high enclosed wall is comprised of stacked basalt boulders and cobbles. Agricultural features are present in the vicinity.

SITE NOS.: STATE: 2387 PHRI: W-98

BPBM: T-69-70\*

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 7.7 m long by 5.0 m wide; c. 39 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure with associated agricultural features. The enclosure is higher on the west side to accommodate the slope. Walls are 1-2 m thick and range from 30-60 cm in height. Walls are composed of stacked basalt boulders and cobbles.

SITE NOS.: STATE: 2388 PHRI: W-101 BPBM: —

FORMAL TYPE: Bridge

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle CONDITION: Poor INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 4.0 m wide; c. 36 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Transportation DESCRIPTION: Historic wooden bridge. The bridge is collapsed. The south side still has some of the lower supports in place; "X" braces nailed to supports. Most of the cross members are missing. Supports consist of chemically treated piles.



Figure D-12. SITE W-90, ENTRANCE TO HISTORIC BURIAL.
VIEW TO SOUTHEAST. (PHRI Neg.1145-3)

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## APPENDIX E

## KEOKEA SITE AND FEATURE DESCRIPTIONS

SITE NOS.: State: 2046 PHRI: K-1 BPBM: T-15

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

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VEGETATION: Grasses, lantana, wante, panini, and 'ilima

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 80.0 m long by 40.0 m wide;

c. 3,200.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Platform (Fea. A), terrace (Fea. B), mounds, paved areas, walls, and possible trails. There are a large number of agricultural features in this area including terraces, mounds, and modified outcrops.

FEATURE A: Platform

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, morning glory, 'ilima,

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 7.0 m wide; c. 49.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: An irregular paved platform with two possible bedrock cupboards on the north side. Feature is constructed aganist a bedrock outcropp. It is constructed of stacked cobbles and boulders. The upper surfeace is irregularly paved with cobbles. The north half of the feature is partially collapsed.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

DIMENSIONS: 5.8 m long by 6.4 m wide; c. 37 sq m VEGETATION: Lantana, grasses, moming glory, 'ilima,

panini

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CONDITION: Fair INTEGRITY: Unaltered PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular terrace. The tops of the south and west walls are even with the inside ground surface. The east wall consists of modified bedrock. The terrace wall has a maximum height of 50 cm and is composed of stacked basalt boulders and cobbles.

SITE NOS.: State: 2047 PHRI: K-2 BPBM: T-16

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: 'Ilima, lantana, and grass

CONDITION: Fair to Good INTEGRITY: Altered\* PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Site consists of two adjacents enclosures. There are a large number of agricultural features in this area including terraces, mounds, and modified outcrops.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Lantana and grass

CONDITION: Fair INTEGRITY: Altered\*

DIMENSIONS: 12.0 m long by 10.0 m wide;

c. 120.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a 5.0m by 6.0 m paved platform in the southeast corner and a possible firepit inside. The northwest wall sits on the edge of a drop and consists of an alignment. The walls range from 1.0 to 2.0 m in thickness and average 50 cm in height. The walls are constructed of stacked cobbles and boulders. The south corner of Fea. B abuts the north corner of Fea. A.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: lantana, grass, and 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 7.0 m wide; c. 70.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Irregular enclosure, the east wall of which consists of a bedrock outcrop. Facing present on both sides of the north and east walls. The south corner abuts the north corner of Fea. A. Walls are comprised of stacked

basalt boulders and cobbles.

SITE NOS.: State: 2028 PHRI: K-3 BPBM: T-14

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 120.0 m long by 100.0 m wide;

c. 12,000.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial\*/

Habitation/Agriculture

<sup>\*</sup> Tentative, temporary, or provisional

DESCRIPTION: Two rectangular enclosures with wide walls, one with an internal L-shaped wall. Agricultural terraces and mounds surround the enclosure.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: 'Ilima, lantana, grasses

CONDITION: Good **INTEGRITY:** Unaitered

DIMENSIONS: 14.0 m long by 14.0 m wide;

c. 196.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with wide walls. especially in the northwest corner. The west and south walls are faced externally and the east wall is faced internally. The walls average 80 cm in height and are copmrised of stacked boulders and cobbles. A curved, rock-retained terrace curves southward and then west away from the southeast corner of the enclosure. A test unit excavated in the interior of this feature revealed the presence of a subsurface deposit containing charcoal, marine shell, bone, and basalt flakes. The bone includes two phalanges from a child, potentially indicating and infant burial beneath the floor of the structure. A radiocarbon sample from the deposit yielded a calendric age range of AD 1640-1890.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

**CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 9.0 m long by 8.5 m wide; c. 76.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with internal dividing wall. The internal wall forms a small room in the northwest corner of the enclosure. There is some interior and exterior facing on the south wall. The walls range between 40 and 60 cm in height and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2049 PHRI: K-4 BPBM: FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, and 'ilima

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 27.0 m long by 10.0 m wide;

c. 270.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of an irregular

present in Fea. A. Features fit pattern of typical residences situated along the edge of a terraced slope. Numerous agriculture terraces surround the site.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, and 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.2 m long by 6.0 m wide; c. 43.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Irregular nearly C-shaped enclosure. Possible terrace in the north half; possible firepit in the center. Walls range from 100 cm to 10 cm in height and are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, kiawe, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 8.5 m long by 7.5 m wide; c. 63.8 sq m

PROBABLE AGE: Prehistoric

**DESCRIPTION:** Rectangular enclosure with small room in the southeast corner. A c. 20.0 m long terrace wall extends off the southeast corner of the enclosure. A two track road runs through this terrace. Walls average 30 cm in height and are comprised of stacked boulders and cobbles.

SITE NOS.: State: 2048 PHRI: K-5 BPBM: T-19

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 75.0 m long by 18.5 m wide;

c. 1,387.5 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Temporary

Habitation/Agriculture

DESCRIPTION: Site consists of a C-shape, a platform, a modified outcrop wall, and surrounding terraces. The wall may have diverted water to a large earthen terrace system.

FEATURE A: Platform

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle.

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS:5.0 m long by 3.0 m wide; c. 15.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Paved collapsed platform. Given its enclosure and a rectangular enclosure. Possible firepit size and shape (triangular), the platform may have served an agricultural function; however, testing is necessary to verify function. Feature is c. 30 cm high and is comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.8 m wide; c. 47.6 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the southwest. Possible midden within enclosure, as the soil inside is darker and finer than the surrounding soil. Position of surrounding features indicates the enclosure may be agricultural.

SITE NOS.: State: 2029 PHRI: K-6 BPBM: FORMAL TYPE: Complex (4 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 75.0 m long by 60.0 m wide:

c. 4,500.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial/Habitation

/Agriculture

DESCRIPTION: Complex consists of three enclosures, a mound, and agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, and wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 11.8 m wide;

c. 153.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Notched rectangular enclosure with two internal platforms, an internal room, and an external platform. Internal platforms are in the northeast half of the enclosure and are connected by a step. The internal room is in the southwest portion of the enclosure near the notch. A test unit excavated in side the internal room revealed a subsurface cultural deposit containing volcanic glass and basalt flakes, sea urchin remains, coral fragments, marine shell, mammal and fish bone, charcoal, and kukui nut shell. A radiocarbon sample from the deposit yielded two possible calendric age ranges of AD 1470-1680 and AD 1739-1805.

FEATURE B: Mound

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 2.0 m long by 1.0 m wide; c. 2.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular mound surrounded by bedrock outcrops. Facing on southwest side of this feature indicates that it may be a partially collapsed burial platform. The mound has a maximum height of 30 cm and is comprised

of stacked basait boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 7.0 m wide; c. 49.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with high well-faced walls, except for the east wall which is mostly collapsed. The enclosure is adjacent to a collapsed lava tube. The enclosure's external wall faces are higher than the internal ones (avr. 85 cm versus avr. 60 cm). Terraced level areas are adjacent to the north and south sides of the enclosure.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Fair/Poor INTEGRITY: Unaltered

DIMENSIONS: 5.8 m long by 5.6 m wide; c. 32.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the west. The walls look very deflated, though there is no evidence of collapse. Rocks from the wall may have been removed and utilized for the construction of Fea. C.

SITE NOS.: State: 2030 PHRI: K-7 BPBM: T-22 (Figure E-1)

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wiliwili, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 110.0 m long by 70.0 m wide;

c. 7,700.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

**DESCRIPTION:** Complex consists of two enclosures, one rectangular and one oval. Surrounding the enclosures are numerous agriculture features.

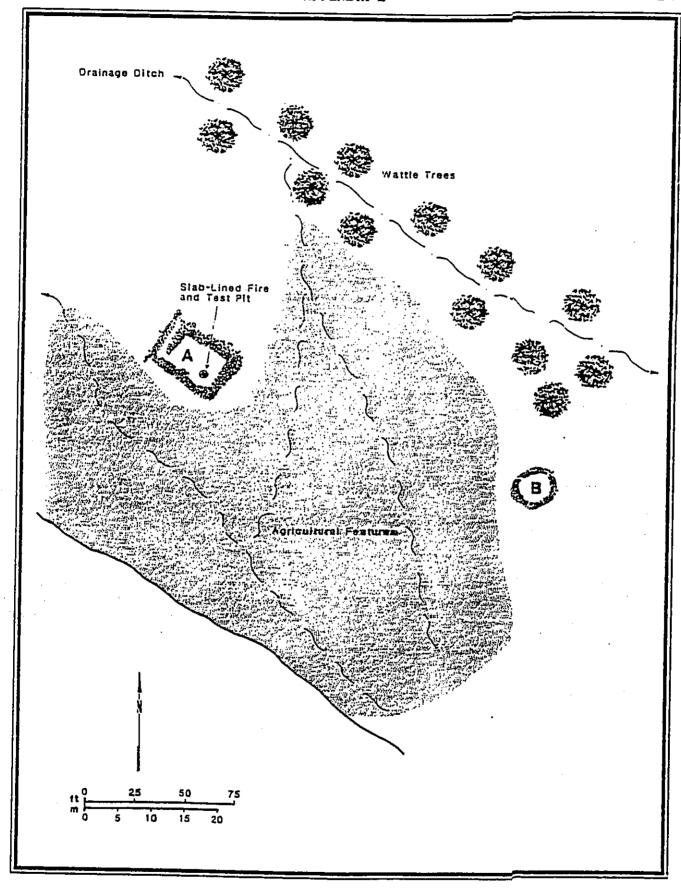


Figure E-1. SITE K-7, FEATURES A AND B.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wiliwili

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 10.0 m wide:

c. 130.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a terrace attached to the northwest wall. A probable entryway opens onto the terrace near the west corner of the northwest wall. Facing is intermittent along the walls which are 65 cm to 75 cm high and comprised of stacked basalt boulders and cobbles. A slab-lined firepit is centrally located in the eastern half of the structure.

A test unit was excavated which half-sectioned the firepit. The test unit revealed a subsurface cultural deposit containing marine shell, mammal bone, volcanic glass flakes, and charcoal. A radiocarbon sample collected from the deposit yielded three possible calendric age ranges: AD 680-1060, AD 1077-1125, and AD 1135-1157.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.5 m long by 5.0 m wide; c. 27.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure; walls mostly faced, some collapsed. The south part of the structure lies even with the ground surface. The walls average 80 cm in height and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2050 PHRI: K-8 BPBM: — FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 50.0 m long by 45.0 m wide;

c. 2,250.00sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

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DESCRIPTION: Complex consists of three rectangular enclosures, two rectangular and one irregular. Many agriculture features are present in the general area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima

CONDITION: Good

INTEGRITY: Unaitered

DIMENSIONS: 20.0 m long by 15.0 m wide;

c. 300.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Irregular in plan. South wall extends c. 4.0 m beyond the east wall. The southwest portion of the structure has wider walls and the exterior of these walls are collapsed. A short section of the south wall is faced. Maximum wall height is 1.0 m. Walls are comprised of stacked cobbles and boulders. A possible firepit is present in the north central portion of the enclosure.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima

CONDITION: Fair/Poor INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 6.0 m wide; c. 78.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure partially faced on the interior of the northeast corner. The outside of the east wall is partially covered by alluvium. The walls range in height from 30 cm to 40 cm and are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 8.0 m wide; c. 96.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with partial facing on the southeast exterior wall. The feature has been damaged by cattle to the extent that details of construction are difficult to ascertain. Maximum height of walls is 1.0 m and they average 1.5 m in width.

SITE NOS.: State: 2051 PHRI: K-9 BPBM: --- T-38

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 95.0 m long by 90.0 m wide;

c. 8,550.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two overhangs with associated walls, a rectangular enclosure, and a large irregular enclosure. The irregular enclosure surrounds an area of agricultural features. Both enclosures are attached to the wall of Site K-12.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, honey suckle.

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 5.0 m wide; c. 50.00 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of two adjacent overhangs with associated walls on top of an outcrop. The south edge of the outcrop abuts the rock wall of Site K-12. The northern overhang is 3.0 m long, 2.5 m deep, and 1.5 m high. The southern overhang is 1.3 m long, 1.2 m deep, and 1.5 m high. Although no cultural remains noted on the surface of the overhangs their association with Feature B and size indicate possible use as shelters. Testing would be necessary to verify prehistoric use.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 10.0 m long by 8.0 m wide; c. 80.0 sq m

PROBABLE AGE: Prehistoric/Historic

DESCRIPTION: Rectangular enclosure; paved area adjacent to east wall. The paved area measures c. 8.0 by 4.0 m; its exact dimensions are difficult to determine because dense vegetation covers the feature. The walls have an average width of 80 cm and a maximum height of 80 cm. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, Christmas-berry

**CONDITION:** Good INTEGRITY: Altered

DIMENSIONS: 45.0 m long by 15.0 m wide;

c. 675.0 sq m

PROBABLE AGE: Historic/Prehistoric\*

DESCRIPTION: Very large irregular-shaped enclosure surrounding an area of agricultural features. Feature forms part of the wails of Site K-12 a complex of of historic cartle control walls; however, the presence of a series of terraces and numerous mounds in the interior suggest the enclosure also functioned, potentailly prehistorically, as a garden enclosure. The walls range from 1.0 to 1.8 m in height and average 80 cm in thickness. they are comprised of stacked basait boulders and cobbles.

SITE NOS.: State: 2052 PHRI: K-10 BPBM: — FORMAL TYPE: Complex (7 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, wattle

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 80.0 m long by 60.0 m wide;

c. 4,800.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two square enclosures, two oval enclosures, one circular enclosure, one U-shaped enclosure, a platform, and many surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, panini

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 3.6 m long by 3.5 m wide; c. 12.6 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small square enclosure; most of the walls are faced internally and externally. A probable entryway is present in the western portion of the northeast wall. The walls have a maximum thickness of 70 cm and a maximum height of 1.3 m. Walls are comprised of stacked

basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, wattle

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 5.7 m long by 3.8 m wide; c. 21.7 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with high walls. The structure is built into a slope so that the northeast wall is almost at ground level; the wall opposite the northeast wall is very high, 1.5 m. The interior walls of the enclosure are faced, and most of the exterior walls are faced. Walls have a maximum thickness of 1.0 m and are comprised of stacked

basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, wattle

CONDITION: Good/Fair **INTEGRITY:** Unaltered

DIMENSIONS: 6.5 m long by 5.0 m wide; c. 32.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure; two internal curboards present in east and south walls. The north wall is the highest and is built into the slope. Internal facing on the southeast and southwest corners. The walls have a maximum thickness of 1.0 m and range from 10 to 30 cm in height. Walls are

occasionally incorporate bedrock outcrops.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, wattle

**CONDITION: Poor** INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 4.0 m wide; c. 16.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small circular enclosure; some interior facing on the southwest side. Just south of the enclosure, at the foot of Site K-12, is a small natural cupboard in bedrock. Walls average 20 cm in height and 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.3 m long by 5.3 m wide; c. 22.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure; exteriors of the southwest and northeast walls and interiors of northeast, southeast, and northwest walls are faced. Possible cupboard present in north corner. The walls have a maximum thickness of 1.3 m and a maximum height of 80 cm. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE F: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaltered

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DIMENSIONS: 4.5 m long by 7.6 m wide; c. 34.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: U-shaped enclosure open to the northeast. Both sides of southeast and southwest walls are faced. The northwest wall is mostly collapsed. Walls average 20 cm in height and 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE G: Platform/pavement TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 5.0 m wide; c. 25.0 sq m

PROBABLE AGE: Prehistoric

comprised of stacked basalt cobbles and boulders and DESCRIPTION: Platform or partially elevated pavement built on and around bedrock. One meter north of the platform is a faced wall which extends north for 4.0 m. The feature has a maximum height of 50 cm and is comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2053 PHRI: K-11 BPBM: -- T-39

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini, wattle,

**CONDITION: Good** INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular terrace; the east side and part of the west wall of the terrace consist of bedrock outcrops. Most of the west and north walls retain and rise slightly above a level area. Walls are unfaced. Many agricultural features in the general area.

SITE NOS.: State: 2054 PHRI: K-12 BPBM: -

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, 'ilima, wiliwili

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 700.0 m long by 333.0 m wide;

c. 23,3100.0 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Site consists of a complex of variable length cattle walls some of which form large enclosures in a collapsed lava tube. The walls extend beyond the project area's southwestern corner. The most prominent wall extends the distance and loops around to return to the project area's west boundary.

SITE NOS.: State: 2055 PHRI: K-13 BPBM: --FORMAL TYPE: Complex (6 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, cilantro (Coriandrum

sativum L., 'ilima, wattle, panini

**CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 100.0 m long by 45.0 m wide;

c. 4.500.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Four rectangular enclosures, one D-shaped enclosure, and one oval enclosure. Agriculture features, mounds and terraces, present in the area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 3.5 m long by 3.0 m wide; c. 10.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; internal cupboard present on east wall; north-south wall extension off the east wall. Some of the inside of the north wall is faced; however, most walls are collapsed. Walls range from 30 cm to 60 cm in height and average 50 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, cilantro

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 5.8 m wide; c. 36.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Sub-rectangular enclosure with collapsed walls; no facing or internal features present. Faced terrace nearby. Walls average 60 cm in height and 1.4 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, and 'ilima

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.7 m long by 5.3 m wide; c. 30.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; north and northeast sides of the feature are built on bedrock. The walls are collapsed and the interior is filled with rubble. Walls average 60 cm in height and 1.4 m in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, wattle, forbs

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 5.0 m wide; c. 25.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with unfaced walls

Walls average 40 cm in height and 1.2 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

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FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, morning glory, grasses, panini,

'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.6 m long by 4.5 m wide; c. 25.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: D-shaped enclosure. North wall formed by an overhang and the remaining walls are comprised of stacked rock. The east wall and portions of the west wall are faced. Walls average 40 cm in height and 80 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE F: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.5 m long by 5.5 m wide; c. 35.8 sq m

PROBABLE AGE: Prehistoric

**DESCRIPTION:** Sub-rectangular structure with no facing. Walls average 40 cm in height and 1.2 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2056 PHRI: K-14 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, panini, grasses, forbs

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 50.0 m long by 35.0 m wide;

c. 1,750.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Complex consists of a U-shaped structure and associated agriculture features. The U-shape opens to southwest. The feature is 6.0 m long, 5.5 m wide, and has a maximum height of 70 cm. The walls average 2.0 m in thickness and appear mostly collapsed. A cattle wall

(Site K-12) runs through the site.

SITE NOS.: State: 2057 PHRI: K-16 BPBM: —

FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, honey suckle, wattle,

panini

CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 85.0 m long by 55.0 m wide; c. 4,675.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION - Habitation DESCRIPTION: Complex consists of four habitation enclosures. A cattle wall, which is part of Site K-12, runs

through the site. Minor agricultural features surround complex.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, Christmas-berry

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.7 m wide; c. 14.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure. The eastern enclosure is circular, the walls are collapsed and they incorporate bedrock. The western enclosure is square, and the walls are collapsed. Walls average 80 to 100 cm in height and 100 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, Christmas-berry,

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.5 m long by 5.5 m wide; c. 35.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; facing present on all of the exterior walls and on the interiors of the south and west walls. The stones used in construction are quite irregular so that the facing is not obvious. A break in the west wall is probably due to cattle, but may represent an entryway. Walls have a maximum height of 85 cm and and a maximum thickness of 80 cm.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini

**CONDITION: Poor** INTEGRITY: Unaltered

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DIMENSIONS: 8.5 m long by 7.5 m wide; c. 63.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with collapsed walls. Walls average 10 cm in height and 60 cm in thickness. Walls are comprised of stacked basait cobbles and boulders.

SITE NOS.: State: 2058 PHRI: K-19 BPBM:-FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 60.0 m long by 45.0 m wide;

c. 2,700.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

**DESCRIPTION:** Complex of three habitation structures and numerous agriculture features. Many of the agriculture features are well-defined, are well-constructed, and incorporate bedrock.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.2 m wide; c. 21.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small circular structure with some internal facing. Walls average 50 cm in height and 65 cm in thickness. Walls are comprised of stacked basalt pebbles, cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle, panini

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 4.2 m long by 3.5 m wide; c. 14.7 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small C-shaped enclosure. No facing observed. Walls average 55 cm in height and 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

**CONDITION:** Good INTEGRITY: Unaitered

DIMENSIONS: 8.5 m long by 8.0 m wide; c. 68.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Ovalenclosure with some facing in the northeast corner. North wall is the highest. Walls average 80 cm in height and 60 cm in thickness. Walls are comprised

of stacked basalt cobbles and boulders.

SITE NOS.: State: 2059 PHRI: K-20 BPBM: — FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wattle, Christmas-berry CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 50.0 m long by 35.0 m wide: c. 1,750.0 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two enclosures, one residential terrace, and many surrounding agriculture terraces.

FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grass, 'ilima, wattle,

Christmas-berry CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 6.3 m long by 0.0 m wide; c. 0.00 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square unfaced enclosure; possible step on the interior of the east wall at a possible entryway. Walls have a maximum height of 50 cm. and are comprised of stacked basait pebbles, cobbles and boulders.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 5.0 m wide; c. 30.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Rectangular level area with walls on three sides. A wall, or what may be a wall, extends off the northwest corner of the terrace. Walls average 80 cm in height and 80 m in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

**CONDITION:** Good INTEGRITY: Unaitered

DIMENSIONS: 2.0 m long by 2.0 m wide; c. 4.0 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: This is a small circular enclosure. There is some facing on the walls. A possible entry way is present in the sutheast side. Walls average 70 cm in height and 50 m in thickness. Walls are comprised of stacked basalt INTEGRITY: Altered cobbles and boulders.

SITE NOS.: State: 2060 PHRI: K-21 BPBM: — FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, wattle, panini

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 55.0 m long by 25.0 m wide;

c. 1.375.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a notched enclosure and a badly collapsed circular enclosure. Within the notched enclosure is a small room. Agriculture features present in general area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wattle, panini

CONDITION: Fair **INTEGRITY:** Unaltered

DIMENSIONS: 5.5 m long by 5.5 m wide; c. 30.3 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure bisected by a modified bedrock wall. The walls are severely collapsed. Walls average 60 cm in height and 35 m in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, Christmas-berry, panini

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 11.0 m long by 10.5 m wide;

c. 115.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Notched structure with thick, 2.0+ m wide walls in the northeast corner and north end of the east wall. A small internal room, c. 2.5 m by 1.5 m in size, extends from the north wall. Some facing is evident around the structure, as well as on the internal room. Walls average 80 cm in height and 1.15 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2061 PHRI: K-25 BPBM: — FORMAL TYPE: Complex (6 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wattle, panini

CONDITION: Good

DIMENSIONS: 120.0 m long by 90.0 m wide;

c. 10,800.0 sq m

PROBABLE AGE: Historic/Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture/Animal Control

DESCRIPTION: Complex consists of a circular enclosure, one irregular enclosure, two sub-rectangular enclosures, an L-shaped enclosure, one upslope-downslope wall, and many agriculture features. A series of well-faced, relatively high scallop-shaped terraces which frequently incorporate bedrock outcrops are present on the steeper slopes in the southeast portion of the site.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.5 m wide; c. 14.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure with partially collapsed unfaced walls. Structure opens to the southwest. Walls average 30 cm in height and 60 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE B: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 9.4 m long by 5.3 m wide; c. 49.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: L-shaped enclosure with some facing on the interior and exterior of the south wall. Feature is open to the southeast. The west wall is entirely collapsed. An area of rubble indicates feature may have once had a north wall. Walls have a maximum height of 1.2 m and average 90 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders. There is a mound very close to the feature and a small C-shaped mound 2.0 m from the northwest corner.

FEATURE C: Enclosure

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TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 9.0 m wide; c. 108.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Enclosure is irregular in plan view. The southwest wall runs upslope-downslope into Site K-36. Enclosure contains an internal terrace wall in poor condition. Facing is present on the interior of the northeast corner and

parts of the south wall. Walls average 45 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, 'ilima, lantana, wattle, panini

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 20.5 m long by 15.0 m wide;

c. 307.5 sq m

PROBABLE AGE: Prehistoric/Historic

DESCRIPTION: Large rectangular enclosure; the east and west walls form terraces. The north and south walls are free standing. A wing wall extends off the southeast corner for c. 15 m. A long upslope-downslope probable ranch wall extends off the northeast corner, and a terrace extends off the east wall.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.5 m long by 4.0 m wide; c. 18.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with some facing present on the exterior of the northeast corner. Walls average 60 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE F: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 32.0 m long by 0.8 m wide; c. 25.6 sq m

PROBABLE AGE: Historic

DESCRIPTION: Upsole-downslope wall segment. West end of wall falls about 2.0 meters short of connecting with Fea. D. The east end of the wall is broken up into several walls and extends almost to a drainage. Walls average 60 cm in height and are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2062 PHRI: K-26 BPBM: — T-64

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 40.0 m long by 20.0 m wide;

c. 800.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Feature A is comprised of two rectangular rooms and a semicircular room. Feature B is a triangular planform. There are agricultural terraces throughout the general area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 7.0 m wide; c. 70.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Three-roomed enclosure consisting of two rectangular enclosures which share a wall with a semicircular enclosure. Rectangular enclosures are simuted just uphill from the semicircular enclosure. Wall of the semicircular enclosure is faced. Walls average 30 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Platform

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wiliwili

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 3.5 m long by 5.0 m wide; c. 17.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Triangular platform extends out from a gentle slope. The northwest wall is faced. The platform is 30 cm high and comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2063 PHRI: K-27 BPBM: — T-62 (Figure E-2)

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 30.0 m wide;

c. 900.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a rock shelter with a curved wall in front of it, and a rectangular enclosure which makes extensive use of bedrock. Agriculture features surround the complex.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, wattle CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two small chambers are present within the 50 cm high overhang. A wall fronting the overhang forms a semicircular enclosure with the overhang. The wall averages 60 cm in height and is comprised of stacked basalt cobbles and boulders. Off the east wall of the enclosure there is a level area consisting of rubble (possible pavement).

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wante

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 10.0 m long by 5.8 m wide; c. 58.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A rectangular enclosure. The north wall consists of the outcrop Feature A cuts into. There is some facing on the south and east walls. A 50 cm high step or bench runs the length of the interior of the east wall and possibly extends a little on the north and south walls. Walls average 60 cm in height and are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2064 PHRI: K-29 BPBM: — T-63

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, grasses, 'ilima
CONDITION: Good/Fair

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 50.0 m long by 50.0 m wide;

c. 2,500.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Feature A has walls extending from the northwest and southwest corners. Feature B has a possible platform in the southeast corner and a paved trail in the southwest corner. Agriculture features surround the complex. Some distance from the complex an isolated piece of coral was found. The substantial nature of Feature B and its close proximity to the heiau, Site K-30 suggest it may have functioned as a high status and/or priestly residence.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered



Figure E-2. SITE K-27, OVERHANG. VIEW TO WEST-NORTHWEST. (PHRI Neg. 1143-10a)

DIMENSIONS: 12.0 m long by 10.0 m wide;

c. 120.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with modified bedrock walls extending off the northeast and southeast corners. These walls run upslope, the longest for 15.0 m, the other for 5.0 m. The north wall and the interior of the east wall are faced. Maximum wall height is 1.5 m. Walls are comprised of stacked cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 18.0 m long by 13.0 m wide;

c. 234.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a possible collapsed platform in the southeast corner. Portions of the north wall are paved with pebbles, especially the eastern half of the north wall. The upper surface of the west wall is nearly flush with the interior of the structure and thus, may have served as a porch. The walls are very substantially constructed being nearly 2.0 m thick and up to 1.2 m high. Intact facing is present along most of the interior and exterior of the structure's walls. A paved walkway is present 0.5 m from the southwest corner of the enclosure; this walkway extends for 5.0 m to the west.

SITE NOS.: State: 2031 PHRI: K-30 BPBM: -

(Figure E-3)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, morning glory,

castor bean CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 25.0 m long by 24.0 m wide;

c. 600.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious

DESCRIPTION: Molohai Heiau; a large and notched enclosure. Internal features include a long low wall, two mounds (one of which is faced), a triangular platform faced on one side, a square platform in the north corner, a step or bench around most of the inside wall, and a step or bench along outside of the north and west walls. A fragment of coral is present on the step on the inside of the south wall.

A test unit was excavated near the triangular platform which revealed a subsurface cultural deposit containing volcanic glass and basalt flakes, marine shell, mammal bone, and charcoal.

SITE NOS.: State: 2065 PHRI: K-31 BPBM: --T-13

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 9.0 m wide; c. 90.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Sub-rectangular enclosure with very collapsed walls. Agricultural features surround this site. Some facing is present on the inside of the east wall. Possible platform present in the northeast corner. The wall ranges from 20 cm to 55 cm in height and averages 2.5 m in width. The wall is comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2066 PHRI: K-32 BPBM: —

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected ailuvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 5.5 m wide; c. 33.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Sub-rectangular terrace with walls on the north, south, and west sides. The walls range from 50 cm to 60 cm in height and average 1.3 m in thickness. Walls are comprised of stacked basalt cobbles and boulders. The east side is defined by a bedrock alignment. A short wall extends off the south corner.

SITE NOS.: State: 2067 PHRI: K-35 BPBM: — FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 80.0 m long by 65.0 m wide;

c. 5,200.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists primarily of a interconnected complex of agricultural terraces with an associated small enclosure and a small overhang.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, grasses

CONDITION: Fair

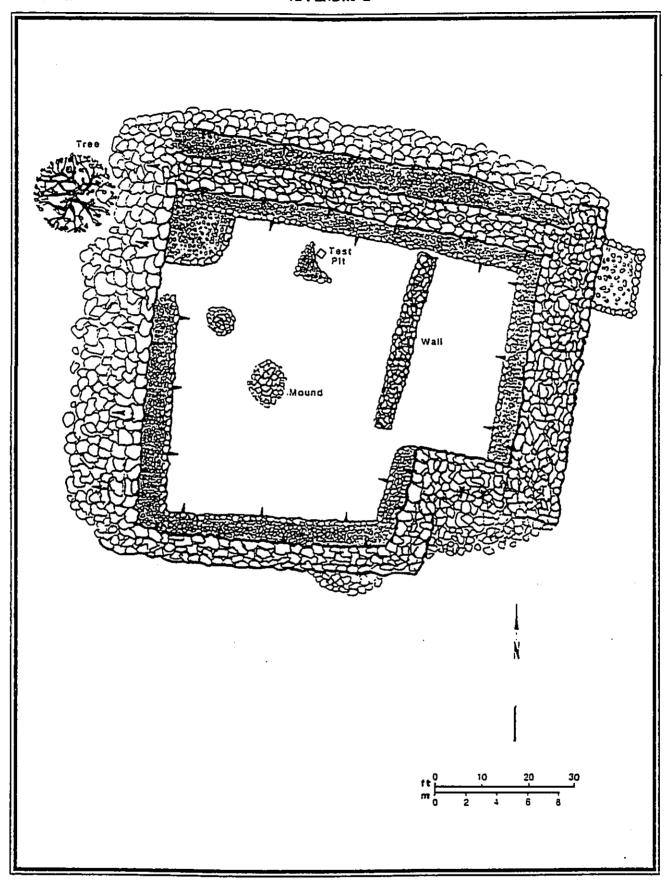


Figure E-3. SITE K-30.

INTEGRITY: Unaltered

DIMENSIONS: 6.5 m long by 5.6 m wide; c. 36.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: D-shaped enclosure with two terrace walls curving off the northwest and southeast sides. The walls connect with a larger terrace 5.0 m to the south. Another wall may have once been connected to the east side of the enclosure; this wall is now separated from the enclosure by a cattle trail.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wantle, 'ilima, grasses, vines

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 4.7 m long by 3.1 m wide; c. 14.6 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Natural partially collapsed lava blister. The 50 cm high blister opening is partially blocked with a cobble wall. The wall is faced on the inside of its northwest end.

SITE NOS.: State: 3032 PHRI: K-36 BPBM: — FORMAL TYPE: Complex (5 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, grasses, wattle

CONDITION: Excellent INTEGRITY: Unaitered

DIMENSIONS: 100.0 m long by 90.0 m wide;

c. 9,000.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two rectangular enclosures, one trapezoidal enclosure, two attached circular enclosures, one very large rectangular enclosure, and numerous associated agriculture features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wante, Christmas-berry,

ʻilima

CONDITION: Very Good INTEGRITY: Unaltered

DIMENSIONS: 4.8 m long by 3.3 m wide; c. 15.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a cupboard and intact facing on interior of the southwest wall. The feature has very high walls, up to 2.0 m (exterior measurement). The walls average 1.0 m in thickness and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, grasses, morning glory

CONDITION: Excellent INTEGRITY: Unaltered

DIMENSIONS: 5.9 m long by 5.4 m wide; c. 31.9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: All walls are faced on both sides. A few small areas of the wall are collapsed. The walls average 80 cm in height and average 1.0 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 7.5 m wide; c. 67.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Sub-trapezoidal enclosure. Inside of west wall is faced. Present on exterior of north wall is a bedrock overhang (3.3 m long by 60 cm deep by 60 cm high). All wails are partially collapsed. The walls have a maximum height of 1.0 m and average 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

Feature is within and attached to Feature E.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 65.0 m long by 37.0 m wide:

c. 2,405.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature C is within this very large enclosure; a Feature E is attached to the outside of the enclosure. Terraces are present throughout the enclosure's interior. The enclosure average 75 cm in height ane are comprised of stacked basalt cobbles and boulders.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 5.0 m wide; c. 50.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure consisting of two attached, roughly circular enclosures. The walls are very collapsed. North wall is formed by Feature D. Much of the east wall is formed by an outcrop. The walls have a maximum height of 90 cm and average 60 cm in thickness.

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SITE NOS.: State: 2068 PHRI: K-39 BPBM: —

FORMAL TYPE: Overhangs

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, Christmas-berry,

grasses

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 28.0 m long by 10.0 m wide;

c. 280.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Consists of two shelters situated on the same side of a collapsed lava tube. The northern shelter is smaller than the southern one. The northern shelter is approximately 11 m long, 1.0m to 1.6 m deep, and 40 cm to 60 cm high. The southern shelter is approximately 8 m long, 1.6 m to 4.6 m deep, and 40 cm to 90 cm high. A terrace is fronts the southern shelter extending 5.0 m outside the shelter opening. The terrace has a maximum height of

SITE NOS.: State: 2069 PHRI: K-40 BPBM: --

(Figure E-4)

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, grasses, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 8.0 m wide; c. 96.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Complex consists of a rockshelter situated directly beneath a rectangular enclosure.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, grasses

**CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 11.0 m long by 8.4 m wide; c. 92.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a c. 1.0 mwide bench or step along the east wall. The northwest corner is comprised of bedrock, which extends over the top of Feature B. The west and north walls, and the southeast corner of the enclosure are partially faced. The walls range from 30 to 70 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

**CONDITION:** Good

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INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.6 m wide; c. 14.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Natural rock shelter in partially collarsed blister. The shelter is 90 cm high. Two basait flakes noted

at the north end of the shelter.

SITE NOS.: State: 2070 PHRI: K-41 BPBM: -

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, grasses, Christmas-berry

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 1.2 m long by 1.0 m wide; c. 1.20 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Temporary

Habitation

DESCRIPTION: Very small rock shelter. Shelter is 60

cm high. Kukui nut fragment found inside.

SITE NOS.: State: 2071 PHRI: K-42 BPBM: — (Figure E-5)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Very Good INTEGRITY: Unaltered

DIMENSIONS: 50.0 m long by 18.0 m wide;

c. 900.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Rectangular enclosure with core-fill walls. Walls average 90 cm in height. A piece of columnar basalt is present in the east wall. Sixteen meters away from the enclosure is a 26.0 m long wall.

SITE NOS.: State: 2072 PHRI: K-44 BPBM: — FORMAL TYPE: Complex (4 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 55.0 m long by 45.0 m wide:

c. 2,475.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a rectangular structure, an irregular enclosure, two C-shape enclosures, and surrounding agriculture features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope



Figure E-4. SITE K-40, OVERHANG. VIEW TO SOUTHEAST. (PHRI Neg. 1157-10)

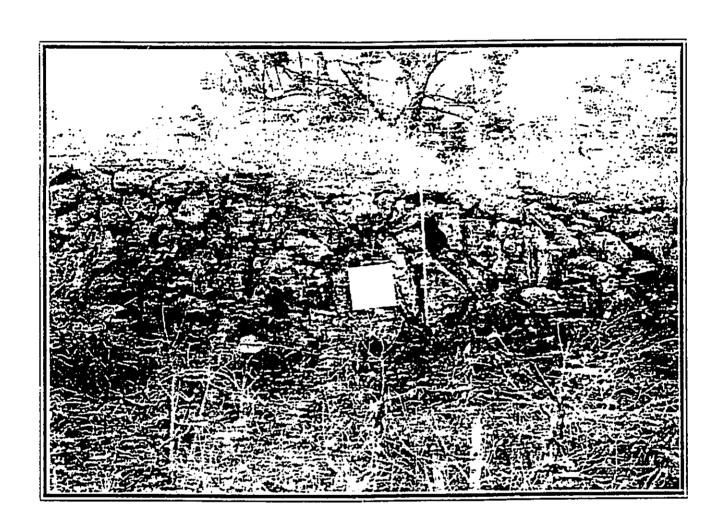


Figure E-5. SITE K-42, NE WALL OF FEATURE A. VIEW TO SOUTHWEST.
(PHRI Neg.1151-1)

VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.5 m long by 6.0 m wide; c. 45.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular structure with very thick (2-3.0 m) walls. Interior of the east and west walls are faced. North and west walls are somewhat collapsed. The walls range from 50 (interior) to 1.1 m (exterior) in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 17.0 m long by 13.0 m wide;

c. 221.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure consisting of a roughly square and a roughly rectangular enclosure. The walls of the enclosure are very thick, up to 4.0 m thick on the southeast side. The south corner of the enclosure is faced. Near the south corner, on the southwest wall, is an opening. The walls range from 60 cm (interior) to 80 cm (exterior) in height and are comprised of stacked basalt cobbles and boulders occasionally incorporating bedrock outcrops.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 8.5 m wide; c. 76.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large C-shaped enclosure with walls faced on both sides. A short wall extends off the west corner of the enclosure. The southeast wall of the enclosure is collapsed. The walls average 55 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wantle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.0 m long by 3.0 m wide; c. 9.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small C-shaped enclosure open to the north. The back wall of the enclosure is built into an outcrop. On this same outcrop are several small terraces.

SITE NOS.: State: 2073 PHRI: K-45 BPBM: — T-60

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, panini, wante, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.8 m long by 6.5 m wide; c. 50.7 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure with most of each wall faced. The northeast wall is built partially on bedrock. North of the feature is a long terrace which forms an arc; level areas are present above and below the terrace. The walls average 50 cm in height and are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2074 PHRI: K-46 BPBM: — T-60

FORMAL TYPE: Complex (4 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, panini, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 74.0 m long by 35.0 m wide;

c. 2590.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two rectangular enclosures, one C-shaped enclosure, one D-shaped enclosure, and numerous surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, 'ilima grasses CONDITION: Fair

INTEGRITY: Unaltered

DIMENSIONS: 6.5 m long by 6.0 m wide; c. 39.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: The northwest side of this rectangularshaped feature is very collapsed. The northwest side incorporates a bedrock outcrop. Small portions of both sides of the walls are faced. The walls average 50 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 5.5 m wide; c. 38.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the southwest. The back of the C-shape is comprised of an outcrop. The outside of north wall is faced. A rock alignment runs across the front of the enclosure. The walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.5 m long by 5.5 m wide; c. 41.3 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure. Exteriors of all walls except east wall are faced. East wall is totally collapsed. The west wall incorporates some bedrock. The walls are comprised of stacked basalt cobbles and boulders.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 5.0 m wide; c. 35.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: D-shaped enclosure comprised of a bedrock outcrop and a wall. The outcrop forms the straight wall and part of the western portion of the D-shape. The walls are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2033 PHRI: K-48 BPBM: T-61-17-58 (Figure E-6)

FORMAL TYPE: Complex (4 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, 'ilima, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 145.0 m long by 75.0 m wide;

c. 10,875.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Very large complex consisting of a very large enclosure, a double enclosure, a small square enclosure, and an irregular enclosure. An extensive series of large contour terraces is situated along a broad ridge which extends through the central portion of the site.

FEATURE A: Enclosure

LZ1

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 67.0 m long by 67.0 m wide:

c. 4,489.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large irregular-shaped enclosure with substantial walls, several of which incorporate large upright slabs as facing stones. Some of the walls are faced. Walls have a maximum thickness of 2.0 m and are up to 1.5 m in height. Walls are comprised of stacked basalt boulders and

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, vines, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 10.5 m wide:

c. 126.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure in good condition. Lanai of porch present outside of the west wall. Situated just above the northeast corner of the enclosure is a curved paved terrace. Much facing present on interior walls. The walls have a maximum height of 1.1 m and maximum thickness of 2.0 m.

Two test units were excavated in the feature, one in each room. The units revealed a subsurface cultural deposit containing sea urchin remains, mammal and fish bone, a shark tooth, basalt and volcanic glass flakes, and charcoal. A radiocarbon sample collected from the deposit yielded a calendric age range of AD 1518-1591.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 17.0 m long by 17.0 m wide;

c. 289.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Generally rectangular in plan view. The north and east walls are very thick, the west wall is thin, and the south wall is single-stacked, single-coursed. Present in the northeast corner is a platform.

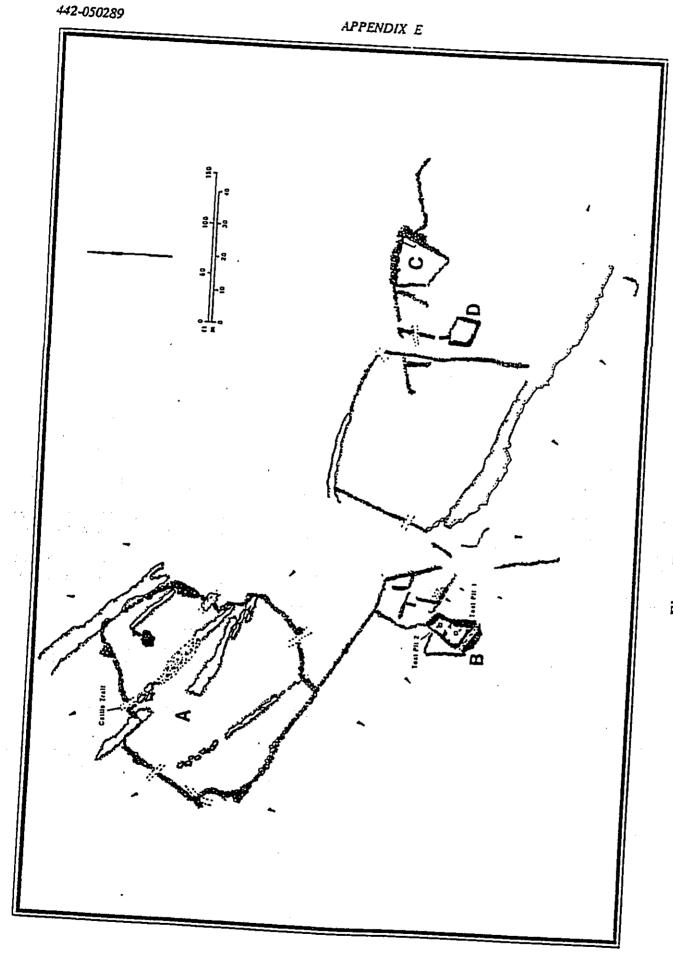
FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, grasses, Christmas-berry

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 9.0 m wide; c. 81.0 sq m



E-22

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature has very low intact walls. Walls have a maximum thickness of 1.5 m and are up to 30 cm in height. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2075 PHRI: K-50 BPBM: -

(Figure E-7)

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Steep dissected alluvial slope VEGETATION: Lantana, wattle, 'ilima, Christmas-berry,

grasses

**CONDITION:** Good INTEGRITY: Altered

DIMENSIONS: 40.0 m long by 35.0 m wide;

c. 1,400.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Complex features are spread along a steep slope. At the top of the slope is a rectangular enclosure; further down the slope is an oval enclosure, and further down from the oval enclosure is a double enclosure. Numerous agricultural features, primarily terraces, are present in the area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, Christmas-berry, grasses

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 7.8 m wide; c. 70.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; parts of the northwest corner and south wall are missing. The north and east walls are mostly bedrock. Walls have a maximum height of 80 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

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DIMENSIONS: 7.2 m long by 7.0 m wide; c. 50.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with well built and preserved wails. Internal wails are mostly faced. Opening present on northwest side. Walls have a maximum height of 90 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected ailuvial slope

VEGETATION: Lantana, 'ilima, wattle, Christmas-berry, grasses

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 12.8 m long by 8.0 m wide; c. 102.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two circular enclosures connected by a short wail. The southern enclosure is built almost entirely within a natural circle of bedrock. The northern enclosure is built on a flat area of bedrock; the southwest wall of the enclosure consists of modified bedrock. Walls have a maximum height of 70 cm. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2076 PHRI: K-51 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, wattle, morning glory, panini

**CONDITION: Fair** INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 5.5 m wide; c. 66.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Sub-rectangular enclosure with an attached terrace. East wall has some internal facing; the rest of the walls are mostly collapsed. The northwest wall is totally collapsed. Maximum wall height is 42 cm. Walls average 75 cm in thickness and are copmrised of stacked basalt cobbles and boulders. Agricultural features surround the feature.

SITE NOS.: State: 2077 PHRI: K-52 BPBM: T-31

FORMAL TYPE: Complex (2 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wantle, Christmas-berry,

panini

CONDITION: Fair/Good INTEGRITY: Unaltered

DIMENSIONS: 42.0 m long by 35.0 m wide;

c. 1,470.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of an irregular ovoid enclosure with an adjacent area of possible paving. Agricultural features surround the enclosure.

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Figure E-7. SITE K-50, FEATURE B. VIEW TO SOUTHEAST. (PHRI Neg. 1155-6)

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 24.0 m long by 18.0 m wide:

c. 432.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Western part of feature is built into a bedrock outcrop. There are two cupboards at the southwest end of the enclosure and a paved area at the south end. The wails of the enclosure have some facing. The walls include sections of multiple stacked and core-fill construction. Maximum wall height is 1.5 m.

FEATURE B: Paved Area

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, grasses, honey suckle,

panini

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 15.0 m long by 15.0 m wide;

c. 225.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of an irregularly-shaped area of paving adjacent to the west wall of the structure.

SITE NOS.: State: 2078 PHRI: K-53 BPBM: --FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wattle, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 42.0 m long by 40.0 m wide;

c. 1,680.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a group of connected agricultural and habitation features surrounded by a larger area of agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, wattle, panini

CONDITION: Good INTEGRITY: Unaitered

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DIMENSIONS: 3.0 m long by 1.7 m wide; c. 5.1 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure attached to Feature B. Feature opens to the south. Wall averages 30 cm in height and averages 75 cm in thickness. Wall is constructed of stacked basalt boulders and cobbles. Feature is either a planting windbreak or a temporary habitation structure.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 20.0 m long by 15.0 m wide:

c. 300.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Raised terrace with three small planting features adjacent to the main wall. Wall averages 1.05 m in height and averages 40 cm in thickness. Wall is constructed of stacked basalt boulders and cobbles.

SITE NOS.: State: 2079 PHRI: K-54 BPBM: T-30

(Figure E-8)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 14.0 m long by 11.0 m wide;

c. 154.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: The feature is built on bedrock. It consists of an irregular-shaped enclosure with an internal rectangular terrace at the south end. The east wall is basically a terrace. Portions of the northeast wall are faced on the inside. Wall averages 30 m in height and averages 1.5 m in thickness. Wall is constructed of stacked basalt boulders and cobbles occaissionally incorporating bedrock outcrops.

SITE NOS.: State: 2080 PHRI: K-55 BPBM: — FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, Christmas-berry,

grasses

**CONDITION: Fair** INTEGRITY: Unaltered

DIMENSIONS: 41.0 m long by 41.0 m wide;

c. 1,681.00 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Complex consists of two enclosures and an overhang. Numerous agricultural features surround the site.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses,

Christmas-berry

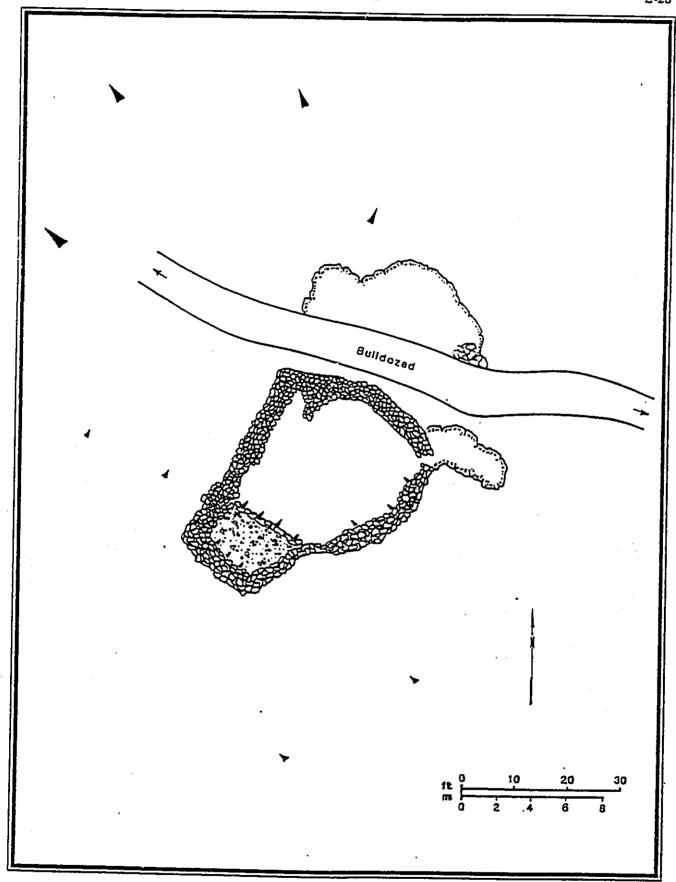


Figure E-8. SITE K-54.

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 5.0 m wide; c. 35.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with downslope wall also forming a terrace. A smaller enclosure or room is attached to the northeast side of the terrace. The terrace/ enclosure walls average 55 cm in height and are comprised of stackeed basalt boulders and cobbles.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 3.0 m wide; c. 15.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A low semicircular wall from the

overhang. Ceiling of the shelter is 85 cm high.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wante, grasses,

Christmas-berry CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 16.0 m long by 7.5 m wide; c. 120.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of two small enclosures connected by a wail of bedrock; the bedrock forms the northeast wall of both rooms. The lower room is triangular in plan, and its northwest wall forms a terrace. The upper room is square in plan. An upright slab is present on the wall of bedrock between the two rooms. The walls range from 55 cm to 90 cm in height and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2081 PHRI: K-57 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, Christmas-berry, wattle,

Silky Oak CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 24.0 m wide;

c. 720.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agriculture

DESCRIPTION: Sub-rectangular enclosure built against an outcrop. The south and southeast walls incorporate bedrock. There is some facing on the enclosure's north comer. The walls average 80 cm in height and are comprised

of stacked basait boulders and cobbles. Many terraces present upslope and downslope of feature.

SITE NOS .: State: 2082 PHRI: K-59 BPBM: -

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 36.0 m long by 28.0 m wide;

c. 1.008.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure with short walls extending from the southeast and northeast corners. Interior of southeast wall and the exterior of northwest wall are faced. Part of the southwest wall is collapsed. The wallis have a maximum thickness of 1.5 m and a maximum height of 1.1 m. Walls are comprised of stacked basalt boulders and cobbles. The enclosure, excluding the extending walls, measures 11.0 by 5.5 by 0.7 m. Numerous small terraces usualy incorporating bedrock outcrops are present to the east of the feature.

SITE NOS.: State: 2083 PHRI: K-60 BPBM: \_\_

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle, 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.5 m long by 1.1 m wide; c. 6.1 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Wall segment is bifaced and core-filled and runs upslope-downslope. Wall averages 50 cm in height and is composed of stacked basalt boulders and

SITE NOS.: 51ate: 2084 PHRI: K-62 BPBM: —

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 45.0 m long by 35.0 m wide;

c. 1,575.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious/Burial/

Habitation/Agriculture

DESCRIPTION: Complex consists of a rectangular enclosure with an internal probable burial platform, a trapezoidal enclosure with an associated probable shrine/

8

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of enclosures and agricultural features close to each other. Six of the enclosures are habitation features, one is probably a field boundary.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 8.2 m long by 6.2 m wide; c. 50.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure with some facing on the interior of the northwest wall. A small cupboard-like overhang is present west of the southwest corner of the enclosure. Walls have a maximum height of 1.1 m and a maximum thickness of 60 cm. Walls are comprised of stacked basalt boulders and cobbles. A bedrock outcrop is incorporated into the southwest corner.

FEATURE B: Walls

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest

CONDITION: Fair INTEGRITY: Unaitered

DIMENSIONS: 45.0 m long by 5.0 m wide; c. 225.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two parallel walls on either side of a collapsed lava tube. The walls begin at the bottom of a short steep slope and extend to top of the slope, where they are joined together by a bedrock outcrop. The northwest wall ends at this point. The southeast wall continues through the site. Walls have a maximum height of 1.5 m and a maximum thickness of 1.0 m. Walls are comprised of stacked basait boulders and cobbles occasionally incorporating bedrock outcrops.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wantle forest CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 6.5 m wide; c. 52.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure. The interior of the southwest wall is faced. The other walls are somewhat collapsed. Walls have a maximum height of 90 cm and a maximum thickness of 1.1 m. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 15.0 m long by 14.0 m wide;

c. 210.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large D-shaped enclosure; the east wall consists of a bedrock outcrop. A few terraces are present within the enclosure. A 3.0 m long wall extends from the northwest portion of the enclosure generally toward the northwest. The northeast side of this wall is faced. Walls have a maximum height of 75 cm and a maximum thickness of 85 cm. Walls are comprised of stacked basalt boulders and cobbles occasionally incorporating bedrock outcrops.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 3.7 m wide; c. 18.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Somewhat square in plan view. Part of the interior of the south wall is faced. Walls have a maximum height of 80 cm and a maximum thickness of 80 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE F: Enclosures

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wantle forest

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 7.5 m wide; c. 90.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large oval enclosure with a slightly smaller enclosure attached to its northeast side. Most of the walls of both enclosures are collapsed. Walls have a maximum height of 65 cm and a maximum thickness of 90 cm. Walls are comprised of stacked basalt boulders and

cobbles.

FEATURE G: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 7.4 m wide; c. 59.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure; interior and exterior of north corner is faced. The west corner of the feature is collapsed. Walls have a maximum height of 60 cm and an

average thickness of 90 cm. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2087 PHRI: K-69 BPBM: T-37 (Figure E-9)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 8.0 m long by 8.0 m wide; c. 64.0 sq m

PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Water Tank DESCRIPTION: Square enclosure faced on the southwest, northwest, and part of the northeast sides. The southeast and part of the northeast walls, which are lower than the rest of the structure, are constructed of generally larger stones than those used in the other walls. Within the enclosure are the remains of a wooden platform for a water tank, and metal hoops used to bind boards of tank together.

SITE NOS.: State: 2088 PHRI: K-70 BPBM: T-27

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wante, grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 35.0 m long by 12.0 m wide;

c. 420.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Terrace extends southward for 10.0 m from a upslope-downslope oriented wall. The junction of the wail and the terrace abuts a basalt outcrop. The south end of the wall curves to create a small terrace measuring 5.0 m in diameter.

SITE NOS.: State: 2089 PHRI: K-71 BPBM: — FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, wattle, Christmas-berry, grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 60.0 m long by 50.0 m wide;

c. 3,000.0 sq m

1.4

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial\*/Habitation DESCRIPTION: Complex consists of two enclosures with terraces between them, and connected to them. One enclosure has unusually thick walls and a small interior. Southwest of this feature is a large rubble area which may be natural. Feature C is a possible lava tube burial.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, wattle, grasses

CONDITION: Fair INTEGRITY: Unaitered

DIMENSIONS: 9.0 m long by 8.5 m wide; c. 76.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large square enclosure with low, collapsed walls. The north corner of the enclosure rises 1.5 m above the slope the enclosure is on. A terrace wall extends 5.0 m southwest off the southwest corner of the enclosure. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lanuana, 'ilima, Christmas-berry, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 7.0 m wide; c. 49.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Enclosure consists of a square area of paving with a small sunken area in the middle of it. A wall built on the paving forms the southwest and part of the northwest wall of the room. The interior of the sunken area and the wall are faced. Walls average 50 cm in height and are comprised of stacked basalt boulders and cobbles.

A terrace runs off the northeast wall.

FEATURE C: Paved Mound

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wattle

CONDITION: Fair INTEGRITY: Unaitered

DIMENSIONS: 10.0 m long by 5.0 m wide; c. 50.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of a level area of rubble fill with a wall on it. The feature is simated in front of collapsed lava tube. This tube may have an opening plugged up with rubble. Several aligned large upright slabs to the southeast and northwest appear to remnants of a terrace wall which would have retained the rubble fill.

SITE NOS.: State: 2090 PHRI: K-76 BPBM: — FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 55.0 m long by 18.0 m wide;

c. 990.0 sq m

PROBABLE AGE: Prehistoric

APPENDIX E E-32

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Complex consists of a U-shaped terrace with some paving and a free standing upslope-downslope-oriented wall segment.

FEATURE A: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, 'ilima, wattle, lantana

CONDITION: Fair/Poor INTEGRITY: Altered

DIMENSIONS: 10.5 m long by 8.0 m wide; c. 84.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: U-shaped terrace with low walls. A small paved area is present in the southeast portion of the feature. Northwest of the terrace is a short terrace. Walls have a maximum height of 45 cm and an average thickness of 1.2 m. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, 'ilima, lantana, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 1.1 m wide; c. 8.8 sq m

PROBABLE AGE: Historic/Prehistoric\*

DESCRIPTION: Core-filled wall segment oriented upslope-downslope. The wall is faced on both sides and is collapsed in some areas. Wall has a maximum height of 1.1 m and an average thickness of 1.2 m. Wall is comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2091 PHRI: K-78 BPBM: — FORMAL TYPE: Complex (6 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima, wattle,

Christmas-berry
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 115.0 m long by 70.0 m wide;

c. 8,050.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*/

Habitation/Agricultural

DESCRIPTION: Complex consists of two habitation terrace complexes, one stepped and paved platform, one rectangular enclosure, and one area of modified bedrock. Agricultural terraces are present north of the main features.

FEATURE A: Terraces

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle,

Christmas-berry
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 25.0 m long by 10.0 m wide;

c. 250.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Three paved terraces oriented upslopedownslope and connected to each other. Northeast boundary of the terraces consists of a bedrock outcrop. The south and west sides of the terraces are raised above the adjacent slope. The northwest wall of the westernmost terrace is faced. The eastern terrace measures 10 m by 7 m by 20 cm high. The central terrace measures 8.9 m by 6.3 m by 40 cm high. The western terrace measures 8.5 m by 5.3 m by 75 cm high.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,

wattle

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 10.0 m long by 8.0 m wide; c. 80.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Probable residential terrace with a small notch in the northwest corner. The inside of the east wall and the outside of the south wall are faced. Interior of terrace has possible paving.

FEATURE C: Platform/terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wartle, 'ilima,

Christmas-berry
CONDITION: Fair
INTEGRITY: Unaltered

**DIMENSIONS: 12.5 m long by 10.5 m wide; c. 131.3 sq m** 

PROBABLE AGE: Prehistoric

DESCRIPTION: Consists of a smaller paved platform built on a larger one. The lower platform forms a paved area which extends out c. 0.8 m beyond the limits of smaller platform. Some facing is present on the west and south sides of the platform.

FEATURE D: Complex

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle,

Christmas-berry
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 32.5 m long by 25.0 m wide;

c. 812.5 sq m

PROBABLE AGE: Prehistoric

.

DESCRIPTION: Complex is located on bedrock and is delineated by retaining walls. Modified bedrock outcrops and a possible walkway are present on the north wall. Within the walls are alignments/terraces and areas cleared of stones presumably for planting.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle,

Christmas-berry CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.4 m long by 8.0 m wide; c. 75.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; the east and south walls are built into a slope and are higher than the north and west walls. The interior of the east and south walls are faced, as are both sides of the west wall. A possible cupboard is present in the west wall. A possible firepit is present in the interior of the structure. Walls average 1 m in height and 1.2 m in width. Walls are comprised of stacked basait boulders and cobbles.

FEATURE F: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wattle,

Christmas-berry **CONDITION:** Good INTEGRITY: Altered

DIMENSIONS: 22.5 m long by 22.5 m wide;

c. 506.3 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large irregular enclosure with the majority of its walls standing on the edge of a low cliff. The northwest wall consists of a single course of rocks. Wing walls extend off the southeast and southwest corners of the enclosure. Enclosure walls have a maximum height of 1.3 m and an average width of 60 cm. Walls are composed of stacked basalt boulders and cobbles occasionally incorporating bedrock outcrops. Feature appears to be either a agricultural enclosure or corral.

SITE NOS.: State: 2092 PHRI: K-79 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, wattle, lantana, panini. 'ilima

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 22.0 m long by 20.0 m wide;

c. 440.0 sq m

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PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Large enclosure irregular in plan view. The south wall is constructed on a collapsed lava tube. The interior of the north wall is faced. The northeast wall consists of a loose alignment of rocks. Walls have a maximum height of 1.0 m and an average thickness of 60 cm. Walls are comprised of stacked basalt boulders and cobbles. Within the enclosure are several terraces.

SITE NOS.: State: 2093 PHRI: K-80 BPBM: T-46

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wante forest

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 50.0 m long by 1.5 m wide; c. 75.0 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Upsiope-downslope oriented wall partly with a fence along it. The wall ranges in height from 30 cm to 90 cm and is comprised of stacked basalt boulders and cobbles. At the north end the wall curves slightly to the west and connects with an outcrop situated above a drainage. Near the upslope portion of the wall is a terrace.

SITE NOS.: State: 2094 PHRI: K-81 BPBM: T-1036

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest **CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 80.0 m long by 40.0 m wide:

c. 3,200.0 sq m

PROBABLE AGE: Historic/Prehistoric

FUNCTIONAL INTERPRETATION: Animal control/

Agriculmal

DESCRIPTION: Complex consists of a large rectangular enclosure, a small circular enclosure, and numerous agricultural terraces. A wall extends off the southeast corner of the large enclosure.

FEATURE A: Enclosure

TOPOGRAPHY: Steep dissected alluvial slope

**VEGETATION:** Wattle Forest

CONDITION: Fair INTEGRITY: Unaitered

DIMENSIONS: 36.0 m long by 50.0 m wide:

c. 1,800.0 sq m

PROBABLE AGE: Historic

DESCRIPTION: Large rectangular enclosure. The northern two-thirds of the west wall consists of a single course of rocks. Present in the southern half of the enclosure is an outcrop. A wall extends c. 25.0 m northeast off the southeast corner of the enclosure.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.5 m wide; c. 14.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small circular enclosure built against a low outcrop. The walls of the enclosure are built with large rocks and are relatively high. The walls are not faced.

SITE NOS.: State: 2095 PHRI: K-84 BPBM: T-55

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.5 m long by 3.5 m wide; c. 15.8 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: L-shaped wall open to the northeast. The northwest portion of the wall is collapsed. Wall has a maximum height of 1.2 mand is comprised of stacked basalt

boulders and cobbles.

SITE NOS.: State: 2096 PHRI: K-85 BPBM: — FORMAL TYPE: Wall and terrace complex TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 80.0 m long by 60.0 m wide;

c. 4,800.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Animal Control/

Agricultural

DESCRIPTION: Complex is largely built on and around bedrock. Site consists of an area of rough terroes and a long well-preserved wall segment. The long wall probably connects to a wall at Site K-101.

SITE NOS.: State: 2097 PHRI: K-87 BPBM: T-25

(Figure E-10)

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 28.0 m long by 8.0 m wide; c. 224.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial

DESCRIPTION: The complex consists of a faced mound and a faced platform. Both features are small. The platform

has a small wall around the top; the platform is probably a burial. The mound is a possible burial.

FEATURE A: Platform

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest CONDITION: Excellent INTEGRITY: Unaltered

DIMENSIONS: 3.8 m long by 2.1 m wide; c. 7.9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: The sides and top of this feature are faced. A wall c. 20 cm high outlines the level upper surface of the platform. Platform has a maximum height of 1.2 m and is comprised of stacked basalt boulders and cobbles.

FEATURE B: Mound/platform

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest CONDITION: Good

INTEGRITY: Unaltered
DIMENSIONS: 2.0 m long by 2.0 m wide; c. 4.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: The east and west sides of the mound are faced; the north and south sides are somewhat collapsed. The feature is built on a L-shaped, rock-retained terrace. The feature has a maximum height of 1 m and is comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2098 PHRI: K-89 BPBM: --

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 150.0 m long by 125.0 m wide;

c. 18,750.0 sq m

PROBABLE AGE: Prehistoric/Historic\*

FUNCTIONAL INTERPRETATION: Agricultural/

Habitation/Animal control

DESCRIPTION: Long terrace with a paved area. The terrace connects sides of a collapsed lava tube. Walls are built along the sides of the tube and intersect with the terrace and another large terrace downslope. There are many other small terraces to the north. The terraces appear to be largely agricultural in function, excepting the paved portion which may be a remnant of a habitation feature. For the most part, the walls appear to be ranch-related features. The site roughly resembles the map of Papakea Heiau contained in the SIHP Site Form No. 50-50-10-1036; however, the described location and coral offerings in the form do not match.



Figure E-10. SITE K-87, BURIAL PLATFORM. VIEW TO NORTHWEST. (PHRI Neg#.1151-36)

SITE NOS.: State: 2099 PHRI: K-90 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wattle

**CONDITION:** Fair INTEGRITY: Altered

DIMENSIONS: 17.0 m long by 10.0 m wide;

c. 170.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Possibly notched enclosure which has been heavily disturbed. The enclosure has no northwest wall. The notch is in the south corner. Adjacent to the northwest side are two paved terraces or lanai. An internal wall subdivides the enclosure interior into upper and lower portions. The wails have a maximum height of 60 cm and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2300 PHRI: K-95 BPBM: — FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana CONDITION: Fair INTEGRITY: Unaitered DIMENSIONS: 50.0 m long by 30.0 m wide; c. 1,500.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

DESCRIPTION: Complex consists of an ovoid enclosure, a partially walled terrace, and a wall segment. There numerous agricultural terraces in the area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: The west side and portions of the south wall of this enclosure are built into bedrock. The interiors of the east, west, and north walls, and the exterior of the west and north walls are faced. The top of the east wall is even with the ground surface on the exterior, uphill side. Walls have a maximum height of 60 cm. Wall are comprised of stacked basalt boulders and cobbles and incorporate bedrock outcrops.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana CONTINUES NO. 17.4

INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 8.0 m wide; c. 72.0 sq m

E-36

PROBABLE AGE: Prehistoric

DESCRIPTION: Terrace has east and south walls only; built on bedrock. Feature is eroded and heavily vegetated making it very difficult to determine its exact form and function. Feature may be agricultural in function.

FEATURE C: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana

CONDITION: Fair/Poor INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 2.0 m wide; c. 8.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two course high wall faced on the west side but mostly collapsed. Maximum wall height is 20 cm. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2301 PHRI: K-96 BPBM: --

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.4 m long by 4.5 m wide; c. 24.3 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation\*/

Animal Control

DESCRIPTION: Circular enclosure with unfaced walls. The southeast wall is built into a small outcrop of rock. Maximum wall height is 40 cm. Walls are comprised of stacked basalt boulders and cobbles. A small drainage is present c. 4.0 m west of the enclosure.

SITE NOS.: State: 2302 PHRI: K-97 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest

**CONDITION: Fair** INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 0.6 m wide; c. 4.2 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Modified bedrock wall c. 0.5 m high (maximum). Feature is probably agricultural. Small agricultural terraces present in the area.

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SITE NOS.: State: 2303 PHRI: K-98 BPBM: ---

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

CONDITION: Fair INTEGRITY: Altered\*

DIMENSIONS: 9.5 m long by 8.5 m wide; c. 80.8 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Rectangular enclosure with very low walls which look disturbed. There is some facing in the south comer of the enclosure. About 2.0 m southwest of the enclosure are two rock-retained terraces. Walls average 1.5 m in thickness and have a maximum height of 60 cm. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2304 PHRI: K-99 BPBM: T-3

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 5.5 m wide; c. 38.5 sq m

PROBABLE AGE: Prehistoric

**FUNCTIONAL INTERPRETATION: Habitation** 

**DESCRIPTION:** Rectangular enclosure with openings in the south corner and northwest side. The southwest wall of the enclosure is built on a small bedrock outcrop. Possible slab-lined firepit in the center of enclosure. Walls have a maximum height of 70 cm and are comprised of stacked basalt boulders and cobbles.

A test unit excavated in the enclosure sectioning the possible firepit did not reveal any subsuface cultural remains indicating the feature is either not a habitation (i.e., an agricultural enclosure) or that the feature was little used.

SITE NOS.: State: 2305 PHRI: K-100 BPBM: —

FORMAL TYPE: Wali

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

**CONDITION: Poor INTEGRITY:** Altered

DIMENSIONS: 21.0 m long by 0.8 m wide; c. 16.8 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal/Control DESCRIPTION: Cattle wall roughly faced on both sides. Wall has a maximum height of 60 cm; comprised of stacked

basait boulders and cobbles.

SITE NOS.: State: 2306 PHRI: K-101 BPBM: T-24

FORMAL TYPE: Mounds and Wall TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Good INTEGRITY: Altered DIMENSIONS: 300.0 m long by 1.0 m wide;

c. 300.0 sq m

PROBABLE AGE: Historic/Prehistoric

FUNCTIONAL INTERPRETATION: Animal Control/ Agricultural

DESCRIPTION: Long cattle wall which curves to form a large arc which opens downslope. In the northeast portion of this are are several probable agricultural mounds. The wall is roughly faced on both sides. Wall has a maximum height of 60 cm; comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2307 PHRI: K-102 BPBM: -

FORMAL TYPE: Terrace and Wall TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair

INTEGRITY: Unaltered

DIMENSIONS: 18.0 m long by 6.0 m wide; c. 108.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Rectangular terrace built on the top of a knoll. The wall is built across a small steep-sided drainage situated 6.0 m south of the terrace. The south and north walls of the terrace are situated on the edge of the knoll. An alignment extends 4.0 m north from the northwest corner of

SITE NOS.: State: 2308 PHRI: K-103 BPBM: T-56

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

**CONDITION:** Good

INTEGRITY: Unaltered

DIMENSIONS: 32.0 m long by 22.0 m wide;

c. 704.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Feature includes large walled area in front of the 80 cm high overhang. The walls of the area run down a steep, short slope (from the cliff to the bottom of the drainage) where the northeast wall runs parallel to the drainage. A level area extends 5.0 m out from the dripline of the overhang.

SITE NOS.: State: 2035 PHRI: K-105 BPBM: -

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana

**CONDITION:** Good INTEGRITY: Altered DIMENSIONS: 26.0 m long by 26.0 m wide; c. 676.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Rectangular enclosure. Outside of the east wall and portions of the inside of the north and south walls are faced. Walls are collapsed on the north and west sides. In the northeast corner is a possible rock-filled pit. Terraces are present north of the enclosure.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containing fish and mammal bone, kukui nut shell, and and charcoal. A radiocarbon sample from the deposit yielded three posssible calendric age ranges of AD 1470-1670, AD 1775-1793, and AD 1947-

SITE NOS.: State: 2310 PHRI: K-106 BPBM: —

FORMAL TYPE: Stone

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 2.0 m long by 2.0 m wide; c. 4.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Tool Manufacturing DESCRIPTION: Site consists of abraded depressions in several pahoehoe slabs at the bottom of a hill. The slabs range in size from 20 cm to 90 cm in diameter.

SITE NOS.: State: 2311 PHRI: K-107 BPBM: —

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, Christmas-berry, wattle,

koa-haole **CONDITION:** Good

INTEGRITY: Altered\* DIMENSIONS: 14.0 m long by 6.0 m wide; c. 84.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial/Agricultural DESCRIPTION: Consists of a burial in a lava blister overhang. The blister is  $0.3\,\mathrm{m}$  high and  $c.\,4.0\,\mathrm{m}$  in diameter. Bones (patella and rib) were observed inside. A wall extends from the opening 9.0 m to the northwest. The entrance may have been plugged at one time, but is now open. Agricultural features surround the site.

SITE NOS.: State: 2312 PHRI: K-108 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: C-shaped enclosure open to the northwest; interior of the southeast portion is faced. The southeast wall, which is the highest, abuts a slope. The wall averages 60 cm in thickness and has a maximum height of 90 cm. Wall is comprised of stacked basalt boulders and cobbles.

SITE NOS:: State: 2313 PHRI: K-109 BPBM: T-49 FORMAL TYPE: Complex (2 Features)

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 55.0 m long by 40.0 m wide:

c. 2,200.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: The complex consists of a C-shaped terrace, and agricultural features. Several terraces extend from an outcrop. Terraces situated downslope from C-

shape.

FEATURE A: Terraces

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, wattle, 'ilima, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 3-5 m long by 0.5-1.0 m wide by

0.3-0.5 m high

PROBABLE AGE: Prehistoric

DESCRIPTION: Small terraces scattered across slope. Most incorporate bedrock outcrops and are roughly constructed. They are opportunistically placed to utilized scattered pockets of soil.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry

**CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 3.7 m long by 3.4 m wide; c. 12.6 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped terrace, probably agricultural in function. A slightly modified bedrock terrace is present immediately below the feature.

SITE NOS.: State: 2314 PHRI: K-110 BPBM: T-48

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 36.0 m long by 14.0 m wide;

c. 504.0 sq m

PROBABLE AGE: Prehistoric

terrace and continues downslope.

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Large terrace forms a rough C-shape. Terrace is situated in the bottom and sides of a drainage. A wall extends upslope-downslope from the south end of the

SITE NOS.: State: 2036 PHRI: K-111 BPBM: -

FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 40.0 m long by 20.0 m wide;

c. 800.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Complex consists of a pair of adjoining overhangs, a paved terrace, and a small overhang with possible walls delineating a level area.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 11.0 m wide;

c. 132.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two adjoining overhangs with a possible wall in front of the western one. In front of the overhangs is a natural terrace area which extends 4.0 m to the west. Subsurface testing was conducted at the feature.

The test unit excavated near the dripline of the overhang revealed a subsurface cultural deposit containing volcanic glass flakes, marine shell, bone and charcoal. A radiocarbon sample from the deposit yielded a calendric age range of AD 1640-1955.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 7.5 m wide; c. 75.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: This paved terrace is on a very steep slope and is built to extend the top of the ridge. About 1.5 m of the north wall is faced, and the other 1.5 m of the same wall is collapsed.

FEATURE C: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 5.0 m long by 4.0 m wide; c. 20.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Overhang alone measures 1.4 m by 0.7 m; a level area fronts it. A possible modified bedrock wall is situated west of the overhang; this wall curves and connects with Feature B and encloses a level area.

SITE NOS.: State: 2315 PHRI: K-112 BPBM: T-43

FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 60.0 m long by 50.0 m wide:

c. 3,000.0 sq m

PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural/Animal Control

DESCRIPTION: Complex consists of an overhang, an oval enclosure, and a cattle wall. Agricultural features surround the site.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 2.0 m deep by 1.8 m wide; c. 3.6 sq m

PROBABLE AGE: Prehistoric

**DESCRIPTION:** Feature consists of an 1 m high overhang with collapsed bedrock in front. Soil deposit present inside overhang.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini

**CONDITION: Poor** 

INTEGRITY: Unitered

DIMENSIONS: 5.5 m long by 5.0 m wide; c. 27.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Mostly collapsed oval enclosure. alls have a maximum height of 30 cm and are comprised of stacked basalt boulders and cobbles. No facing remains and

the walls are rounded in cross-section.

FEATURE C; Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 60.0 m long by 0.75 m wide

PROBABLE AGE: Historic

DESCRIPTION: Cattle wall which may be connected to the walls of Site K-12. Multiple-stacked wall comprised of stacked basalt boulders and cobbles. Wall is 80 cm high and 75 cm in thickness.

SITE NOS.: State: 2316 PHRI: K-115 BPBM: T-42 FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, grasses, 'ilima, kiawe
CONDITION: Good

INTEGRITY: Unaltered
DIMENSIONS: 35.0 m long by 20.0 m wide;

c. 700.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a square enclosure, an enclosure irregular in plan, and agricultural terraces.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, kiawe

CONDITION: Excellent INTEGRITY: Unaltered

DIMENSIONS: 8.9 m long by 7.9 m wide; c. 70.3 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure with a 3.5 m square platform adjacent to the walls in the northeast quadrant of the structure's interior. The level upper surface of the platform is flush with the upper surfaces of the adjacent walls which are also level. Both sides of all walls are well-faced. The south wall is massive, 1.9 m thick. The walls average 80 cm in height and average 1.5 m in thickness. A possible external cupboard is present on the outside of the north wall near the northeast corner. The walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, kiawe

CONDITION: Poor INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 20.0 m wide;

c. 600.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Enclosure irregular in plan view surrounding a small sink. The walls of the enclosure are poorly constructed and are low. The north wall may have been altered during fence building. The western wall is the

only wall which is easily discernible; the east wall is covered with lantana. The walls have a maximum height of 80 cm and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2317 PHRI: K-116 BPBM: T-41

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, grasses, kiawe

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 75.0 m long by 55.0 m wide;

c. 4,125.0 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Complex consists of two large enclosures, one square and one trapezoidal. Both are probably historic corrals for cattle based on their size, location relative to other similar features, and construction.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 30.0 m long by 22.0 m wide;

c. 660.0 sq m

PROBABLE AGE: Historic

DESCRIPTION: Large square enclosure with intermittent facing on the walls. Most of the west wall is missing due to buildozer activity during the building of a fence in the area. A upslope-downslope oriented wall segment extends for c. 5.0 m off the northeast corner. The walls average 75 cm to 80 cm in thickness and have a maximum height of 1.0 m. The walls are of multiple-stacked to core-filled construction and are composed of stacked basalt cobble and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 30.0 m long by 22.0 m wide;

c. 660.0 sq m

PROBABLE AGE: Historic

DESCRIPTION: Large trapezoidal enclosure with only the north and east walls intact. The other walls are linear piles of rubble having been probably destroyed by bulldozer activity. There is a depression in the northwest one-third of the enclosure. The walls average 80 cm in thickness and have a maximum height of 1.3 m. The walls are of multiple-stacked to core-filled construction and are composed of stacked basalt cobble and boulders.

SITE NOS.: State: 2318 PHRI: K-118 BPBM: ---FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 70.0 m long by 40.0 m wide;

c. 2,800.0 sq m

PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural/Animal Control

DESCRIPTION: Complex consists of a large square enclosure, a circular enclosure, a sub-rectangular enclosure and associated agricultural features. The large enclosure is probably a historic cattle corral based on it's size, location relative to other similar features, and construction.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 35.0 m long by 30.0 m wide;

c. 1,050.0 sq m

PROBABLE AGE: Prehistoric/Historic

DESCRIPTION: Large square enclosure. Most of the walls are faced, the west wall, however, is somewhat collapsed. The south wall is in the best condition. A collapsed terrace extends c. 5.0 m from the north corner, then extends 8.0 m to the northeast, then extends eastward and ends 5.0 m from Feature B. The enclosure walls average 70 cm in thickness and have a maximum height of 1.2 m. The walls are of multiple-stacked construction and are composed of stacked basalt cobble and boulders.

FEATURE B: Enclosure

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TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.3 m wide; c. 21.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure. The north half of the enclosure is collapsed, and the south half is in very good condition. Walls of the south half are faced on both sides. The enclosure walls average 70 cm in thickness and have a maximum height of 90 m. The walls are of multiple-stacked construction and are composed of stacked basalt cobble and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 4.5 m wide; c. 40.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Sub-rectangular enclosure with very collapsed walls. Most of the south half of the east wall is

missing.

SITE NOS.: State: 2319 PHRI: K-120 BPBM: T-40

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini,

morning glory CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 60.0 m long by 25.0 m wide;

c. 1,500.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of a paved terrace, a

small lava tube, and a rectangular enclosure.

FEATURE A: Paved terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini,

morning glory **CONDITION: Good** INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 4.5 m wide; c. 31.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of an outcrop of cobbles which has been modified into a terrace. A faced retaining

wall is present on the southeast downslope side of the platform. The upper surface of the terrace is roughly paved.

FEATURE B: Lava Tube

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini.

morning glory

**CONDITION: Good** 

INTEGRITY: Unaltered

DIMENSIONS: 1.8 m long by 0.8 m wide; c. 1.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A small lava tube open at both ends. Some possible stacking of cobbles at one opening, or the cobbles may represent collapse. Floor of tube has a soil deposit. internal height ranges from 35 cm to 55 cm.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini,

morning glory

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 3.7 m wide; c. 22.9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with all walls faced. There may be an opening in the south corner. Walls have a maximum height of 1.1 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2037 PHRI: K-124 BPBM: — FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, grasses, wattle
CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 65.0 m long by 60.0 m wide;

c. 3,900.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

**DESCRIPTION:** Complex consists of an oval enclosure, an overhang wall, a rectangular enclosure, and surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: An oval enclosure built into an natural collapsed lava tube depression. Portions of the interiors and exteriors of the walls are faced. The walls range from 60 cm to 80 cm in thickness and range from 1.2 m to 1.4 m in height. The walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Just north of the enclosure is a small lava tube which extends to the northwest for an indeterminable length.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containingsmall and medium mammal bone, three basalt flakes, and charcoal. Aradiocarbon sample from the deposit yielded a calendric age range of AD 1640-1955.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.4 m long by 2.5 m wide; c. 8.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Overhang with a small curved wall

fronting it. The wall encloses a small area in front of the overhang and both ends of the wall connects to an outcrop equal in height to the wall. Afew boulders are present on the outcrop, above the lip of the overhang. The walls have a maximum height of 1.0 m and a maximum thickness of 50 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses lantana, 'ilima, wattle

CONDITION: Poor INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 6.0 m wide; c. 48.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure. The walls of the enclosure are quite collapsed making it difficult to determine their exact dimensions. The north wall, being on the side of a swale, is higher than the others. Part of the exterior of the west wall is faced. The walls have a maximum height of 1.0 m and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2320 PHRI: K-127 BPBM: —

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 65.0 m long by 35.0 m wide;

c. 2275.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of a circular enclosure, a small overhang with an associated wall, and many surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, 'ilima, lantana, panini, wattle

CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 8.2 m wide; c. 73.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure; the interior of the south wall and the exterior of the north wall are faced. A possible cupboard is present in the south wall. The walls have a maximum height of 85 cm and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

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CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 3.7 m wide; c. 22.9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with all walls faced. There may be an opening in the south corner. Walls have a maximum height of 1.1 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2037 PHRI: K-124 BPBM: — FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wattle CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 65.0 m long by 60.0 m wide;

c. 3,900.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of an oval enclosure, an overhang wall, a rectangular enclosure, and surrounding agricultural features.

FEATURE A: Enciosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: An oval enclosure built into an natural collapsed lava tube depression. Portions of the interiors and exteriors of the walls are faced. The walls range from 60 cm to 80 cm in thickness and range from 1.2 m to 1.4 m in height. The walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Just north of the enclosure is a small lava tube which extends to the northwest for an indeterminable length.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containingsmall and medium mammal bone, three basalt flakes, and charcoal. A radiocarbon sample from the deposit yielded a calendric age range of AD 1640-1955.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.4 m long by 2.5 m wide; c. 8.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Overhang with a small curved wall

fronting it. The wall encloses a small area in front of the overhang and both ends of the wall connects to an outcrop equal in height to the wall. Afew boulders are present on the outcrop, above the lip of the overhang. The walls have a maximum height of 1.0 m and a maximum thickness of 50 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses lantana, 'ilima, wattle

CONDITION: Poor INTEGRITY: Unaitered

DIMENSIONS: 8.0 m long by 6.0 m wide; c. 48.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure. The walls of the enclosure are quite collapsed making it difficult to determine their exact dimensions. The north wall, being on the side of a swale, is higher than the others. Part of the exterior of the west wall is faced. The walls have a maximum height of 1.0 m and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2320 PHRI: K-127 BPBM: -

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 65.0 m long by 35.0 m wide;

c. 2275.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of a circular enclosure, a small overhang with an associated wall, and many surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, 'ilima, lantana, panini, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 8.2 m wide; c. 73.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure; the interior of the south wall and the exterior of the north wall are faced. A possible cupboard is present in the south wall. The walls have a maximum height of 85 cm and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

E-43

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 1.8 m long by 0.4 m wide; c. 0.7 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A small shallow overhang in a lava blister. A 8.0 m long somewhat informal appearing wall extends north from the overhang. The wall measures 0.5 m wide; c. 0.5 m high. The overhang is 0.7 m high.

SITE NOS.: State: 2038 PHRI: K-130 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 40.0 m long by 40.0 m wide;

c. 1.600.0 sa m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

DESCRIPTION: Rectangular enclosure with a small associated overhang containing a pig mandible. Most of the interior walls are faced. The walls have a maximum height of 1.3 m and a maximum thickness of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. The overhang is 1.4 m high, 1.4 m wide, and 50 cm deep. There are many agricultural features in the area.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containing small mammal bone, marine shell, three basalt flakes, and charcoal. A radiocarbon sample from the deposit yielded five possible calendric age ranges: AD 1523-1566, AD 1629-1696, AD 1726-1818, AD 1859-1861, and AD 1921-1955.

SITE NOS.: State: 2321 PHRI: K-131 BPBM: —

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 80.0 m long by 50.0 m wide;

c. 4,000.0 sq m

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PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture/Animal Control

DESCRIPTION: Complex consists of a square enclosure, an oval enclosure, an overhang and a wall, and associated agricultural features. A wall of Site K-12 bisects the site.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory,

panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.0 m long by 0.4 m wide; c. 1.2 sq m

PROBABLE AGE: Prehistoric
DESCRIPTION: Very shallow, 50 cm high overhang with a possible deposit on the floor. A nearby wall is probably not associated with the overhang, as it appears to be a cattle wall. The wall is 50+ m long, 70 cm thick, and 50 cm high. There is also a probable road between this wall and the wall of Site K-12.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory,

panini

CONDITION: Fair/Poor INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 5.0 m wide; c. 25.00 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure with collapsed walls and rock mounds possibly associated with the enclosure. The walls have a maximum height of 30 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory, panini

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 5.0 m wide; c. 30.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure with collapsed walls. No facing was present on any of the walls. The walls have a maximum height of 50. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2322 PHRI: K-134 BPBM: --

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini

CONDITION: Fair-Poor INTEGRITY: Altered

DIMENSIONS: 18.5 m long by 13.2 m wide;

c. 244.2 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*/

Habitation

E-44

DESCRIPTION: Large substantial rectangular enclosure with wide walls and internal features. The east wall is intermittently faced on both sides. There is a possible internal step, or bench along the south half of the east wall. A natural step in the bedrock floor separates the higher north one-quarter of the floor from the lower south three-quarters. The later portion of the interior may have been futher subdivided by a wall which is now completely collapsed. A cattle wall has been constructed along the west wall of the feature. Stones from the remaining walls, especially the north and south ones, have been removed to construct the cattle wall. The walls average 70 cm in height and have a maximum thickness of up-to 2.0 m. Walls are comprised of stacked basalt boulders and cobbles. The feature commands a broad view of the surrounding terrain. The enclosure is one of the largest within the project area and probably represents a small heiau, a men's house, or high status residence based on its size, construction, and location.

SITE NOS.: State: 2323 PHRI: K-135 BPBM: — FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini.

morning glory
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 35.0 m long by 15.0 m wide;

c. 525.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of an enclosed portion of a collapsed lava tube, and an L-shaped wall within a collapsed lava tube. Along the tube, throughout the site, there are small associated features. A long wall, which may be part of Site K-112 or Site K-12, is situated nearby.

FEATURE A: Lava Tube

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, morning glory,

ferns

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 12.0 m wide;

c. 144.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: An enclosure built within a collapsed lava tube; the northeast and southwest walls have been built on the sides of the tube. The walls have a maximum height of 1.5 m and a maximum thickness of 85 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE B: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory,

ferns

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: L-shaped wall built within a collapsed lava tube. One leg of the L-shape is on the top of the tube and the other crosses the tube. The northeast side of the tube is steep enough to act as a wall—which creates an over all U-shape open to the northwest. The walls have a maximum height of 1.5 m and a maximum thickness of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2324 PHRI: K-137 BPBM: -

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, Christmas-berry

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.6 m wide; c. 14.4 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Sub-rectangular enclosure with some facing on the east wall. Northeast side of structure is built into an outcrop. The walls have a maximum height of 70 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Agicultural features, mounds, terraces, and modified outcrops, surround site.

SITE NOS.: State: 2325 PHRI: K-140 BPBM: —

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, vines

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 50.0 m long by 40.0 m wide;

c. 2,000.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Indeterminate

DESCRIPTION: Complex consists of a large ovoid enclosure, and a C-shaped enclosure. Associated with these features are two small overhangs.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, vines

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 16.0 m wide;

c. 480.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large ovoid enclosure situated in a depression/sink. Much of the south wall consists of a small cliff. The other walls are high and are intermittently faced. Wall average 1.0 m in height. Walls are multiple-stacked comprised of basait cobbles and boulders and frequently incorporate bedrock outcrops. Interior is thickly vegetated possibly indicating feature served as an garden enclosure.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, vines

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.8 m long by 3.8 m wide; c. 18.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the west. The walls are low and are not faced. The walls have an average height of 20 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2326 PHRI: K-142 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, vines

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.8 m long by 6.0 m wide; c. 46.8 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Rectangular enclosure with intermittent facing on all sides. Terraces are present north and south of the west wail. The terraces form the edge of a level area which runs to the base of a ridge situated to the east and north. The walls have an average height of 40 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

A test unit excavated in the enclosure sectioning the possible firepit did not reveal any subsuface cultural remains indicating the feature is either not a habitation (i.e., an agricultural enclosure) or that the feature was little used.

SITE NOS.: State: 2327 PHRI: K-143 BPBM: --FORMAL TYPE: Complex (2 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,

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**CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 50.0 m long by 25.0 m wide;

c. 1.250.00 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of an irregular enclosure, an overhang, and surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, panini

CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 8.0 m long by 7.0 m wide; c. 56.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Enclosure is irregular in plan view. Walls are infrequently faced on the north and west sides. In the southwest corner is a possible small platform. In the northwest corner is a low area defined by a terrace connected to the possible platform and north wall. The walls have an maximum height of 80 cm and a maximum thickness of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,

panini

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 2.5 m long by 1.5 m wide; c. 3.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A 80 cm overhang with short wails of modified bedrock on either side of the entrance. Present in the vicinity of the overhang are numerous agricultural

SITE NOS.: State: 2328 PHRI: K-146 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, Christmas-berry, wattle

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

**FUNCTIONAL INTERPRETATION: Habitation** 

DESCRIPTION: U-shaped enclosure open to the southeast. Northwest side of enclosure is built into a small outcrop. A level area is present on the other side of the outcrop. The walls have a maximum height of 70 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2329 PHRI: K-148 BPBM: — (Figure E-11) FORMAL TYPE: Complex (5 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle, Christmas-berry CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 90.0 m long by 60.0 m wide; c. 5,400.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Site consists of three circular enclosures, one U-shaped enclosure, one rectangular enclosure, and

surrounding agricultural features. FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, warrie, Christmas-berry CONDITION: Fair INTEGRITY: Unaltered DIMENSIONS: 6.5 m long by 6.5 m wide; c. 42.3 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Circular enclosure with low, unfaced walls. The walls have a maximum height of 25 cm. Walls are of multiple-stacked construction comprised of basalt

boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, wattle CONDITION: Fair INTEGRITY: Unaitered DIMENSIONS: 10.0 m long by 7.5 m wide; c. 75.0 sq m PROBABLE AGE: Prehistoric DESCRIPTION: U-shaped enclosure open to the northeast, with associated walls. Small portion of southwest wall is faced. Present within the enclosure is a small wall which extends 2.0 m northeast off the enclosure's southwest wall. The walls have a maximum height of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles and occasionally incorporating bedrock outcrops. Three meters east of the enclosure is what appears to be a very collapsed U-shape.

FEATURE C: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, wattle CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.5 m long by 7.0 m wide; c. 52.5 sq m PROBABLE AGE: Prehistoric DESCRIPTION: Circular enclosure with unfaced walls quite collapsed. The walls have a maximum height of 35 cm. Walls are of multiple-stacked construction comprised of basait boulders and cobbles.

FEATURE D: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, wattle CONDITION: Poor INTEGRITY: Unaltered DIMENSIONS: 5.4 m long by 5.2 m wide; c. 28.1 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with very collapsed walls. The only portions of the enclosure above ground level are the south wall, the southeast corner, and a small bit of the east wall. A wall extends c. 4.0 m south from the southwest corner of the enclosure. The walls have a maximum height of 30 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2330 PHRI: K-149 BPBM: --FORMAL TYPE: Overhang TOPOGRAPHY: Dissected alluvial slope VEGETATION: lantana, 'ilima, wattle, grasses, panini CONDITION: Fair INTEGRITY: Unaitered DIMENSIONS: 8.0 m long by 3.5 m wide; c. 28.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Overhang is enclosed; it is small and low, and a wall seals off one-quarter of the entrance. Fronting the overhang is a fairly level area which is terraced. The overhang measures 2.9 by 1.1 by 0.5 m.

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wante CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 40.0 m long by 40.0 m wide; c. 1,600.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/

SITE NOS.: State: 2331 PHRI: K-152 BPBM: —

DESCRIPTION: Complex consists of a double terrace, a U-shaped enclosure, and surrounding agricultural features.



Figure E-11. SITE K-148, FEATURE B. VIEW TO SOUTHWEST. (PHRI Neg.# 1154-20)

E-48

FEATURE A: Double terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, 'ilima, lantana

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.9 m long by 5.8 m wide; c. 34.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of two attached paved terraces. The downslope and northwest side of each level area is well faced. The upper terrace surface is 80 cm above the lower one. The southeast corner of each terrace is level with the slope of the hill. The lower terrace is 70 cm high.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.7 m long by 5.0 m wide; c. 28.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: U-shaped enclosure open to the southwest. The walls of the enclosure are faced. The back wall of the U-shape, the northeast side, is collapsed. The walls have a maximum height of 40 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2332 PHRI: K-200 BPBM: -

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, wattle, Christmas-berry,

grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 10.7 m long by 3.0 m wide; c. 32.1 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Site consists of an 1.1 m high overhang with a partially walled entrance. One wall is on the southeast side of the entrance. The wall has a faced corner. The wall on the other side is collapsed. Inside the overhang is a small oval-shaped level terraced area.

SITE NOS.: State: 2333 PHRI: K-201 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana

**CONDITION: Fair** INTEGRITY: Unaltered

DIMENSIONS: 3.3 m long by 2.8 m wide; c. 9.3 sq m

PROBABLE AGE: Prehistoric

**FUNCTIONAL INTERPRETATION: Habitation** 

DESCRIPTION: Small square enclosure with collapsed walls. There is a bit of facing on the southwest corner. A possible entryway is present in the southwest wall. The walls have a maximum height of 30 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Five meters south of the enclosure is a wall of Site K-12.

SITE NOS.: State: 2334 PHRI: K-202 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wattle

CONDITION: Poor INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.0 m wide; c. 12.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: A small rectangular enclosure with a modified bedrock terrace extending 10.0 m off the southwest corner. The walls have a maximum height of 70 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles occasionally incorporating bedrock outcrops.

SITE NOS.: State: 2335 PHRI: K-203 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 45.0 m long by 22.0 m wide;

c. 990.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Large irregular-shaped enclosure with two rooms on the southwest side. Probable agricultural features within enclosure including modified outcrops and terraces. The walls have a maximum height of 1.5 m. Walls are of multiple-stacked to core-fill construction. Walls are comprised of basalt boulders and cobbles occasionally incorporating bedrock outcrops.

SITE NOS.: State: 2336 PHRI: K-204 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: grasses, lantana, 'ilima, wattle,

Christmas-berry **CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 5.0 m wide; c. 31.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Circular enclosure with collapsed walls. The interior of the southwest wall is partially faced. Possible

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1 ρį. opening present in a section of the west wall. The walls have a maximum height of 55 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

SITE NOS.: State: 2337 PHRI: K-205 BPBM: —

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, Christmas-berry, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 18.0 m long by 5.0 m wide; c. 90.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Overhang with a terraced area in front of it. Overhang has two deep recesses at either end; recesses differ in elevation and are separated by a collapsed modified bedrock wall. Overhang ceiling ranges from 50 cm to 90 cm in height.

SFTE NOS.: State: 2338 PHRI: K-206 BPBM: T-1

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, 'ilima, lantana

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.6 m long by 5.5 m wide; c. 36.30 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation\*/

Agricultural

DESCRIPTION: The northwest and southeast walls of this enclosure are formed by a collapsed lava tube. Possible cupboard present in the middle of the northeast wall. Within the tube, 6.0 m upslope of the enclosure, is a terrace. The walls have a maximum height of 90 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

SITE NOS.: State: 2339 PHRI: K-207 BPBM: T-45

FORMAL TYPE: Sink, Burial

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, Christmas-berry, panini

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 36.0 m long by 5.0 m wide;

c. 180.00 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial/Habitation DESCRIPTION: Very deep sink with a small circular alignment in lava tube at the bottom. A lava tube extends to the west. Human bone noted on surface in tube. Sink is filled with trash and dead animals. Areas of charcoal-stain noted on floor of tube.

SITE NOS.: State: 2340 PHRI: K-208 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.3 m wide; c. 21.5 sq m

PROBABLE AGE: Prehistoric

**FUNCTIONAL INTERPRETATION: Habitation** 

DESCRIPTION: Sub-rectangular enclosure built on a bedrock outcrop. Interiors and exteriors of walls are faced. The walls have a maximum height of 90 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles. Many agricultural terraces present northwest of the enclosure.

SITE NOS.: State: 2341 PHRI: K-209 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, morning glory, kiawe

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 15.0 m wide;

c. 450.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: Large oval enclosure encircling a sink. Aside from the east wall, which is built on a slope and which utilizes bedrock, all walls are faced on both sides.

The walls have a maximum height of 1.4 m and a maximum thickness of 90 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles. Agricultural

terraces surround the enclosure.

SITE NOS.: State: 2342 PHRI: K-210 BPBM: --

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.1 m long by 2.9 m wide; c. 11.9 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Overhang with irregular enclosure in front. Two sides of the enclosure consist of bedrock; one of the bedrock sides has a small overhang. The interior portion of the northwest wall is faced; all other walls are collapsed. The walls have a maximum height of 90 cm and a maximum thickness of 60 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

SITE NOS.: State: 2343 PHRI: K-211 BPBM: —
FORMAL TYPE: Terrace
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima, wattle, lilikoi
CONDITION: Good
INTEGRITY: Unaltered
DIMENSIONS: 13.0 m long by 6.5 m wide; c. 84.50 sq m
PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Probable residential terrace with modified bedrock walls present on the south and west sides. The other walls were vaguely defined. Terrace is simated on the end of a ridge. The walls have a maximum height of 80 cm and a maximum thickness of 1.1 m. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

## APPENDIX F

# FULL UTM COORDINATES, ELEVATION AND PROXIMITY TO WATER FOR IDENTIFIED SITES

W-1 774,450 2,295,100 1820 625 (5) W-2 774,350 2,295,850 1820 175 (N) W-3 774,300 2,295,800 1820 175 (N) W-4 774,300 2,295,700 1820 175 (N) W-4 774,300 2,295,700 1820 175 (N) W-4 774,300 2,295,700 1820 175 (N) W-6 774,300 2,295,700 1820 175 (SW) W-6 774,300 2,295,700 1820 175 (SW) W-10 774,500 2,295,700 1820 150 (S/S) W-11 774,500 2,295,900 1900 500 (S) W-12 774,500 2,295,900 1900 150 (S/S) W-13 774,500 2,295,600 1900 150 (S/S) W-14 774,800 2,295,600 1900 150 (S/S) W-27 775,000 2,295,600 1900 175 (N) W-21 775,000 2,295,600 2100 375 (N) W-23 775,000 2,295,600 2100 375 (N) W-34 775,000 2,295,600 2100 375 (N) W-35 775,000 2,295,600 2100 175 (N) W-36 775,000 2,295,600 2100 175 (N) W-37 775,000 2,295,600 2200 175 (N) W-37 775,000 2,295,500 2200 2200 175 (N) W-37 775,000 2,295,500 2200 2200 220 (W-3 W-47 776,530 2,294,950 2200 2200 220 (W-3 W-47 776,530 2,294,950 2800 220 (S/S) W-48 776,550 2,294,900 2800 200 (S/S) W-49 776,550 2,294,900 2800 100 (S/S) W-49 776,550 2,294,900 2800 100 (S/S) W-49 776,550 2,294,900 2800 200 (S/S) W-49 776,550 2,294,900 2800 200 (S/S) W-49 776,550 2,294,900 2800 200 (S/S)	EVATION DISTANCE AND	PIIRI	FUL	FULL UTM	ELEVATION	DISTANCE AND
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774,300 2,295,700 1820 774,200 2,295,550 1820 774,500 2,295,750 1880 774,600 2,295,750 1900 774,500 2,295,400 1940 774,700 2,295,600 1940 774,800 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1960 774,800 2,295,600 1960 775,150 2,295,600 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2200 775,000 2,295,600 2200 775,000 2,295,600 2200 775,600 2,295,100 2220 776,550 2,294,950 2280 776,650 2,294,950 2840 776,550 2,294,950 2840 776,550 2,294,950 2840	340 225 (SW)	W-71	775,400	2.294.950	2340	1000 (S)
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774,600 2,295,900 1900 774,500 2,295,250 1960 774,500 2,295,400 1940 774,700 2,295,650 1980 774,800 2,295,600 1980 774,800 2,295,600 1980 775,050 2,295,600 1960 775,150 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,100 2100 775,100 2,295,100 2100 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 22200 775,600 2,295,100 22200 775,600 2,295,100 22200 775,600 2,295,100 22200 775,500 2,295,100 22200 775,500 2,295,100 22200 775,500 2,295,100 22200 775,500 2,295,100 2720 776,550 2,295,100 2280 776,550 2,294,950 2840	•	W-80	775,750	2,295,050	2400-2540	
774,500 2,295,250 1960 774,500 2,295,400 1940 774,700 2,295,650 1940 774,700 2,295,650 1940 774,800 2,295,650 1980 774,800 2,295,600 1980 774,800 2,295,600 1960 775,050 2,295,550 2100 775,150 2,295,600 2100 775,150 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,050 2,295,100 2200 776,350 2,295,100 22200 776,350 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720	300 150 (S)	W-82	775,700	2,295,050	2440	
774,500 2,295,400 1940 774,700 2,295,500 1980 774,700 2,295,650 1940 774,850 2,295,850 1980 774,800 2,295,600 1980 774,700 2,295,600 1960 775,050 2,295,150 2100 775,150 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,050 2,295,100 22200 776,350 2,295,100 22200 776,350 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320	360 250 (S)	W-83	775,450	2,295,250	2300	100 (N)
774,700 2,295,500 1980 774,700 2,295,650 1940 774,850 2,295,700 1980 774,800 2,295,700 1960 775,050 2,295,600 1960 775,150 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,050 2,295,100 2280 776,350 2,295,100 2280 776,350 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,650 2,295,500 2320 776,650 2,295,500 2840 776,550 2,294,950 2840	940 625 (S), 575 (N)	W-88	776,450	2,294,750	2840	(S) (O)
774,700 2,295,650 1940 774,850 2,295,850 1980 774,800 2,295,700 1980 774,700 2,295,600 1960 775,050 2,295,600 2100 775,150 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,000 2,295,600 2200 776,950 2,295,100 2280 776,350 2,295,100 2280 776,550 2,295,100 2280 776,550 2,295,100 2280 776,550 2,295,100 2840 776,550 2,295,500 2840 776,550 2,294,950 2840		W-90	775,950	2,295,050	2540	125 (S)
774,850 2,295,850 1980 774,800 2,295,700 1980 774,700 2,295,600 1960 775,050 2,295,550 2100 775,150 2,295,600 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,050 2,295,100 2200 776,350 2,294,950 2200 776,550 2,294,950 2280 776,550 2,294,950 2860 776,550 2,294,950 2860 776,550 2,294,950 2860	940 300 (S)	W-96	774,250	2,295,650	1820	100 (N)
774,800 2,295,700 1980 774,700 2,295,600 1960 775,050 2,295,550 2100 775,150 2,295,150 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 774,950 2,294,900 2200 774,950 2,295,100 2180 776,350 2,295,100 2720 776,550 2,295,100 2320 775,600 2,295,100 2320 775,600 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,500 2280	980 375 (SW)	W-97	774,200	2,295,400	1820	125 (S)
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774,950 2,294,900 2200 775,050 2,295,100 2180 774,950 2,294,950 2200 776,350 2,295,100 2720 775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2840 776,550 2,294,900 2840		K-2	774,200	2,293,400	2240	•
775,050 2,295,100 2180 774,950 2,294,950 2200 776,350 2,295,100 2720 775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2840 776,550 2,294,900 2840	175 (N) 175 (D)	K-3	774,300	2,293,600	2300-2320	•
774,950 2,294,950 2200 776,350 2,295,100 2720 775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050	180 875 (W/SW)	K-4	774,300	2,293,350	2280	•
776,350 2,295,100 2720 775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050	•	K.5	774,250	2,293,300	2280-2300	
775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050	720 575 (S)	K-6	774,150	2,293,250	2260-2280	
775,500 2,295,550 2280 776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050 2760		K-7	774,100	2,293,200	2250-2280	•
776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050 2760		K-8	774,050	2,293,150	2260-2280	•
776,550 2,294,900 2840 776,450 2,295,050 2760		K-9	773,900	2,292,850	2280-2320	,
776,450 2,295,050 2760		K-10	773,900	2,292,800	2320-2340	•
33.1	,	K-11	773,850	2,292,750	2300-2320	•
W-55 776,250 2,294,500 2820 950 (	(N) 050 (N)	K-12	773,900	2,292,400	2380-2480	•

\* Water = Internitent drainage. There are no known water sources in the Keokea parcel.

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FULL UTM COORDINATES, ELEVATION AND PROXIMITY TO WATER FOR IDENTIFIED SITES (cont.)

TEMP.	COÓR	COORDINATES	ELEVATION (ft. above	DISTANCE AND	PHRI	FULL	FULL UTAL	El.EVATION	DISTANCE AND
NUMBER	EASTING	NORTHING	sea level)	(II.) (approx.)	NUMBER	EASTING NORTH	NORTHING	(fl. above sea level)	DIRECT. TO WAYER (A.) (approx.)
K-13	773,800	2,292,650	2320-2360	•					
K-14	773,900	2,292,700	2360	•	K-64	774,400	2,292,800	2480	•
K-16	774,000	2,292,700	2360		K-65	774,400	2,292,600	2540-2600	
K-19	774,100	2,292,900	2340	•	K-69	774,450	2,292,350	2680	,
K-20	774,150	2,292,900	2360	•	K-70	774,450	2,292,400	2640	•
K-21	774,100	2,293,000	2320	•	K-71	774,500	2,292,550	2580-2600	
K-25	774,200	2,293,100	2320-2380	•	K-76	774,550	2,292,700	2540-2560	
K-26	774,200	2,293,200	2300	•	K-78	774,650	2,292,700	2560	,
K-27	774,300	2,293,200	2340	•	K-79	774,650	2,292,850	2560	
K-29	774,250	2,293,250	2300	•	K-80	774,700	2,292,800	2560	•
K-30	774,300	2,293,300	2300		K-81	774,500	2,292,650	2580-2600	
K-31	774,300	2,293,500	2300	•	K-84	774,500	2,292,400	2660	•
K-32	774,400	2,293,450	2320	•	K-85	774,450	2,292,300	2680	
K-35	774,250	2,293,100	2320-2340	•	K-87	774,450	2,292,200	2720	
K-36	774,200	2,293,000	2260-2280	•	K-89	774,400	2,292,150	2700-2720	
K-39	774,000	2,292,600	2340-2420		K-90	774,250	2,292,150	2660	•
K40	774,000	2,292,600	2420	•	K-95	774,200	2,291,900	2700	•
K41	774,050	2,292,500	2560-2480	•	K-96	774,450	2,292,100	2740	•
K42	774,250	2,292,800	2440	•	K-97	774,550	2,292,100	2760	•
× 44	774,300	2,292,800	2440-2460	•	K-98	774,650	2,292,500	2640	
K-45	774,300	2,292,850	2440		K-99	774,700	2,292,650	2600	•
K-46	774,300	2,292,900	2420-2440	•	K-100	774,750	2,292,650	2600-2620	,
X 48	774,400	2,293,000	2320-2520	•	K-101	774,550	2,292,200	2700-2740	,
K-50	774,200	2,292,600	2480-2520	•	K-102	774,600	2,292,100	2780	•
K-51	774,100	2,292,400	2540	•	K-103	774,700	2,292,400	2680-2700	,
K-52	774,200	2,292,400	2560	•	· K-105	774,100	2,291,900	2680	
K-53	774,250	2,292,450	. 2560	•	K-106	774,100 € €		2620	•
K-54	774,200	2,292,500	2540		K-107	774,200	2,292,150	2640	•
K-55	774,300	2,292,600	2520	•	K-108	774,150	2,292,300	. 2580	
K-57	774,350	2,292,700	2500	•	K-109	774,100	2,292,200.	2580-2600	
K-59	774,350	2,292,750	2480		K-110	774,1000	. 2,292,150	2600	•,
%-60 -	774,400	2,292,950	2440	_	K-11	774,000	2,292,100	2600	. •
K-62	774,500	2,293,000	2440-2460		K-112	773,400	2,292,200	2360	
K-63	774,500	2,292,800	2480-2500		K-115	773,500	2,292,300	2360	•
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FULL: UTM COORDINATES, ELEVATION AND PROXIMITY TO WATER FOR IDENTIFIED SITES (cont.)

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PHRI	TOS	FULL UTM	ELEVATION	DISTANCE AND
NUMBER	EASTING	ING NORTHING	(II. above sca level)	DIRECT. TO WATER (ft.) (approx.)
K-118	773,600	2,292,400	2380	•
K-120	773,700	2,292,450	2380	
K-124	773,850	2,292,600	2380	
K-127	773,800	2,292,450	2400	
K-130	773,600	2,292,200	2400-2420	
K-131	773,700	2,292,150	2460-2480	
K-134	773,800	2,292,300	2460	
K-135	773,800	2,292,350	2440	
K-137	773,950	2,292,400	2440	•
K-140	773,900	2,292,300	2480-2500	
K-142	773,800	2,292,250	2480	•
K-143	773,800	2,292,100	2500	•
K-146	773,950	2,292,250	2520	
K-148	774,050	2,292,350	2520	•
K-149	774,050	2,292,400	2500-2520	
K-152	774,000	2,292,200	2560	
K-200	774,300	2,293,100	2360-2380	
K-201	773,950	2,202,500	2420	•
K-202	774,500	2,293,450	2360	
K-203	774,150	2,292,800	2400	
K-204	774,250	2,292,700	2500	
K-205	773,900	2,292,700	2360	
K-206	000,577	2,292,400	2800	
K-207	774,250	2,291,950	2700	•
K-208	774,250	2,292,300	2600	•
K-209	773,500	2,292,150	2380	•
K-210	774,250	2,292,650	2500	•
K-211	774,200	2,292,600	2500	•

COMMENTS RECEIVED DURING DRAFT ENVIRONMENTAL ASSESSMENT REVIEW PERIOD



CIVIL & STRUCTURAL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT & INSPECTIONAL SERVICES

October 16, 2000

State of Hawaii Office of Environmental Quality Control (OEQC) 220 South King Street, 4<sup>th</sup> Floor Honolulu, HI 96813

Attention: Ms. Genevieve Salmonson

Director

Re: Draft Environmental Assessment

Lower Kula and Waiohuli Water System Improvements

At Kula, Maui, Hawaii

TMK: (2) 2-2-02:56 (Portion)

(2) 2-3-06:32

Ladies & Gentlemen:

Pursuant to your office's comment letter dated December 20, 1996 (copy attached), the following are our responses.

To minimize the visual impact, the new reservoirs were painted green. The shade of green was determined by the County Department of Water Supply with the assistance of community input. In addition, wedelia groundcover and hibiscus hedging planted at the site's perimeter were also added to soften visual impact.

Thank you for the opportunity to address your comments.

Should you have any questions or comments, please do not hesitate to call me.

Very truly yours,

Kirk T. Tanaka, P.E., L.S.

Kis. Jaml

President

KTT:sh

Att.

cc: Mr. Gerald Lee

871 KOLU STREET SUITE 201 • WAILUKU, MAUI, HAWAII 96793-1436 • PHONE 242-6861

BENJAMIN J. CAYETANO



### STATE OF HAWAII

### OFFICE OF ENVIRONMENTAL QUALITY CONTROL

236 SOUTH BERETANIA STREET SUITE 702 HONOLULU, HAWAII 86813 TELEPHONE (808) 886-4185 FACSIMILE (808) 886-4186

December 20, 1996

Mr. Kali Watson, Chair Department of Hawaiian Homelands 335 Merchant Street Honolulu, Hawaii 96813

Dear Mr. Watson:

Draft Environmental Assessment for the Lower Kula and Subject:

Waiohuli Water System Improvements, Kula, Maui

Thank you for the opportunity to review the subject document. We have the following comment.

According to the environmental assessment, the proposed reservoirs will be painted green to match the character and color of the surrounding residential subdivision. We commend your effort in minimizing the visual impacts of the project. To further improve the area's aesthetics, we suggest landscaping with native Hawaiian plants.

Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Gary Gill Director

R. T. Tanaka Engineers

GARY GILL DIRECTOR

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2000-11-08-MA-FEA-

### FILE COPY

### FINAL ENVIRONMENTAL ASSESSMENT FOR IOWER KULA AND WAIOHULI WATER SYSTEM IMPROVEMENTS AT KULA, MAUI, HAWAII TAX MAP KEY: (2) 2-2-02:56 (PORTION) (2) 2-3-06:32

PREPARED FOR:
DEPARTMENT OF HAWAIIAN HOME LANDS
STATE OF HAWAII
P. O. BOX 1879
HONOLULU, HAWAII - 96805

PREPARED BY: R. T. TANAKA ENGINEERS, INC. 871 KOLU STREET, SUITE 201 WAILUKU, MAUI, HAWAII - 96793

OCTOBER 2000

### TABLE OF CONTENTS

ı.	APPLICANT	1
II.	APPROVING AGENCIES	1-2
III.	AGENCIES CONSULTED	2
IV.	DESCRIPTION OF THE PROPOSED PROJECT	2-3
V.	DESCRIPTION OF THE AFFECTED ENVIRONMENT	3-6
VI.	PROBABLE IMPACT OF PROJECT ON THE ENVIRONMENT AND MITIGATIVE MEASURES TO MINIMIZE ADVERSE IMPACTS AND ALTERNATIVES	
	A. PRIMARY IMPACTS B. SECONDARY IMPACTS C. ALTERNATIVES	7 - 13 13 14
VII.	OTHER INTEREST AND CONSIDERATION OF GOVERNMENTAL POLICES THAT OFFSET ADVERSE ENVIRONMENTAL EFFECTS	14
VIII.	DETERMINATION AND SUPPORTING REASONS	14 - 17
IX.	EXHIBITS	
	FIG. 1 - LOCATION MAP	
	FIG. 2 - VICINITY MAP	
	FIG. 3 - SUBDIVISION LAYOUT MAP	
	FIG. 4 - WATER DISTRIBUTION MAP	
	FIG. 5 - KULA KAI RESERVIOR PUMPING IMPROVEMENTS	
	FIG. 6 - SERVICE ZONE NO. 2 RESERVOIR PLAN	
	FIG. 7 - SERVICE ZONE NO. 3 RESERVOIR PLAN	
	FIG. 8 - SERVICE ZONE NO. 4 RESERVOIR PLAN	

### X. APPENDICES

- A. SOILS REPORT
  - 1) SERVICE ZONE NO.2
  - 2) SERVICE ZONE NO. 3
  - 3) SERVICE ZONE NO. 4
- B. BOTANICAL SURVEY
- C. AVIFAUNA AND FERAL MAMMALS SURVEY
- D. ARCHAEOLOGICAL STUDY
- E. COMMENTS RECEIVED DURING DRAFT ENVIRONMENTAL ASSESSMENT REVIEW PERIOD AND RESPONSE LETTERS

### LOWER KULA AND WAIOHULI WATER SYSTEM IMPROVEMENTS

TMK; (2) 2-2-02:56 (PORTION) (2) 2-3-06:32

### KULA, MAUI, HAWAII

### **ENVIRONMENTAL ASSESSMENT**

### I. APPLICANT:

Department of Hawaiian Home Lands, State of Hawaii, P. O. Box 1879, Honolulu, Hawaii - 96805.

### II. APPROVING AGENCIES:

The applicant will have to obtain the following approvals before proceeding with the project:

### County of Maui

### Maui County Planning Department:

1. Environmental Assessment

### Department of Public Works:

Grading and Grubbing Permit

### Department of Water Supply:

Construction Plan Approvals

#### State of Hawaii

Department of Hawaiian Home Lands

## III. AGENCIES CONSULTED:

Prior to the development of project plans, the following have been or will

be consulted:

#### County of Maui:

**Environmental Coordinator** 

Department of Planning

Department of Public Works

Department of Water Supply

## State of Hawaii:

Department of Transportation

Department of Land & Natural Resources

Department of Agriculture

Office of Environmental Quality Control

## IV. <u>DESCRIPTION OF THE PROPOSED PROJECT:</u>

#### A. General:

The proposed project involves the construction of three (3) concrete reservoirs and appurtenant pumping facilities serving proposed Kula Residence Lots, Unit 1 to satisfy the subdivision's water storage requirement imposed by the Maui County Department of Water Supply.

#### B. Proposed Improvements:

The proposed improvements include the construction of three (3) reinforced concrete reservoirs to be constructed on Lot G, Lot 11 and Lot 71 with a 0.2 MG, 0.5 MG and a 0.2 MG reservoir, respectively (see Figures 6, 7 and 8). Appurtenant pumping improvements onsite and at the existing Kula Kai reservoir site is also included in the improvements (see Figure 5) to move the point of adequacy in the existing waterline to the Hawaiian Home Lands parcel.

These proposed improvements are necessary to satisfy the subdivision's storage component of the requirements of the County Department of Water Supply.

These reservoirs will store potable water for the domestic needs and fire flow requirements of the subdivision.

## V. <u>DESCRIPTION OF THE AFFECTED ENVIRONMENT:</u>

### A. Physical Characteristics

### 1. Project Location

The proposed project site is located in Kula, Maui, Hawaii, within the proposed Kula Residence Lots, Unit 1 owned by the Department of Hawaiian Home Lands, State of Hawaii.

Figure 2 shows the proposed development site relative to existing roads.

## 2. Soils

The U.S.D.A. Soil Conservation Services Soil Survey classifies the site (Kula Cobbly Loam, KxaD). This type of soil is characterized as having rapid permeability slow to medium runoff and moderate erosion hazard.

#### 3. Climate

Climate at the project site is typical of Kula region, receiving little annual rainfall, as it lies on the Leeward slopes of Mount Haleakala. Typical of the Hawaiian Islands, northeastern trades are the prevailing winds while storm winds are usually from the south or southeasterly direction.

The average annual rainfall in the Kula area ranges from 25 to 40 inches.

## 4. Topography

The three (3) reservoir sites are presently vacant and covered with scrubby vegetation used for cattle grazing and black wattle trees.

These sites generally slope in a mauka to makai direction ranging from 14 to 18 percent.

## 5. <u>Drainage</u>

Drainage runoff from the reservoir sites generally sheet flow through the sites running into an adjacent ravine.

#### 6. Flooding

According to the Flood Insurance Rate Maps for Maui County the site is within Zone C designation which are areas of minimal flooding.

## B. <u>Biological Characteristics</u>

#### 1. Plant Life

There is no indication of any rare or endangered plants associated with the property. See Botanical Study in Appendix "B" of this report.

## 2. Animal Life

There is no indication of any rare or endangered species of animal associated with this property.

See Avifauna and Feral Mammals Survey in the Appendix "C" of this report.

## C. Land Use and Zoning

## 1. State Land Use and Zoning

The property is located within the agriculture district as designated by the Land Use Commission of the State of Hawaii.

## 2. County Zoning and Upcountry Community Plan

The project site is currently zoned agriculture by the County.

The site is within the agricultural district as designated by the Upcountry Community Plan.

## 3. Existing Land Use

The reservoir sites are presently undeveloped supporting growth of miscellaneous pasture grasses, and black wattle trees.

## 4. Adjacent Land Use

Lands surrounding the project site are presently used for cattle grazing and are owned by Kaonoulu Ranch and the Department of Hawaiian Home Lands.

Rural residential development is scattered throughout the Kula area.

## VI. PROBABLE IMPACT OF PROJECT ON THE ENVIRONMENT AND MITIGA-TIVE MEASURES TO MINIMIZE ADVERSE IMPACTS AND ALTERNATIVES

## A. Primary Impacts

## 1. Anticipated Short-Term Impacts

Short-term construction related impacts are anticipated. These impacts will last no longer than the construction phase and can be mitigated by proper construction techniques, adherence to generally accepted construction practices and compliance with the Maui County Soil Erosion and Sedimentation Control, OSHA Standards, State Air, Noise and Water Quality Regulations. These short-term effects will include the following:

## a. - Dust from Construction Operations

Waterwagons and sprinklers will be used to control dust resulting from construction activities. The proposed project site will be kept moist after working hours and on weekends, if necessary. These requirements will be stated in the construction plans and specifications.

#### b. Noise from Construction Equipment

Noise from construction equipment will be kept within the limits permitted by the State, County and OSHA regulations. Construction activities will be restricted to daylight

hours between 7:00 a.m. and 3:30 p.m. No work will be permitted at night except to complete work activities that would endanger the health and safety of the community if left undone.

## c. <u>Disruption of Normal Traffic Flow</u>

No serious traffic problems are anticipated during the construction phase since the activity will be confined within the proposed project site. Minor traffic inconvenience may be experienced along Kula Highway. All applicable safety precautions will be adhered to for the safety of motorists and pedestrians.

### d. Soil Erosion

The soils at the site are described in the Appendix of this assessment and are characterized as susceptible to wind erosion if the surface vegetation is removed. This being the case, the contractor will be required to keep the graded areas moist by means of waterwagons or temporary sprinkler systems and to have all exposed areas paved, grassed or landscaped immediately upon completion of finished grading. Furthermore, soil erosion, will be minimized by adhering to the requirements of Chapter 20.08 of

the Maui County Code. No adverse environmental impact is anticipated due to soil erosion.

## 2. <u>Anticipated Long-Term Impacts</u>

## a. Physical Impacts

## 1) Grading

All graded areas will either be paved or permanently landscaped.

Long-term grading impacts will be non-existent.

## 2) <u>Drainage</u>

The completion of the project will negligibly result in increased runoff.

Thus, long-term drainage impacts will be non-existent.

## 3) Air Quality and Water Quality

Upon completion of the construction of this project, the existing conditions of the area will remain unchanged.

Therefore, long-term air and water quality will also remain unchanged.

#### 4) Noise

Only short-term impacts associated with noise will be encountered as described earlier. Long-term impacts will be non-existent.

## 5) <u>Aesthetics</u>

Upon completion of the project, the reservoirs will stand approximately 20 feet high and will be painted green to match the character and color of the surrounding residential subdivision.

## 6) <u>Historical and Archaeological Features</u>

Except for an agricultural terrace located on Lot 11 (Site W-49, SIHP Site No. 2368) there were no historic or archaeological features discovered during an archaeological reconnaissance of the project sites.

The recommendations of the State Historic Preservation Division will be followed. Prior to construction of the reservoir on Lot 11, data recovery work, approved by the State Historic Preservation Division, will be completed.

The State Historic Preservation Officer and the County of Maui will be informed immediately should any archaeological features be discovered during grading.

Grading operations will not continue until clearance from the State and County is received.

#### b. <u>Biological Impacts</u>

## 1) Plant

No significant impact on plant life is anticipated as a result of this proposed project. There are no rare or endangered species of plants on the site, nor are there favorable conditions for such species (see Appendix "B").

## 2) Animal and Bird

No significant impact on animal and bird life is anticipated as a result of this proposed project (see Appendix "C").

## c. <u>Public Facilities and Services</u>

## 1) School

There are no impacts to school facilities as a result of the development of the reservoirs and pumping facilities.

#### 2) Public Safety

There are minimal impacts to public safety as a result of this project. During the construction phase the Contrac-

tor will be responsible for the safety of the public affected by his operations.

## 3) Parks and Recreation

There are no impacts to parks and recreational facilities as a result of the development of the reservoirs and pumping facilities.

## d. <u>Infrastructure and Utilities</u>

## 1) Water

When completed and online, the proposed project will provide water storage for domestic needs and fire flow requirements for the subdivision.

### 2) Sewer

The County of Maui does not operate any sewage collection or treatment facilities in the Kula area. Completion of this project will not have an impact on sewage disposal in the area.

#### 3) <u>Utilities</u>

The project site is located in an area presently served by Maui Electric Company, and Hawaiian Telephone

Company. There should be minimal impact as a result of this project.

## 4) Access and Circulation

Access and circulation patterns in the Kula area will not be impacted by the completion of the proposed reservoirs and pumping facilities.

## B. <u>Secondary Impacts</u>

## Anticipated Short-Term Impacts

The proposed development will provide short-term employment during the period of construction. Most or all of these shortterm impacts will affect the contractors and material suppliers that will be involved in this project.

## 2. <u>Anticipated Long-Term Impacts</u>

Anticipated long-term impacts of the project include the delivery of potable water to serve the domestic needs and fire flow requirements of the subdivision.

### C. Alternatives

#### 1. No Project

Any beneficial or adverse impacts associated with the development of this proposed project would not be generated.

This alternative is not a preferred alternative due to the fact that upon development of the subdivision, the domestic needs and fire flow requirements of the homesteaders must be met.

# VII. OTHER INTEREST AND CONSIDERATION OF GOVERNMENTAL POLICES THAT OFFSET ADVERSE ENVIRONMENTAL EFFECTS

Sufficient governmental control as mandated by the Maui County Code,
State Health regulations and Soil Conservation requirements will be enforced to
mitigate any adverse environmental impact.

## VIII. <u>DETERMINATION AND SUPPORTING REASONS</u>:

In accordance with the Rules and Regulations, the proposed project does not have significant adverse effects upon the environment, as follows:

Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

Other than the agricultural terrace located within Lot 11 there are no natural or cultural resources associated with the project site. The State Historic Preservation Division recommendations will be attentively

followed. If any others are discovered, the appropriate agencies will be consulted.

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

The proposed project will be compatible with the surrounding uses of the area.

3. Conflicts with the County's or State's long-term environmental policies or goals and guidelines.

No long-term environmental conflicts are noted.

4. <u>Substantially affects the economic or social welfare activities of the community, County or State.</u>

The completion of the reservoirs is not expected to affect the area's economic or social welfare.

## 5. Substantially affects public health.

The proposed project is not expected to cause any detrimental effect on the well-being of the public.

6. <u>Involves substantial secondary impacts, such as population changes and effects on public facilities.</u>

The completion of the pumps and reservoirs will not involve substantial secondary impacts such as population changes and effects on public facilities.

## Involves a substantial degradation of environmental quality.

The proposed project doesn't involve activities that will lower the existing quality of the environment in the area.

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

The proposed project does not have considerable effect upon the environment. Development is regulated by the County of Maui through its planning and approval process. Approval of the project does not involve a commitment for any larger actions.

## 9. Substantially affects a rare, threatened, or endangered species of animal or plant, or its habitat.

There are no known rare, threatened or endangered species or habitat associated with the project sites.

## 10. <u>Detrimentally affects air or water quality or ambient noise levels.</u>

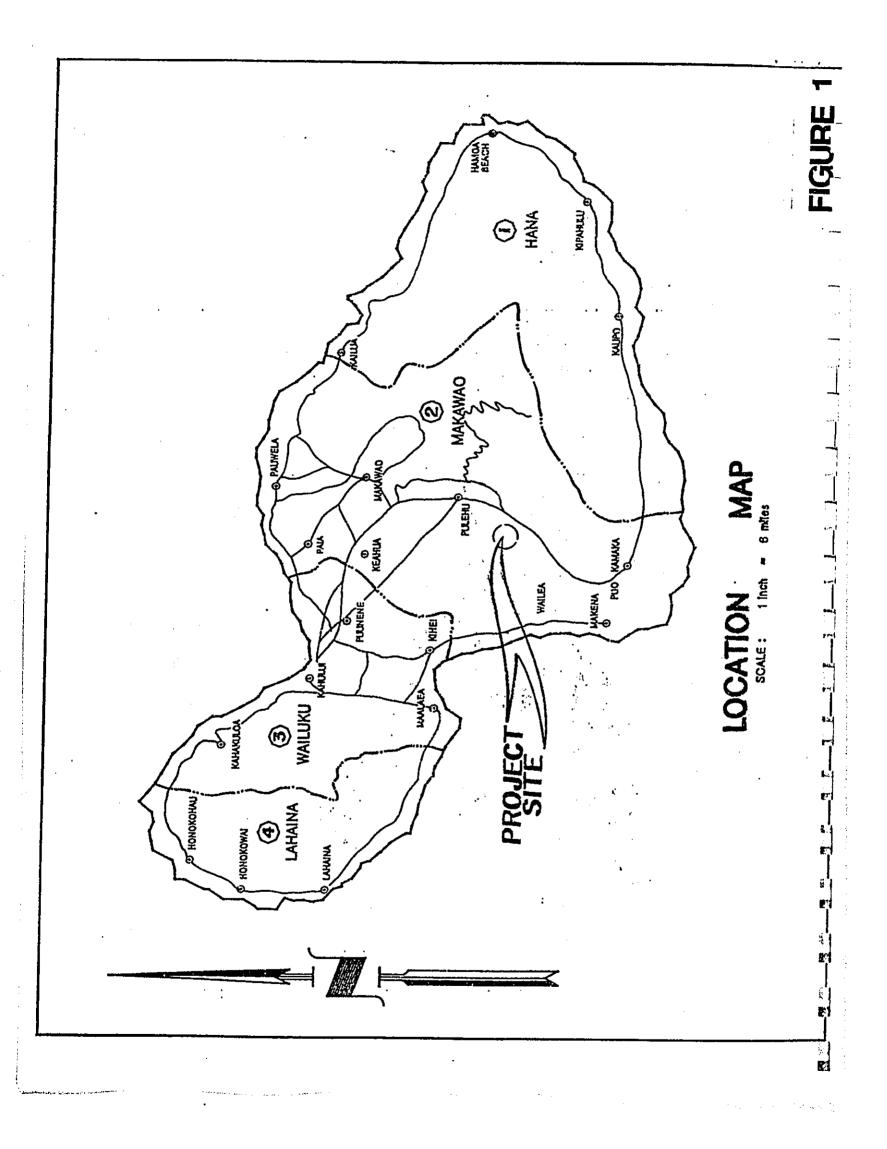
There will be no long-term effects on air quality due to the proposed project.

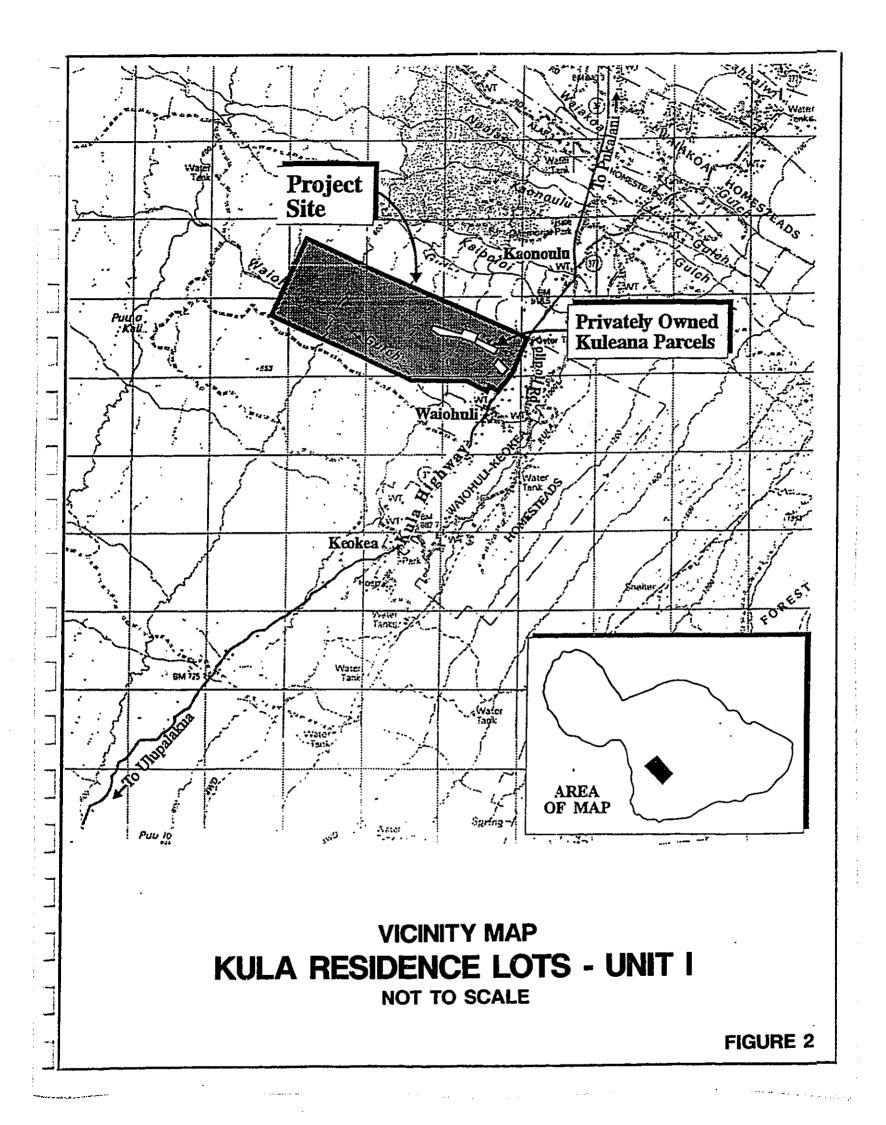
Short-term impacts on air and water quality, as well as noise, will occur during the construction period, but will be mitigated by normal construction practices and will be regulated and imposed within the plans and specifications.

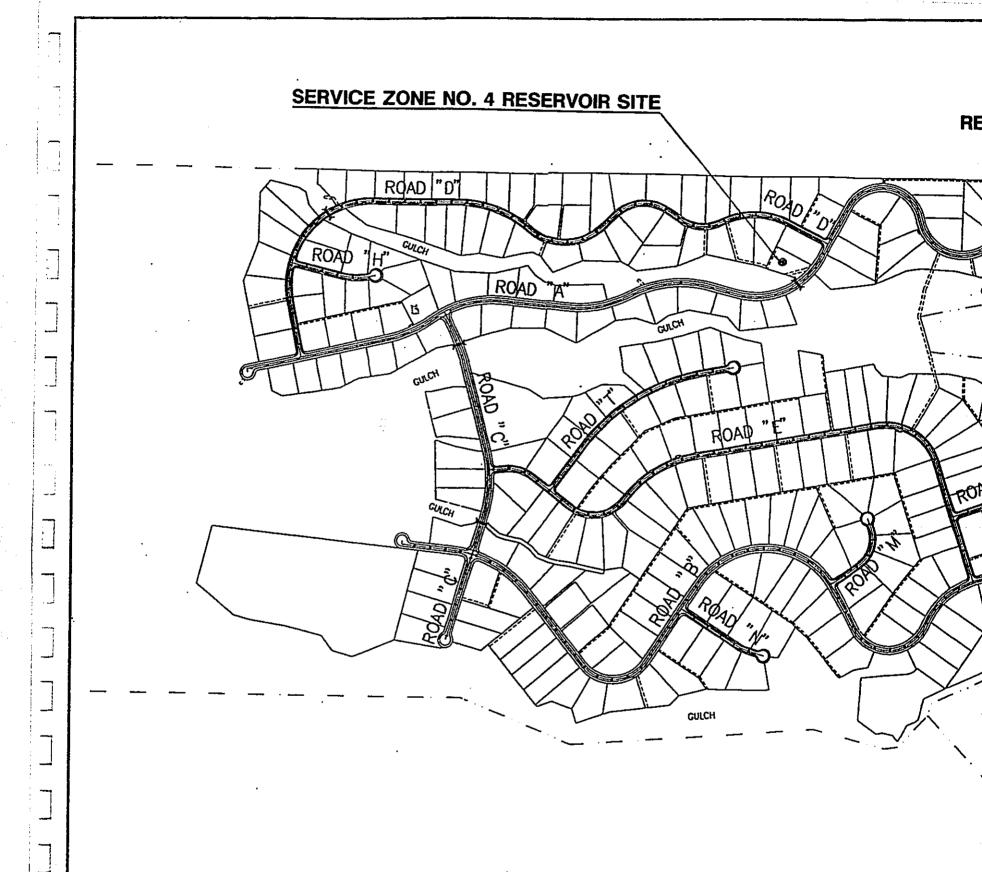
11. Affects an environmentally sensitive area, such as flood plains, tsunami zones, erosion prone areas, geologically hazardous lands, estuaries, fresh waters or coastal waters.

The proposed project is not anticipated to have any adverse impact on flood plains, tsunami zones, geologically hazardous lands, estuaries, fresh waters or coastal waters. Major flooding or erosion problems are not expected. The project site falls within Zone "C" where minimal flooding is expected as established by the "Flood Insurance Rate Maps" for County of Maui. The project site contains soils which are essentially Kula Series Soil classification and construction of the project will require that all graded areas be grassed, landscaped or paved as soon as finish grading is completed.

Therefore, it is concluded that this proposed project will not have a significant effect on the environment.

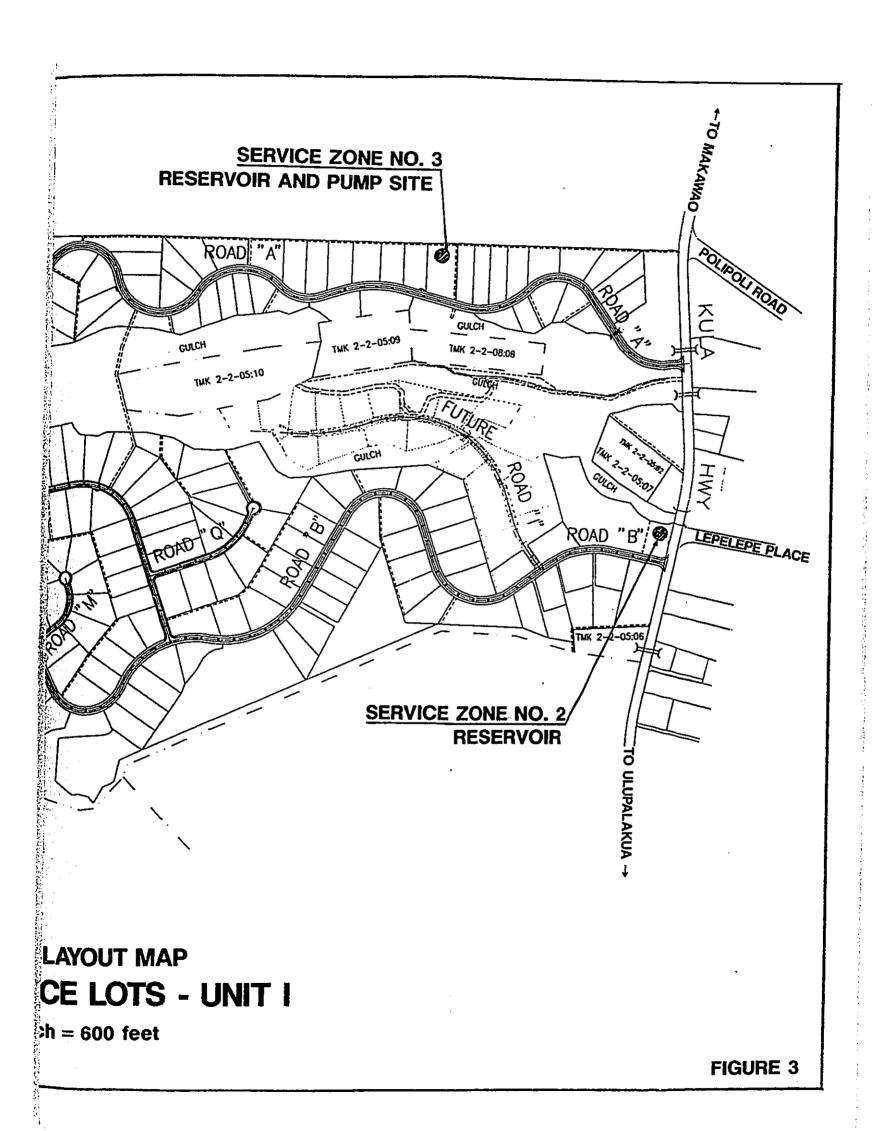


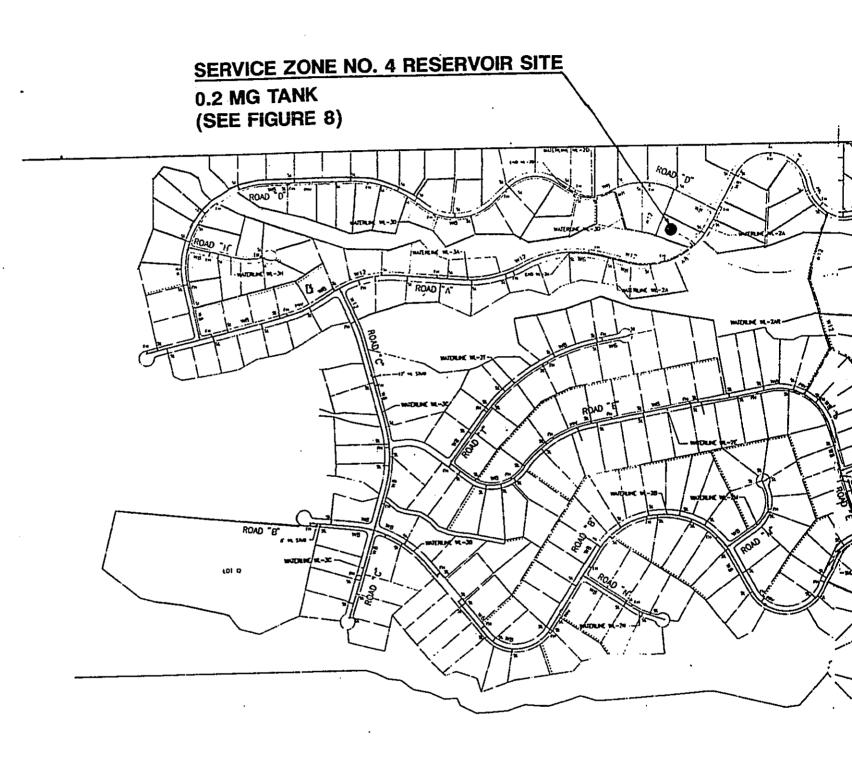




# SUBDIVISION LAYOUT MAI KULA RESIDENCE LOTS

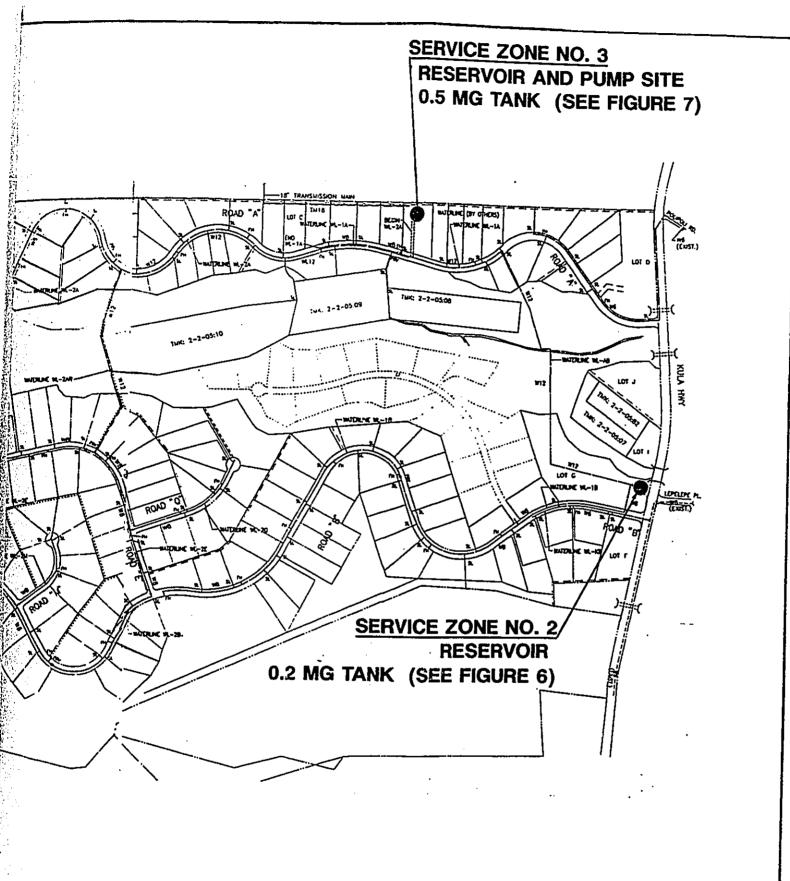
Scale: 1 inch = 600 feet





## WATER DISTRIBUTION MA KULA RESIDENCE LOTS -

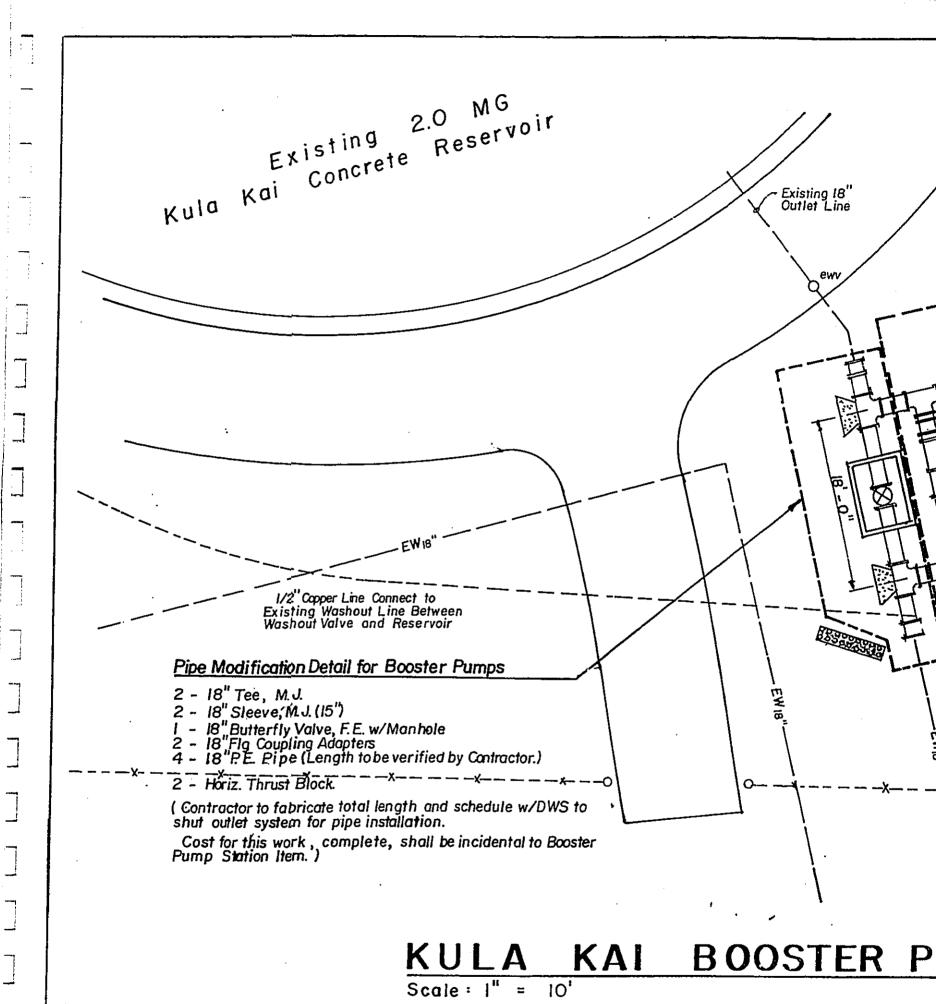
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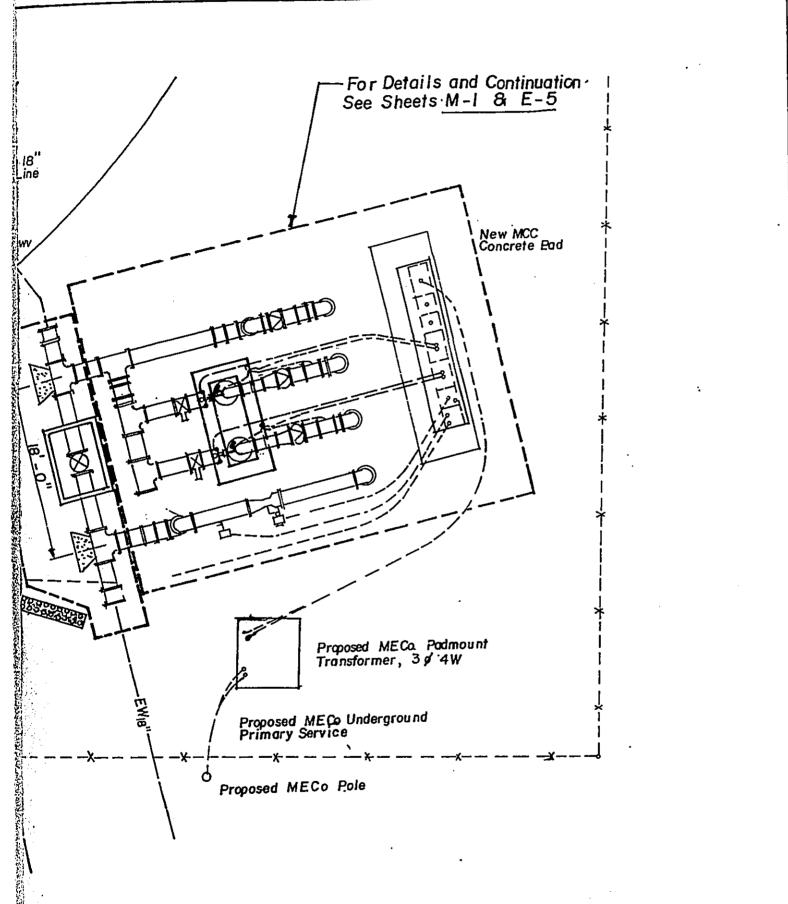


RIBUTION MAP CE LOTS - UNIT I

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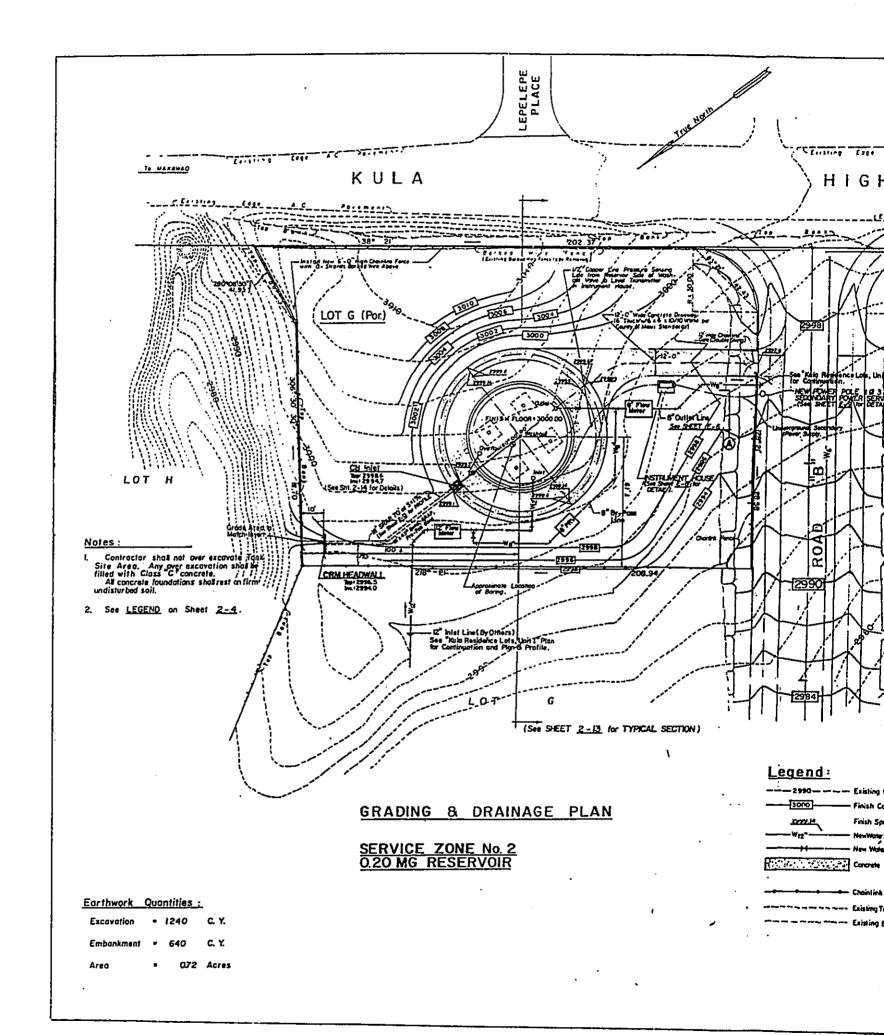
FIGURE 4



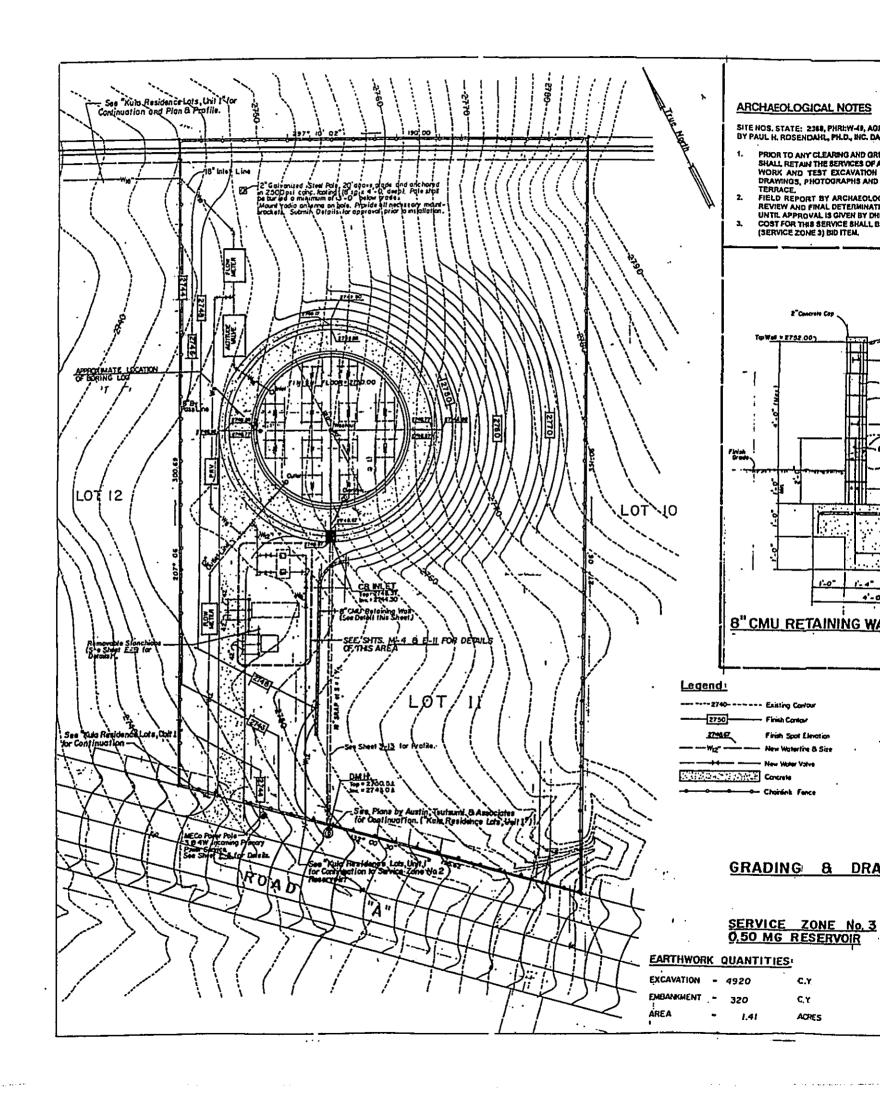


## TER PUMP SITE PLAN

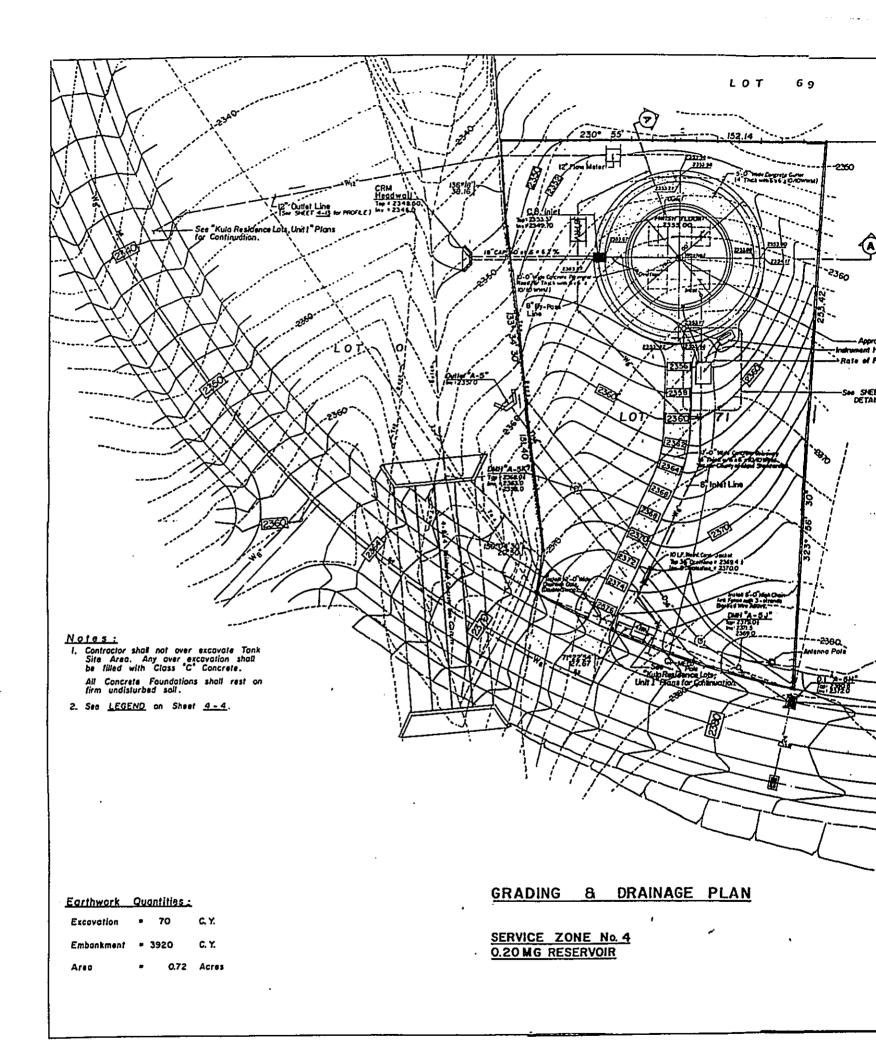
FIGURE 5



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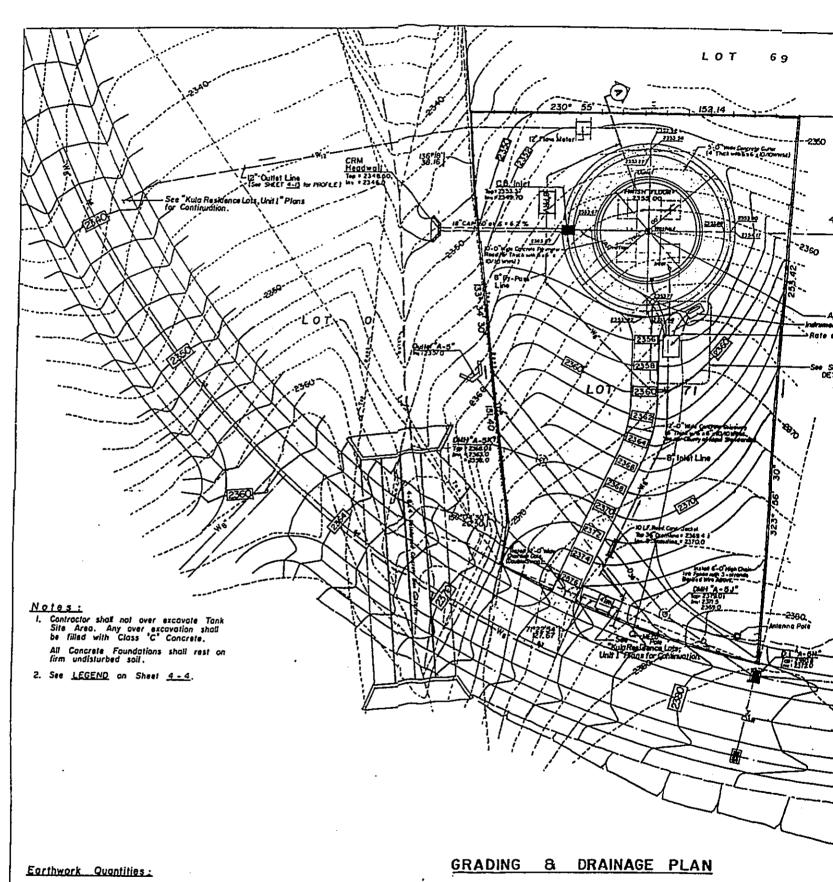
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A Cont.	
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	VEGETATION, WEEDS, BRUSH, ROOTS, STUMPS, RUBBISH, DEBRIS, AND OTHER DELETEROUS MAYERIAL SHALL BE REMOVED FROM THE SITE.
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	C. THE EXPOSED SURFACE SHALL THEN BE SCARFIED TO A DEPTH OF 8 INCHES.
•	MOISTURE CONDITIONED TO HEAR OPTIMUM MOISTURE CONTENT (ASTM D1847-91), AND THEN COMPACTED TO THE DEGREE OF COMPACTION INDICATED BELOW. IF
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١	AND BACKFILL (UNDER AND 3 FEET BEYOND THE EDGES OF STRUCTURES AND
·	PAVEMENTS) SHALL BE THOROUGHLY COMPACTED TO AT LEAST 95 PERCENT OF THE MAXIMUM DRY DENSITY (ASTM D1547-91). ALL OTHER FILL AND BACKFILL SHALL BE
0 0 00000000	COMPACTED TO AT LEAST 90 PERCENT RELATIVE COMPACTION (ASTM DISST-81).  G. DRAINAGE SHALL BE PROVIDED TO MINIMIZE PONDING OF WATER. PONDED AREAS
G & DRAINAGE PLAN	SHALL BE DRAINED IMMEDIATELY OR WATER PUMPED OUT WITHOUT DAMAGING
<b>i</b>	ADJACENT STRUCTURES AND PROPERTY. IF WATER ACCUMULATION SOFTENS THE SUBGRADE MATERIALS, THE AFFECTED SOILS SHALL BE REMOVED AND REPLACED
• *	WITH PROPERLY COMPACTED FILL.  T.M.K.:
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C,Y	Waiohuli, Kula, Moul, Hawali for the Department of Hawalian   SHEET
C,Y ACRES	Home Londs, State of Howell by Austin, Tautasum B Associates.



T 69	LOG OF BORING NO. 1 ELEVATION: +2362' EQUIPMENT USED: SMCO 2400 Deling Rig DEFTH OF BURBLED; B3-96 DATE DRILLED; B3-96	CIVIL & STREETS LND SURVEYORS
ENLES  A  PRINT  2350  LOT 70  Approximate Boring Location Instrument House Rate of Flow & Attilude Valve  See SHEET M-7, E-6 and 4-4 lpr DETARLS and MATERIAL LISTS	OCSCRPTION  OS STATEMENT OF STA	LOWER RULA AND WAIGHULL WATER SYSTEM IMPROVEMENTS O.2 MG CONORETE RESERVOIR FOR BERYIOR FOR DEFT. OF HAWALLIAN HOME LANDS, STATE OF HAWAII GRADING & DRAINAGE PLAN - BORING LOG NO. 1
Sing Company  2380  Anienno Pale  To Kula Highway	PREPARED BY SOILS INTERNATIONAL, DATED SEPTEMBER 24, 1996)  SPECIAL CONDITIONS FOR BITE PREPARATION AND GRADING 9.2 MG RESERVOIR OF SERVICE ZONE NO. 4  A. IN AREAS TO RECEIVE FILL AND BENEATH STRUCTURAL AND PAVEMENT AREAS, ALL VEGETATION, WEEDS, BRUSH, ROOTS, STUMPS, RUBBISH, DEBRIS, AND OTHER DELETERIOUS MATERIAL SHALL BE REMOVED TO MITE STRUCTURAL CONCENTIANT OF THE UNDERLYING ROCK OR CLINKER LAYER AND BE REPLACED WITH PROPERLY COMPACTED FILL.  C. THE EXPOSED SURFACE SHALL THEN BS SCARIFIED TO A DEPTH OF 8 INCHES, MOISTURE CONDITIONED TO HEAR OPTIMUM MOISTURE CONTENT (ASTIM DILEST-91). AND THEN COMPACTED TO THE DEGREE OF COMPACTION IN MINICATED BELOW. IF ENCOUNTERED, LOGISE OR SOFT AREAS SHALL BE REMOVED TO FRAM MATERIAL AND THE RESULTING DEPRESSION SHALL BE FILLED WITH PROPERTY COMPACTED FILL.  D. FILL AND BACHFEL MATERIAL SHALL CONSIST OF SOIL WISCH IS FREE OF ORGANICS, DEBRIS AND EXPANSIVE CLAYEY MATERIAL. THE MATERIAL SHALL BE LESS THAN 3 INCHES IN GREATEST DIMENSION. IMPORTED STRUCTURAL FILL AND BACKFEL MATERIAL SHALL CONTAIN NO MORE THAN 30% FINES (PASSING THE 200 SIEVE).  E. FILL AND BACKFEL SHALL BE PLACED IN LIFTS NOT EXCEEDING 8 INCHES IN LOOSE THICKNESS. PRIOR TO PLACING, THE MATERIAL SHALL BE ARRATED OR MOISTENED TO NEAR OPTHIUM MOISTURE CONTENT (ASTIM DISST-81 TEST PROCEDURE).  F. IN THE UPPER 2 PEET FROM FINISHED SUBGRADE, EACH LAYER OF STRUCTURES AND PAVEMENTS) SHALL BE THOROUGHLY COMPACTED TO ATLEAST SO PERCENT OF THE MAXIMUM BOY DENSITY (ASTIM DISST-81). ALL OTHER FILL AND BACKFEL SHALL BE COMPACTED TO AT LEAST SO PERCENT OF THE MAXIMUM BOY DENSITY (ASTIM DISST-81). ALL OTHER FILL AND BACKFEL SHALL BE COMPACTED TO ATLEAST SO PERCENT OF THE MAXIMUM BOY DENSITY (ASTIM DISST-81). ALL OTHER FILL AND BACKFEL SHALL BE COMPACTED TO ATLEAST SO PERCENT OF THE MAXIMUM BOY DENSITY (ASTIM DISST-81). ALL OTHER FILL AND BACKFEL SHALL BE COMPACTED TO ATLEAST SO PERCENT OF THE SUBGRADE MATERIALS, THE AFFECTED SOILS SHALL BE REMOVED AND REPLACED WITH PROPERLY COMPACTED FILL.  H. FOOTING EXCAVATIONS SHALL	T.M.K.:  SCALE:  DESIGNED BY:  CHECKED BY:  DRAWN BY:  DATE:  JOB No.:  SHEET  4-3

# CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING



Excavation • 70 C.Y.

Embankment - 3920 C.Y.

Ares = 0.72 Acres

SERVICE ZONE No. 4 0.20 MG RESERVOIR

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	(BORING LOG OBTAINED FROM SOILS INVESTIGATION REPORT, PREPARED BY SOILS INTERNATIONAL, DATED SEPTEMBER 24, 1996)	No.
	SPECIAL CONDITIONS FOR SITE PREPARATION AND GRADING 0.2 MG RESERVOR OF SERVICE ZONE NO.4  A. IN AREAS TO RECEIVE FR.1 AND BENEATH STRUCTURAL AND PAVEMENT AREAS, ALL VEGETATION, WEEDS, BRUSH, ROOTS, STUMPS, RUBBISH, DEBRIS, AND OTHER DELETERIOUS MATERIAL SHALL BE REMOVED FROM THE SITE.  D. THE UPPER CLAYEY SILT SHALL BE REMOVED TO THE UNDERLYING ROCK OR CLINKER	Section 1
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To Kulo Highway	THICKNESS, FIGHT OF THE TONE ON TENT (ASTM DISST-81 TEST PROCEDURE).  TO HEAR OPTIMUM MOISTURE CONTENT (ASTM DISST-81 TEST PROCEDURE).  IN THE UPPER 2 FEET FROM FINISHED SUBGRADE, EACH LAYER OF STRUCTURES AND AND BACKFAL (UNDER AND 3 FEET BEYOND THE EDGES OF STRUCTURES AND AND BACKFAL (UNDER AND BACKFAL).  PAYEMENTS) SHALL BE THOROUGHLY COMPACTED TO AT LEAST SO PERCENT OF THE PAYEMENTS) SHALL BE THOROUGHLY COMPACTED TO AT LAYER BEET. SHALL BE	REMSIONS:
	MAXIMUM DRY DENSITY (ASTM D1857-91). ALL OTHER PERL (ASTM D1857-91).  COTPACTED TO AT LEAST 80 PERCENT RELATIVE COMPACTION (ASTM D1857-91).  G. DRAINAGE SHALL BE PROVIDED TO MINIMIZE PONDING OF WATER. PONDED AREAS SHALL BE DRAINED IMMEDIATELY OR WATER PUMPED OUT WITHOUT DAMAGING ADJACENT STRUCTURES AND PROPERTY. IF WATER ACCUMULATION SOFTENS THE SUBGRADE MATERIALS, THE AFFECTED SOILS SHALL BE REMOVED AND REPLACED WITH PROPERLY COMPACTED FILL.	T,M,K.:
	H. FOOTING EXCAVATIONS SHALL BE CLEANED OF LOOSE MATERIAL THAT HAS FALLEN INTO THE EXCAVATION PRIOR TO POURING OF CONCRETE.	SCALE: DESIGNED BY: CHECKED BY: DRAWN BY: DATE:
	Existing contours, roadway improvements and roadway finish grades (contours) as shown have been taken from Construction Plans for "KULA RESIDENCE LOTS, UNIT 1" at Watchwill, Kula, Maul, Hawall for the Department of Hawalish Hame Lands, State of Hawali by Austin, Tsutsumi & Associates	JOB No.: SHEET
		FIGURE

SOILS INVESTIGATION REPORT SERVICE ZONE NO. 2

## REPORT SOILS INVESTIGATION

PROPOSED RESERVOIR
WAIOHULI SUBDIVISION SERVICE ZONE 2
KULA, MAUI, HAWAII

for

R. T. TANAKA ENGINEERS, INC. Engineers

> Project No. H-2681-F September 24, 1996



99-1255 Waiua Place Aiea, Hawaii 96701 Phone: (808) 488-0433 Fax: (808) 488-9535

335 Hoohana Street Building 7, Unit O Kahului, Maui, Hawaii 96732 Phone: (808) 877-3789 Fax: (808) 871-1592

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(808) 488-0433 FAX (808) 488-9535

\$

September 24, 1996 Project No. M-2681-F

R. T. Tanaka Engineers, Inc. 871 Kolu Street, Suite 201 Wailuku, Maui, Hawaii 96793

Attention:

Mr. Kirk Tanaka, P.E.

#### Gentlemen:

The attached report presents the results of a soils investigation for the proposed Waiohuli Subdivision Reservoir at Service Zone 2 in Kula, Maui, Hawaii.

A summary of the findings is as follows:

- 1) The subsurface conditions at the site were explored by drilling 1 test boring to a depth of 19 feet below existing grade. The boring revealed yellow brown and gray silty GRAVEL (CLINKERS) to a depth of 8.5 feet, followed by hard, gray BASALTIC ROCK to the final depth of the boring at 19 feet. The GRAVEL consistency was loose from ground surface to a depth of 1.5 feet, moderately dense from 1.5 to 3.5 feet, then dense to 8.5 feet.
- 2) Groundwater was not encountered in the boring at the time of the field investigation.
- Based on the findings and observations of this investigation, the reservoir foundation may bear on the underlying dense silty GRAVEL, underlying hard BASALTIC ROCK, or properly compacted fill.
- 4) The upper loose to moderately dense silty GRAVEL is not suitable bearing material. Foundation should be deepened to the dense silty GRAVEL or hard BASALTIC ROCK, or the loose to moderately dense material shall be removed and then be replaced with properly compacted fill.
- 5) Excavations are susceptible to caving. Provisions shall be made to protect the excavations from cave-ins.

R. T. Tanaka Engineers, Inc. September 24, 1996 Page Two

Details of the findings and recommendations are presented in the attached report.

This investigation was made in accordance with generally accepted engineering procedures and included such field and laboratory test considered necessary for the project. In the opinion of the undersigned, the accompanying report has been substantiated by mathematical data in conformity with generally accepted engineering principles and presents fairly the design information requested by your organization. No other warranty is either expressed or given.

Respectfully submitted,

SOILS INTERNATIONAL

Lawrence S. Shinsato, P.E.

Vice-President

LSS:BHH:bh

This work was prepared by me or under my supervision.

LICENSET PROFESSIO

## TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
SCOPE OF WORK	1
PLANNED DEVELOPMENT	1
SITE CONDITIONS	2 2 2 3
CONCLUSIONS AND RECOMMENDATIONS  General	4 4 4 6 6 7 7
INSPECTION	10
REMARKS	10
VICINITY MAP Plate	1
PLOT PLAN Plate	2
APPENDIX Field Investigation Laboratory Testing Log of Test Boring	

#### INTRODUCTION

This investigation was made for the purpose of obtaining information on the subsurface conditions from which to base recommendations for the proposed Waiohuli Subdivision Reservoir for Service Zone 2 to be located in Kula, Maui, Hawaii. The location of the site, relative to the existing streets and landmarks, is shown on the Vicinity Map, Plate 1.

#### SCOPE OF WORK

The services included drilling 1 test boring to a depth of 19 feet below existing grade, obtaining samples of the underlying soils, conducting laboratory tests on representative samples, and performing an engineering analysis to determine foundation design parameters. The following information is provided for use by the Architect and/or Engineer:

- 1. General subsurface conditions, as disclosed by the boring.
- 2. Physical characteristics of the soils encountered.
- 3. Recommendations for foundation design, including bearing values, embedment depth and estimated settlement.
- 4. Recommendations for placement of fill and backfill.
- 5. Special design considerations.

#### PLANNED DEVELOPMENT

From the information provided, the project will consist of constructing a 44-foot diameter, 0.2 million gallon water reservoir

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for a subdivision in Service Zone 2. The Grading and Drainage Plan indicate the existing surface elevations at the reservoir site to range from +2998' at the westerly side of the proposed reservoir to +3010' at the easterly side. Finished floor elevation is at +3000'.

#### SITE CONDITIONS

#### Surface

The property is located at the northwest side of Kula Highway, across Lepelepe Place. The project site is located near the highway and is heavily vegetated with trees and plants.

#### Subsurface

The subsurface conditions at the site was explored by drilling 1 test boring to a depth of 19 feet below existing grade at the location shown on the Plot Plan, Plate 2. A detailed log of the boring is presented in the Appendix to this report.

The boring revealed yellow brown and gray silty GRAVEL (CLINKERS) to a depth of 8.5 feet, followed by hard, gray BASALTIC ROCK to the final depth of the boring at 19 feet. The GRAVEL consistency was loose from ground surface to a depth of 1.5 feet, moderately dense from 1.5 to 3.5 feet, then dense to 8.5 feet.

Groundwater was not encountered in the boring at the time of the field investigation.

From the USDA Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii", the site is located in an area classified as Kula loam, 12 to 20 percent slopes (KxD). This series consists of well-drained soils on uplands that developed in volcanic ash (USDA, 1972, Plate 108, pp. 76 to 77).

#### Geology

The site is located on the southwesterly flank of the Haleakala Volcano. The development of the island above sea level is believed to have occurred between later Pliocene and Pleistocene time (approximately 1 and 12 million years ago). Haleakala was built over three rift zones that trend north, southwest and east. These rift zones are studded with large cinder cones. The lava flows making up the main mass of the mountain is known as the Honomanu volcanic series which consist of thin-bedded pahoehoe and aa lava flows.

Above the Hononamu volcanics is the Kula volcanic series which consist of thicker andesitic aa flows. Most of the lava flows dip about 12 degrees. Along the southwest and east rift zones only, the volcano is capped with the Hana volcanic series (Stearns, 1966).

#### CONCLUSIONS AND RECOMMENDATIONS

#### General

Based on the findings and observations of this investigation, the reservoir foundations may bear on the underlying dense silty GRAVEL, underlying hard BASALTIC ROCK, or properly compacted fill.

#### Special Consideration

- 1) The upper loose to moderately dense silty GRAVEL (to a depth of 3.5 feet inthe boring) is not suitable bearing material. Foundations should be either deepened to bear on the dense silty GRAVEL or hard BASALTIC ROCK, or the loose to moderately dense material shall be removed and replaced with properly compacted fill.
- 2) Excavations are susceptible to caving. Provisions shall be made to protect the excavations from cave-ins.
- 3) The underlying ROCK is hard and will be difficult to excavate.

#### Foundation Design

An allowable soil bearing value of 3,000 pounds per square foot may be used for footings that bear on the underlying dense silty GRAVEL, or properly compacted fill. The minimum footing embedment depth shall be 18 inches below lowest adjacent grade.

An allowable rock bearing value of 20,000 pounds per square foot may be used for footings bearing on the underlying hard BASALTIC ROCK.

For footings located adjacent to utility trenches, the bottom of the footing shall be deepened below a 1 horizontal to 1 vertical plane projected upwards from the edge of the utility trench.

For footings located on or adjacent to slopes, the footing shall be deepened such that there is a minimum horizontal distance of 5 feet from the edge of the footing to the slope face.

Where new footings are to be located adjacent to retaining walls or other structural elements which are not designed for surcharge loading, the new footing shall be deepened below a 45 degree plane projected upwards from the adjacent structure.

The bearing values are for dead plus live loads and may be increased by one-third for momentary loads due to wind or seismic forces. If any footing is eccentrically loaded, the maximum edge pressure shall not exceed the bearing pressure for permanent or for momentary loads.

All loose and disturbed soil at the bottom of footing excavations shall be removed to firm soil or the disturbed soil shall be compacted prior to laying of steel or pouring of concrete.

Under the fully applied recommended bearing pressure, it is estimated that the total settlement of the foundation will be less than 1/2 inch.

Differential settlement between footings will vary according to the size and bearing pressure of the footing.

## Lateral Resistance

For resistance of lateral loads, such as wind or seismic forces, an allowable passive earth resistance equivalent to that exerted by a fluid weighing 300 pounds per cubic foot may be used for footings, or other structural elements, provided the vertical surface is in direct contact with undisturbed soil or properly compacted fill.

Frictional resistance between footings and slabs, and the underlying soils may be assumed as 0.4 times the dead load for the on-site dense silty GRAVEL or properly compacted structural fill, and 0.7 times the dead load for the underlying hard BASALTIC ROCK.

Lateral resistance and friction may be combined.

## Slab-on-Grade

For design of concrete slabs-on-grade, a modulus of subgrade reaction of 300 pci may be used for the on-site soils, or imported

# CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

An allowable rock bearing value of 20,000 pounds per square foot may be used for footings bearing on the underlying hard BASALTIC ROCK.

For footings located adjacent to utility trenches, the bottom of the footing shall be deepened below a 1 horizontal to 1 vertical plane projected upwards from the edge of the utility trench.

For footings located on or adjacent to slopes, the footing shall be deepened such that there is a minimum horizontal distance of 5 feet from the edge of the footing to the slope face.

Where new footings are to be located adjacent to retaining walls or other structural elements which are not designed for surcharge loading, the new footing shall be deepened below a 45 degree plane projected upwards from the adjacent structure.

The bearing values are for dead plus live loads and may be increased by one-third for momentary loads due to wind or seismic forces. If any footing is eccentrically loaded, the maximum edge pressure shall not exceed the bearing pressure for permanent or for momentary loads.

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Frictional resistance between footings and slabs, and the underlying soils may be assumed as 0.4 times the dead load for the on-site dense silty GRAVEL or properly compacted structural fill, and 0.7 times the dead load for the underlying hard BASALTIC ROCK.

Lateral resistance and friction may be combined.

### Slab-on-Grade

San Stranger Control of the Control

For design of concrete slabs-on-grade, a modulus of subgrade reaction of 300 pci may be used for the on-site soils, or imported

select granular material (see Site Preparation and Grading section to this report).

It is recommended that the subgrade soil be prepared in accordance with the Site Preparation and Grading section to this report.

#### Slopes

Permanent fill and cut slopes for soil type materials shall not exceed 2 horizontal to 1 vertical.

Cut slopes into the underlying hard BASALTIC ROCK may be made at 1 horizontal to 2 vertical.

Exposed soil slopes shall be covered as soon as practical after construction to minimize erosion.

Fill slopes shall be constructed by either overfilling and cutting back to compacted soil, or the slope shall be track-rolled.

#### Site Preparation and Grading

It is recommended that the site be prepared in the following manner:

In areas to receive fill and beneath structural and pavement areas, all vegetation, weeds, brush, roots, stumps, rubbish, debris, and other deleterious material shall be removed from the site.

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If foundations are not deepened to bear on the underlying dense silty GRAVEL or hard BASALTIC ROCK, the upper loose to moderately dense silty GRAVEL shall be removed to the dense GRAVEL layer.

- 2. The exposed surface shall then be scarified to a depth of 6 inches, moisture conditioned to near optimum moisture content (ASTM D1557-91), and then compacted to the degree of compaction indicated below. If encountered, loose or soft areas shall be removed to firm material and the resulting depression shall be filled with properly compacted fill.
- 3. Fill and backfill material shall consist of soil which is free of organics, debris and expansive clayey material. The material shall be less than 3 inches in greatest dimension. Imported structural fill and backfill material shall contain no more than 20% fines (passing the #200 sieve).

The on-site silty GRAVEL is suitable for use as fill and backfill.

4. Fill and backfill shall be placed in lifts not exceeding 8 inches in loose thickness. Prior to placing, the material shall be aerated or moistened to near optimum moisture content (ASTM D1557-91 test procedure).

Where fill is placed on existing ground that is steeper than 5 horizontal to 1 vertical, the existing ground surface shall be benched into firm soil as the fill is placed.

- 5. In the upper 2 feet from finished subgrade, each layer of structural fill and backfill (under and 3 feet beyond the edges of structures and pavements) shall be thoroughly compacted to at least 95 percent of the maximum dry density (ASTM D1557-91). All other fill and backfill shall be compacted to at least 90 percent relative compaction (ASTM D1557-91).
- 6. Drainage shall be provided to minimize ponding of water. Ponded areas shall be drained immediately or water pumped out without damaging adjacent structures and property. If water accumulation softens the subgrade materials, the affected soils shall be removed and replaced with properly compacted fill.
- 7. Footing excavations shall be cleaned of loose material that has fallen into the excavation prior to pouring of concrete.

It is particularly important to see that all backfill soils are properly compacted especially if these are designed to resist lateral forces.

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#### INSPECTION

During the progress of construction, so as to evaluate compliance with the design concepts, specifications and recommendations contained in this report, a representative from this office should be present to observe the following operations:

- 1. Site preparation.
- 2. Placement of fill and backfill.
- 3. Footing excavations.

#### REMARKS

The conclusions and recommendations contained herein are based on the findings and observations made at the boring location. For the purpose of providing geotechnical design information, conditions beyond the boring are assumed to be similar to those found at the boring location. If conditions are encountered during construction which appear to differ from those disclosed by the boring, this office shall be notified so as to consider the need for modifications.

This report has been prepared for the exclusive use of R. T. Tanaka Engineers, Inc., and their respective design consultants. It shall not be used by or transferred to any other party or to another project without the consent and/or thorough review by this facility. Should the project be delayed beyond the period of one year from the

date of this report, the report shall be reviewed relative to possible changed conditions.

Samples obtained in this investigation will deteriorate with time and will be unsuitable for further laboratory tests within one (1) month from the date of this report. Unless otherwise advised, the samples will be discarded at that time.

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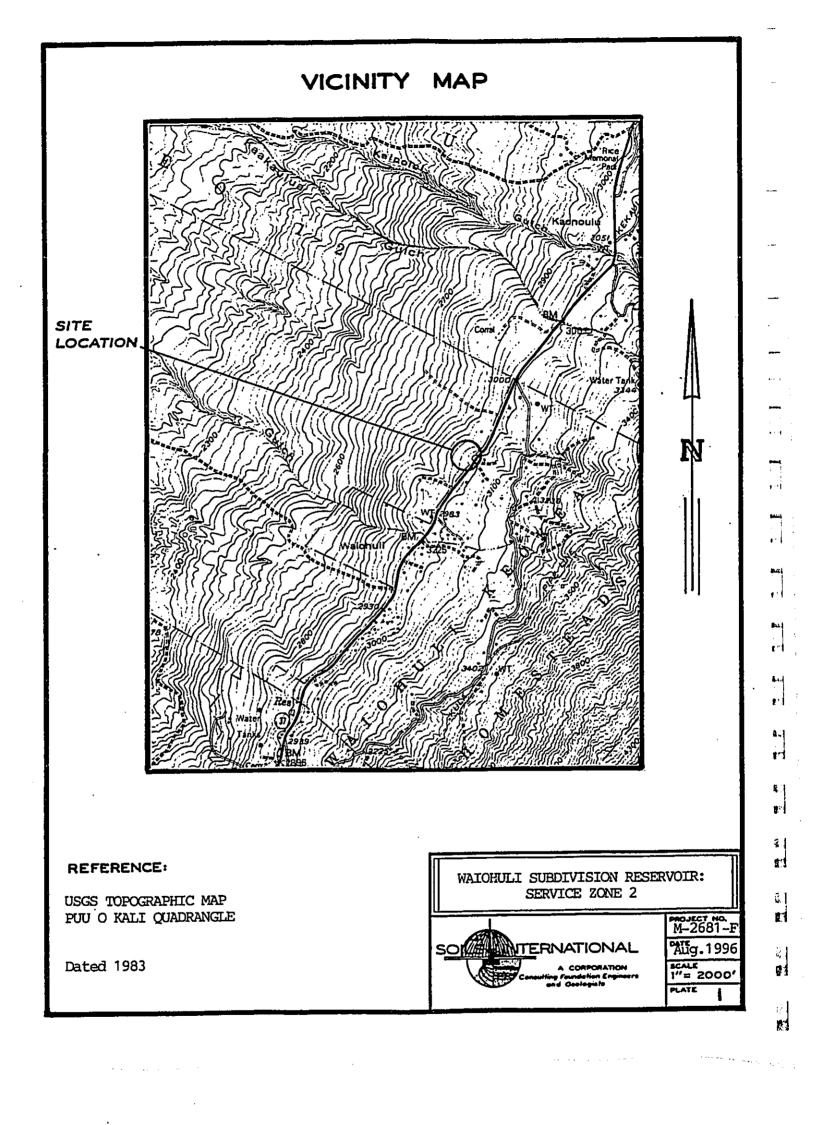
The following are included and complete this report:

Vicinity Map ------ Plate 1

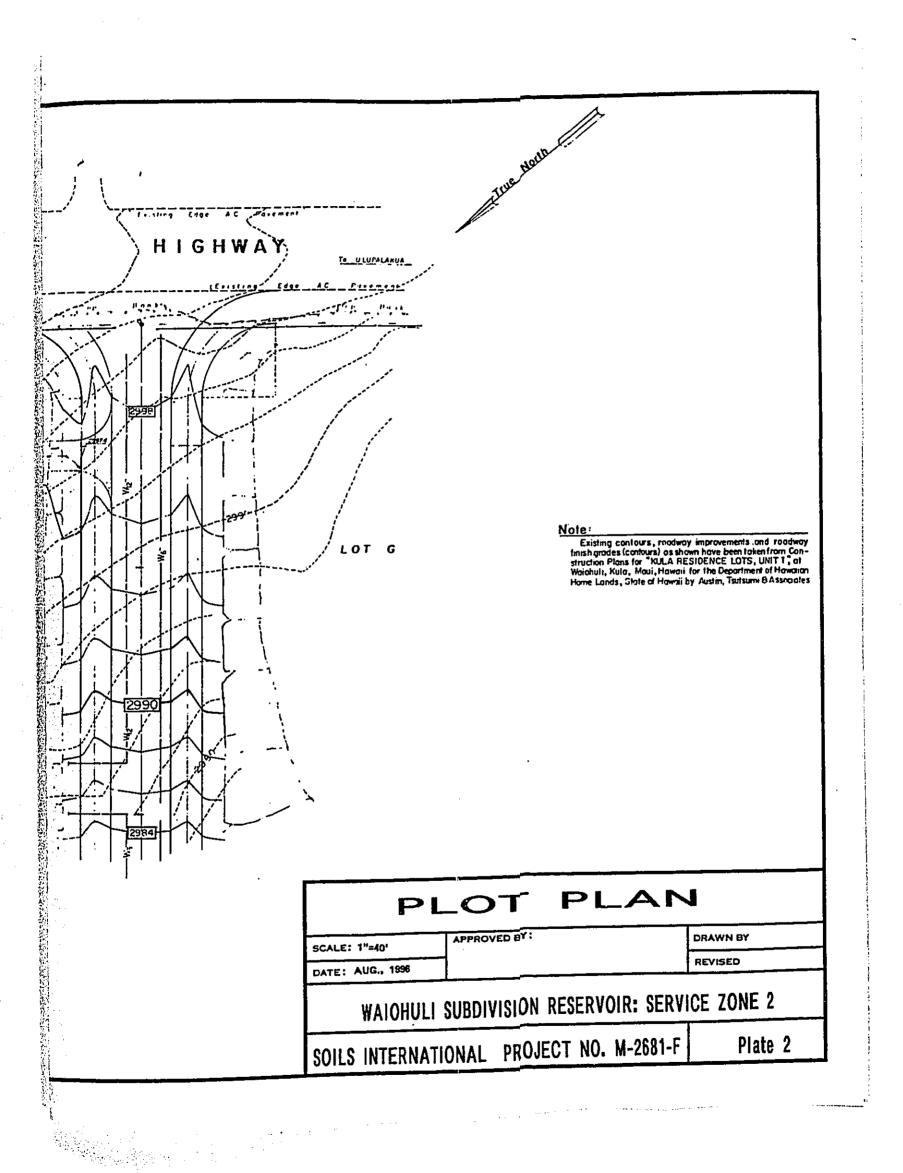
Plot Plan ----- Plate 2

Appendix

Field Investigation
Laboratory Testing
Log of Boring



LEPELEPE PLACE KULA BORING LOT H Note: Contractor shall not over excavate Tank Site Area. Any over excavation shall be filled with Class. "Concrete All concrete foundations shall rest in firm undistricted soil GRADING & DRAINAGE PLAN SERVICE ZONE No. 2 0.20 MG RESERVOIR 11 X 17 PRINTED ON NO. 1000H CLEARPRINT .



#### **APPENDIX**

FIELD INVESTIGATION AND LABORATORY TESTING

#### FIELD INVESTIGATION

#### **General**

The field investigation consisted of performing explorations at the locations shown on the Plot Plan. The method used for the exploratory work is shown on the respective exploration log. A description of the various method or methods used is presented below.

#### Test Borings Using Truck-Mounted Drilling Equipment

Truck-mounted borings are drilled using a gas-powered drilling rig. The hole is advanced using continuous flight augers, wash boring and/or NX coring.

Auger drilling is used in soils where caving does not occur. The augers are 4-1/2 inch diameter continuous helical flight augers with the lead auger having a head equipped with changeable cutting teeth. Soil cuttings are brought to the surface by the continuous flights. After the bore hole is advanced to the required depth and cleaned of cuttings by additional rotation of the augers, the augers are retracted for soil sampling or in-situ testing.

In soils where caving of the bore hole occurs, the hole is advanced by wash boring or hollow-stem augering. Wash boring consists of advancing steel casing by rotary action and water pressure to flush the soil from the casing. The lead section of the casing is equipped with a carbide or diamond casing bit. After the casing has been advanced to the required depth, soil samples are obtained through the inside of the casing. Hollow-stem drilling consists of advancing the hole with 7-5/8 inch outside diameter and 4-1/4 inch inside diameter augers. The leading drill bit is connected to drilling rods through the central portion of the auger. At the required sampling depth, the interior drill rods and lead bit are removed, and the soil sample is taken by driving a sampler through the "hollow" section of the augers.

Coring is used for hard formations such as rock, coral or boulders. The core barrel, consisting of a 5-foot long double tube, hardened steel barrel with either a carbide or diamond bit, is attached to drilling rods and set on the hard formation. The core barrel is advanced through the formation by rotation of the core barrel. Water is used to flush out the cuttings. Upon completion of the core run, the sample is removed from the core barrel and inspected. The total core recovery length and the sum of all intact pieces over 4-inch in length are measured. The length of core recovery divided by the length of the core run is the recovery ratio. The combined length of the 4-inch or longer pieces divided by the length of core run is the Rock Quality Designation (RQD). The values provide an indication of the quality of the formation.

#### Test Borings Using Portable Drilling Equipment

In areas inaccessible to truck-mounted equipment, portable drilling equipment is used to drill the test boring. The boring is advanced by either 1) continuous drive sampling or by 2) using a small gas-powered drill rig with continuous flight augers, wash boring or NX coring.

Soil samples are obtained with a tripod and cathead assembly using soil sampling methods described below.

#### Test Pits Using Excavators/Hopto

Test pits are excavated using a hopto or backhoe. Material excavated from the pit and the sides and bottom of the pit are visually inspected and a continuous log of the hole is kept.

#### Explorations Using Hand Tools

In inaccessible areas requiring only shallow explorations, borings and test pits are made using hand equipment. Borings are drilled using hand augers. Test pits

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are excavated using hand tools. Cuttings from the boring and/or pit are inspected and visually classified.

#### Soil Sampling

Relatively undisturbed samples of the underlying soils are obtained from borings by driving a sampling tube into the subsurface material using a 140-pound safety hammer falling from a height of 30 inches. Ring samples are obtained using a 3-inch outside diameter, 2.5 inch inside diameter steel sampling tube with an interior lining of one-inch long, thin brass rings. The tube is driven approximately 18 inches into the soil and a section of the central portion is placed in a close fitting waterproof container in order to retain field conditions until completion of the laboratory tests. Standard Penetration Test (SPT) values and disturbed soil samples are obtained with a 2-inch (outside diameter) split-barrel sampler instead of the 3-inch sampler. The number of blows required to drive the sampler into the ground is recorded at 6-inch intervals. The blow count for the last 12-inches is shown on the boring logs.

From test pit excavations, undisturbed samples are retained from cohesive type soil formations and disturbed bulk samples are retained from friable and cohesionless soil formations.

The soil samples are visually classified in the field using the Unified Soil Classification System. Samples are packed in moisture proof containers and transported to the laboratory for testing.

#### LABORATORY TESTING

#### <u>General</u>

Laboratory tests are performed on various soil samples to determine their engineering properties. Description of the various tests are listed below.

## Unit Weight and Moisture Content

The in-place moisture content and unit weight of the samples are used to correlate similar soils at various depths. The sample is weighed, the volume determined, and a portion of the sample is placed in the oven. After oven-drying, the sample is again weighed to determine the moisture loss. The data is used to determine the wet-density, dry-density and in-place moisture content.

#### Direct Shear

Direct shear tests are performed to determine the strength characteristics of the representative soil samples. The test consists of placing the sample into a shear box, applying a normal load and then shearing the sample at a constant rate of strain. The shearing resistance is recorded at various rates of strain. By varying the normal load, the angle of internal friction and cohesion can be determined.

#### Consolidation Test

Consolidation tests are performed to obtain data from which time rates of consolidation and amounts of settlement may be estimated. The test is performed by placing a specimen in a consolidation apparatus. Loads are applied in increments to the circular face of a one (1) inch high sample. Deformation or changes in thickness of the specimen are recorded at selected time intervals. Water is introduced to or allowed to drain from the sample through porous disks placed against the top and bottom faces of the specimen. The data is then used to plot a stress-volume strain curve which is used in estimating settlement.

#### Expansion Test - Ring Swell

Expansion tests are performed on clayey soils to determine the expansion potential of the sample. The test is performed using either a remolded or relatively undisturbed field sample. The sample is placed in an expansion apparatus with a one (1) psi surcharge. The sample is saturated and the change in vertical height is recorded. The initial moisture content is varied (field moisture or air-dried) to determine the variation in expansion potential with moisture changes. The data is used to determine the expansion potential of the soil.

#### Classification Tests

The soil samples are classified using the Unified Soil Classification System. Classification tests include sieve and hydrometer analysis to determine grain size distribution, and Atterberg Limits to determine the liquid limit, plastic limit and plasticity index.

#### California Bearing Ratio Test

California Bearing Ratio (CBR) tests are performed on materials to determine the bearing strength of the soil for determination of pavement sections. The sample is compacted into a 6-inch diameter mold in 5 equal layers. Each layer is compacted with a 10-pound hammer falling from a height of 18-inches, with each layer receiving 56 blows. The mold is then placed in a water bath for 4-days and the vertical swell is measured under a surcharge weight of 10 pounds. After the soaking period, the sample is placed in a CBR apparatus that has a 3-square inch penetrometer. The penetrometer is pressed vertically into the soil at constant strain and the loads required to press the penetrometer are recorded. A plot of the load-strain relationship is made to determine the CBR value.

## Maximum Dry Density/Optimum Moisture Content

The maximum dry density and optimum moisture content of the material is determined in accordance with the ASTM D1557-78 test procedure. The sample is compacted into a mold in 5 equal layers using a 10 pound hammer falling from a height of 18 inches. The diameter of the mold is either 4-inches or 6-inches depending on the proportion of gravel in the sample. The sample is compacted at various moisture contents to develop a compaction curve for the soil. The curve is usually bell-shaped with a peak indicating the maximum dry density and optimum moisture content.

#### Penetrometer Test

Penetrometer tests are performed on clayey soils to determine the consistency of the material and an approximate value of the unconfined compressive strength.

#### <u>Torvane</u>

Torvane tests are used to determine the approximate undrained shear strength of clayey soils. The torvane apparatus consists of a torque device with a small diameter plate that has vanes situated perpendicular to the plate. The vanes are pushed into the soil and torque is applied until failure occurs. The torque required to cause failure is converted to approximate undrained strength of the soil.

LO	G OF	ВО	RING NO. 1		ELEVATION: +3002'									
EQUIPMENT USED: SIMCO 2400 Drilling Rig					DEPTH OF BORING (FT.): 19									
DATE DRILLED: 8-8-96						DEPTH TO GROUNDWATER: N/A								
ОЕРТН (FT.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	SAMPLE	BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT (% OF DRY WT.)	PENETROMETER (TSF)	TORVANE STRENGTH (TSF)		
2-		GM	silty GRAVEL (CLINKERS); some sand, few roots  Atterberg Limits at 2' LL=90, Pl=3 cobble at 3' more gravel, few fines		7/6" 35 5/0" 28/6"	yellow brown and gray	sl. moist	mod. dense	73 81	21.1	,			
6-				1	70/9"				74	14.8				
10 - 12 - 14 - 14 - 18 - 18 - 18 - 18 - 18 - 18		(RX)	BASALTIC ROCK; vesicular, fractured Coring Times 9-19' 5.42 min - 1st foot 4.50 min - 2nd foot 6.50 min - 3rd foot 4.33 min - 4th foot 7.50 min - 5th foot 5.33 min - 6th foot 8.50 min - 7th foot 2.33 min - 8th foot 2.50 min - 9th foot 3.17 min - 10th foot  Recovered = 9.00 feet ROD Length = 6.42 feet ROD (%) = 64%		10/0*	gray		hard rock						
o –			END OF BORING											
PROJECT NAME: WAIOHULI SUBDIVISION											PLA	TE		
RESERVOIR SZ-2  PROJECT NO.: M-2681-F						S	O	TERNA	TION: A CORPORI Inical Consti	ATION	3			

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SOILS INVESTIGATION REPORT SERVICE ZONE NO. 3

## REPORT SOILS INVESTIGATION

PROPOSED RESERVOIR
WAIOHULI SUBDIVISION SERVICE ZONE 3
KULA, MAUI, HAWAII

for

R. T. TANAKA ENGINEERS, INC. Engineers

Project No. H-2682-F October 28, 1996



99-1255 Waiua Place Aiea, Hawaii 96701 Phone: (808) 488-0433 Fax: (808) 488-9535

335 Hoohana Street Building 7, Unit O Kahului, Maui, Hawaii 96732 Phone: (808) 877-3789 Fax: (808) 871-1592

99-1255 WAIUA PLACE, AIEA, HAWAII 96701

(808) 488-0433 FAX (808) 488-9535

**R**-7

October 28, 1996 Project No. M-2682-F

R. T. Tanaka Engineers, Inc. 871 Kolu Street, Suite 201 Wailuku, Maui, Hawaii 96793

Attention:

Mr. Kirk Tanaka, P.E.

#### Gentlemen:

The attached report presents the results of a soils investigation for the proposed Waiohuli Subdivision Reservoir at Service Zone 3 in Kula, Maui, Hawaii.

A summary of the findings is as follows:

- The subsurface conditions at the site were explored by drilling 1 test boring to a depth of 22.5 feet below existing grade. The boring revealed soft to moderately stiff, light brown clayey SILT to a depth of 2.5 feet, followed by very stiff, brown to light brown clayey SILT to a depth of 7.5 feet. Below the clayey SILT, moderately hard, gray BASALTIC ROCK was found to a depth of 10 feet, followed by dense, gray CLINKERS to a depth of 19 feet. Below the CLINKERS, soft, gray BASALTIC ROCK was found to the final depth of the boring at 22.5 feet.
- 2) Groundwater was not encountered in the boring at the time of the field investigation.
- Based on the findings and observations of this investigation, the reservoir foundation may bear on the on-site very stiff clayey SILT, underlying dense CLINKERS, underlying hard BASALTIC ROCK, or properly compacted fill.
- 4) The upper soft to moderately stiff clayey SILT is not suitable bearing material. This material shall be removed and if necessary to obtain finished subgrade elevation shall be replaced with properly compacted fill. The removed soft to moderately stiff soil will not be suitable for reuse as compacted fill due to high existing moisture content.

R. T. Tanaka Engineers, Inc. October 28, 1996 Page Two

5) A layer of moderately hard rock was encountered in the boring at a depth of 7.5 feet. Excavation into this material will be difficult to accomplish.

Details of the findings and recommendations are presented in the attached report.

This investigation was made in accordance with generally accepted engineering procedures and included such field and laboratory test considered necessary for the project. In the opinion of the undersigned, the accompanying report has been substantiated by mathematical data in conformity with generally accepted engineering principles and presents fairly the design information requested by your organization. No other warranty is either expressed or given.

Respectfully submitted,

SOILS INTERNATIONAL

Lawrence S. Shinsato, P.E.

Vice-President

LSS:BHH:bh

This work was prepared by me or under my supervision.

NCE S. SHIN

LICENSED PROFESSIONAL ENGINEER No. 4169-C

## TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
SCOPE OF WORK	1
PLANNED DEVELOPMENT	1
SITE CONDITIONS	2
Subsurface	2 2
Geology	. 3
CONCLUSIONS AND RECOMMENDATIONS	4 4
Special Considerations	4
Foundation Design	5
Lateral Resistance	6 6
Slab-on Grade	7
Slopes	7
Site Preparation and Grading	8
INSPECTION	10
REMARKS	11
VICINITY MAP Plate	1
PLOT PLAN Plate	2
APPENDIX	
Field Investigation	
Laboratory Testing Log of Boring	
Results of Laboratory Testing	

#### INTRODUCTION

This investigation was made for the purpose of obtaining information on the subsurface conditions from which to base recommendations for the proposed Waiohuli Subdivision Reservoir for Service Zone 3 to be located in Kula, Maui, Hawaii. The location of the site, relative to the existing streets and landmarks, is shown on the Vicinity Map, Plate 1.

#### SCOPE OF WORK

The services included drilling 1 test boring to a depth of 22.5 feet below existing grade, obtaining samples of the underlying soils, conducting laboratory tests on representative samples, and performing an engineering analysis to determine foundation design parameters. The following information is provided for use by the Architect and/or Engineer:

- 1. General subsurface conditions, as disclosed by the boring.
- 2. Physical characteristics of the soils encountered.
- 3. Recommendations for foundation design, including bearing values, embedment depth and estimated settlement.
- 4. Recommendations for placement of fill and backfill.
- 5. Special design considerations.

#### PLANNED DEVELOPMENT

From the information provided, the project will consist of constructing a 68-foot diameter, 0.5 million gallon water reservoir

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for a subdivision in Service Zone 3. Finished floor elevation for the reservoir will be at +2750.00.

#### SITE CONDITIONS

#### Surface

The property is located at the northwest side of Kula Highway, about 1,500 feet from the highway. The project site is heavily vegetated with trees and plants.

Existing surface elevations (according to the Grading and Drainage Plan provided) range from approximately +2748' at the west side of the proposed reservoir to +2766' at the east side of the site.

#### Subsurface

The subsurface conditions at the site was explored by drilling 1 test boring to a depth of 22.5 feet below existing grade at the location shown on the Plot Plan, Plate 2. A detailed log of the boring is presented in the Appendix to this report.

The boring revealed soft to moderately stiff, light brown clayey SILT to a depth of 2.5 feet, followed by very stiff, brown to light brown clayey SILT to a depth of 7.5 feet. Below the clayey SILT, moderately hard, gray BASALTIC ROCK was found to a depth of 10 feet, followed by dense, gray CLINKERS to a depth of 19 feet. Below the

CLINKERS, soft, gray BASALTIC ROCK was found to the final depth of the boring at 22.5 feet.

Groundwater was not encountered in the boring at the time of the field investigation.

From the USDA Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii", the site is located in an area classified as Kula cobbly loam, 12 to 20 percent slopes (KxaD). This series consists of well-drained soils on uplands that developed in volcanic ash (USDA, 1972, Plate 108, p. 59).

#### Geology

The site is located on the southwesterly flank of the Haleakala Volcano. The development of the island above sea level is believed to have occurred between later Pliocene and Pleistocene time (approximately 1 and 12 million years ago). Haleakala was built over three rift zones that trend north, southwest and east. These rift zones are studded with large cinder cones. The lava flows making up the main mass of the mountain is known as the Honomanu volcanic series which consist of thin-bedded pahoehoe and aa lava flows.

Above the Hononamu volcanics is the Kula volcanic series which consist of thicker andesitic aa flows. Most of the lava flows dip about 12 degrees. Along the southwest and east rift zones only, the volcano is capped with the Hana volcanic series (Stearns, 1966).

#### CONCLUSIONS AND RECOMMENDATIONS

#### General

Based on the findings and observations of this investigation, the reservoir foundation should bear on the on-site very stiff clayey SILT, underlying hard ROCK, dense CLINKERS, or on properly compacted fill.

#### Special Consideration

- The upper soft to moderately stiff clayey SILT is not suitable bearing material. This material shall be removed and if necessary to obtain finished subgrade elevation shall be replaced with properly compacted fill. The removed soft to moderately stiff soil will not be suitable for reuse as compacted fill due to high existing moisture content.
- 2) A layer of moderately hard rock was encountered in the boring at a depth of 7.5 feet. Excavation into this material will be difficult to accomplish.

#### Foundation Design

An allowable soil bearing value of 2,500 pounds per square foot may be used for footings bearing on the on-site very stiff clayey SILT or on properly compacted fill. The minimum footing embedment depth shall be 18 inches below lowest adjacent finished grade.

An allowable soil bearing value of 6,000 pounds per square foot may be used for footings bearing on the on-site underlying dense CLINKERS, or soft to moderately hard BASALTIC ROCK. The minimum footing embedment depth shall be 12 inches below lowest adjacent finished grade.

For footings located adjacent to utility trenches, the bottom of the footing shall be deepened below a 1 horizontal to 1 vertical plane projected upwards from the edge of the utility trench.

For footings located on or adjacent to slopes, the footing shall be deepened such that there is a minimum horizontal distance of 5 feet from the edge of the footing to the slope face.

Where new footings are to be located adjacent to retaining walls or other structural elements which are not designed for surcharge loading, the new footing shall be deepened below a 45 degree plane projected upwards from the adjacent structure.

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The bearing values are for dead plus live loads and may be increased by one-third for momentary loads due to wind or seismic forces. If any footing is eccentrically loaded, the maximum edge pressure shall not exceed the bearing pressure for permanent or for momentary loads.

All loose and disturbed soil at the bottom of footing excavations shall be removed to firm soil or the disturbed soil shall be compacted prior to laying of steel or pouring of concrete.

## Settlement

Under the fully applied recommended bearing pressure, it is estimated that the total settlement of foundation will be less than 1/2 inch.

Differential settlement between footings will vary according to the size and bearing pressure of the footing.

## Lateral Resistance

For resistance of lateral loads, such as wind or seismic forces, an allowable passive earth resistance equivalent to that exerted by a fluid weighing 300 pounds per cubic foot may be used for footings, or other structural elements, provided the vertical surface is in direct contact with undisturbed soil or properly compacted fill.

Frictional resistance between footings and slabs, and the underlying soils may be assumed as 0.4 times the dead load for the on-site materials or properly compacted structural fill.

Lateral resistance and friction may be combined.

## Slab-on-Grade

For design of concrete slabs-on-grade, a modulus of subgrade reaction of 150 pci may be used for the on-site clayey SILT and 300 pci for imported select granular material or the underlying CLINKERS and ROCK (see Site Preparation and Grading section to this report).

It is recommended that the subgrade soil be prepared in accordance with the Site Preparation and Grading section to this report.

#### Slopes

Permanent fill and cut slopes of soil type materials shall not exceed 2 horizontal to 1 vertical.

Cut slopes into the underlying CLINKERS and BASALTIC ROCK may be made at 1 horizontal to 1 vertical.

Exposed soil slopes shall be covered as soon as practical after construction to minimize erosion.

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Fill slopes shall be constructed by either overfilling and cutting back to compacted soil, or the slope shall be track-rolled.

## Site Preparation and Grading

It is recommended that the site be prepared in the following manner:

 In areas to receive fill and beneath structural and pavement areas, all vegetation, weeds, brush, roots, stumps, rubbish, debris, and other deleterious material shall be removed from the site.

The existing soft to moderately stiff clayey SILT shall be removed from beneath the structure and if necessary to obtain finished grade, shall be replaced with properly compacted fill.

- 2. The exposed surface (except ROCK and CLINKERS) shall then be scarified to a depth of 6 inches, moisture conditioned to near optimum moisture content (ASTM D1557-91), and then compacted to the degree of compaction indicated below. If encountered, loose or soft areas shall be removed to firm material and the resulting depression shall be filled with properly compacted fill.
- 3. Fill and backfill material shall consist of soil which is free of organics, debris and expansive clayey material. The material shall be less than 3 inches in greatest dimension.

Imported structural fill and backfill material shall contain no more than 20% fines (passing the #200 sieve).

The on-site clayey SILT is <u>not</u> suitable for use as fill and backfill.

Excavated ROCK and CLINKER material which can be crushed to meet the maximum particle size requirement may be used as fill. In the case of "bony" or coarse material, sufficient fines or earth filler shall be mixed with the coarse material to fill the interstices between the larger particles.

4. Fill and backfill shall be placed in lifts not exceeding 8 inches in loose thickness. Prior to placing, the material shall be aerated or moistened to near optimum moisture content (ASTM D1557-91 test procedure).

Where fill is placed on existing ground that is steeper than 5 horizontal to 1 vertical, the existing ground surface shall be benched into firm soil as the fill is placed.

5. In the upper 2 feet from finished subgrade, each layer of structural fill and backfill (under and 3 feet beyond the edges of structures and pavements) shall be thoroughly compacted to at least 95 percent of the maximum dry density (ASTM D1557-91).

22

All other fill and backfill shall be compacted to at least 90 percent relative compaction (ASTM D1557-91).

- 6. Drainage shall be provided to minimize ponding of water.

  Ponded areas shall be drained immediately or water pumped out without damaging adjacent structures and property. If water accumulation softens the subgrade materials, the affected soils shall be removed and replaced with properly compacted fill.
- 7. Footing excavations shall be cleaned of loose material that has fallen into the excavation prior to pouring of concrete.

It is particularly important to see that all backfill soils are properly compacted especially if these are designed to resist lateral forces.

#### INSPECTION

During the progress of construction, so as to evaluate compliance with the design concepts, specifications and recommendations contained in this report, a representative from this office should be present to observe the following operations:

- Site preparation.
- 2. Placement of fill and backfill.
- 3. Footing excavations.

#### REMARKS

The conclusions and recommendations contained herein are based on the findings and observations made at the boring location. For the purpose of providing geotechnical design information, conditions beyond the boring are assumed to be similar to those found in the boring location. If conditions are encountered during construction which appear to differ from those disclosed by the boring, this office shall be notified so as to consider the need for modifications.

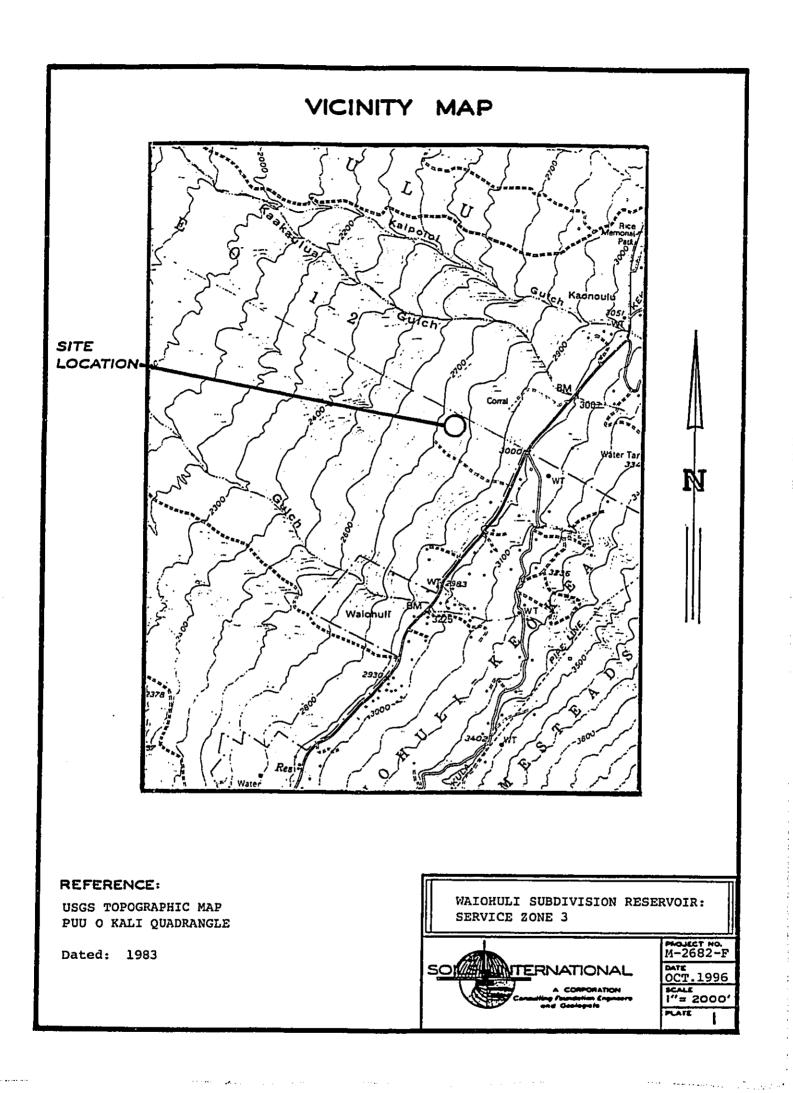
This report has been prepared for the exclusive use of R. T. Tanaka Engineers, Inc., and their respective design consultants. It shall not be used by or transferred to any other party or to another project without the consent and/or thorough review by this facility. Should the project be delayed beyond the period of one year from the date of this report, the report shall be reviewed relative to possible changed conditions.

Samples obtained in this investigation will deteriorate with time and will be unsuitable for further laboratory tests within one (1) month from the date of this report. Unless otherwise advised, the samples will be discarded at that time.

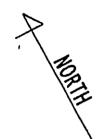
The	following are included and complete this report:		
	Vicinity Map	Plate	<b>a</b> 1
	Plot Plan	Plate	2
	Appendix		
	Field Investigation		
	Laboratory Testing		1
	Log of Boring		
	Results of Laboratory Testing		

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**GRADING** SERVICE ZONE 0:50 MG RESERVI TANK DIA. : 68.0' 71.33'



#### GRADING & DRAINAGE PLAN

SERVICE ZONE No. 3 0.50 MG RESERVOIR TANK DIA. 68.0 ± 1.D. 71.33 0.D.

PLOT PLAN						
SCALE: 1"=40'	APPROVED BY:	DRAWN BY				
DATE:OCTOBER, 1996	i	REVISED				
WAIOHULI S	SUBDIVISION RESERVO	OIR: SERVICE ZONE 3				
SOILS INTERNAT	IONAL PROJECT NO.	M-2682-F Plate 2				

APPENDIX FIELD INVESTIGATION AND LABORATORY TESTING

## FIELD INVESTIGATION

#### General

The field investigation consisted of performing explorations at the locations shown on the Plot Plan. The method used for the exploratory work is shown on the respective exploration log. A description of the various method or methods used is presented below.

# Test Borings Using Truck-Mounted Drilling Equipment

Truck-mounted borings are drilled using a gas-powered drilling rig. The hole is advanced using continuous flight augers, wash boring and/or NX coring.

Auger drilling is used in soils where caving does not occur. The augers are 4-1/2 inch diameter continuous helical flight augers with the lead auger having a head equipped with changeable cutting teeth. Soil cuttings are brought to the surface by the continuous flights. After the bore hole is advanced to the required depth and cleaned of cuttings by additional rotation of the augers, the augers are retracted for soil sampling or in-situ testing.

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In soils where caving of the bore hole occurs, the hole is advanced by wash boring or hollow-stem augering. Wash boring consists of advancing steel casing by rotary action and water pressure to flush the soil from the casing. The lead section of the casing is equipped with a carbide or diamond casing bit. After the casing has been advanced to the required depth, soil samples are obtained through the inside of the casing. Hollow-stem drilling consists of advancing the hole with 7-5/8 inch outside diameter and 4-1/4 inch inside diameter augers. The leading drill bit is connected to drilling rods through the central portion of the auger. At the required sampling depth, the interior drill rods and lead bit are removed, and the soil sample is taken by driving a sampler through the "hollow" section of the augers.

Coring is used for hard formations such as rock, coral or boulders. The core barrel, consisting of a 5-foot long double tube, hardened steel barrel with either a carbide or diamond bit, is attached to drilling rods and set on the hard formation. The core barrel is advanced through the formation by rotation of the core barrel. Water is used to flush out the cuttings. Upon completion of the core run, the sample is removed from the core barrel and inspected. The total core recovery length and the sum of all intact pieces over 4-inch in length are measured. The length of core recovery divided by the length of the core run is the recovery ratio. The combined length of the 4-inch or longer pieces divided by the length of core run is the Rock Quality Designation (RQD). The values provide an indication of the quality of the formation.

#### Test Borings Using Portable Drilling Equipment

In areas inaccessible to truck-mounted equipment, portable drilling equipment is used to drill the test boring. The boring is advanced by either 1) continuous drive sampling or by 2) using a small gas-powered drill rig with continuous flight augers, wash boring or NX coring.

Soil samples are obtained with a tripod and cathead assembly using soil sampling methods described below.

#### Test Pits Using Excavators/Hopto

Test pits are excavated using a hopto or backhoe. Material excavated from the pit and the sides and bottom of the pit are visually inspected and a continuous log of the hole is kept.

## Explorations Using Hand Tools

In inaccessible areas requiring only shallow explorations, borings and test pits are made using hand equipment. Borings are drilled using hand augers. Test pits

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are excavated using hand tools. Cuttings from the boring and/or pit are inspected and visually classified.

## Soil Sampling

Relatively undisturbed samples of the underlying soils are obtained from borings by driving a sampling tube into the subsurface material using a 140-pound safety hammer falling from a height of 30 inches. Ring samples are obtained using a 3inch outside diameter, 2.5 inch inside diameter steel sampling tube with an interior lining of one-inch long, thin brass rings. The tube is driven approximately 18 inches into the soil and a section of the central portion is placed in a close fitting waterproof container in order to retain field conditions until completion of the laboratory tests. Standard Penetration Test (SPT) values and disturbed soil samples are obtained with # 2-inch (outside diameter) split-barrel sampler instead of the 3-inch sampler. The number of blows required to drive the sampler into the ground is  $r \notin corded$  at 6-inch intervals. The blow count for the last 12-inches is shown on the boring logs.

From test pit excavations, undisturbed samples are retained from cohesive type soil formations and disturbed bulk samples are retained from friable and cohesionless soil formations.

The soil samples are visually classified in the field using the Unified Soil Classification System. Samples are packed in moisture proof containers and transported to the laboratory for testing.

#### LABORATORY TESTING

#### <u>General</u>

Laboratory tests are performed on various soil samples to determine their engineering properties. Description of the various tests are listed below.

#### Unit Weight and Moisture Content

The in-place moisture content and unit weight of the samples are used to correlate similar soils at various depths. The sample is weighed, the volume determined, and a portion of the sample is placed in the oven. After oven-drying, the sample is again weighed to determine the moisture loss. The data is used to determine the wet-density, dry-density and in-place moisture content.

#### Direct Shear

Direct shear tests are performed to determine the strength characteristics of the representative soil samples. The test consists of placing the sample into a shear box, applying a normal load and then shearing the sample at a constant rate of strain. The shearing resistance is recorded at various rates of strain. By varying the normal load, the angle of internal friction and cohesion can be determined.

#### Consolidation Test

Consolidation tests are performed to obtain data from which time rates of consolidation and amounts of settlement may be estimated. The test is performed by placing a specimen in a consolidation apparatus. Loads are applied in increments to the circular face of a one (1) inch high sample. Deformation or changes in thickness of the specimen are recorded at selected time intervals. Water is introduced to or allowed to drain from the sample through porous disks placed against the top and bottom faces of the specimen. The data is then used to plot a stress-volume strain curve which is used in estimating settlement.

#### Expansion Test - Ring Swell

Expansion tests are performed on clayey soils to determine the expansion potential of the sample. The test is performed using either a remolded or relatively undisturbed field sample. The sample is placed in an expansion apparatus with a one (1) psi surcharge. The sample is saturated and the change in vertical height is recorded. The initial moisture content is varied (field moisture or air-dried) to determine the variation in expansion potential with moisture changes. The data is used to determine the expansion potential of the soil.

#### Classification Tests

The soil samples are classified using the Unified Soil Classification System. Classification tests include sieve and hydrometer analysis to determine grain size distribution, and Atterberg Limits to determine the liquid limit, plastic limit and plasticity index.

#### California Bearing Ratio Test

California Bearing Ratio (CBR) tests are performed on materials to determine the bearing strength of the soil for determination of pavement sections. The sample is compacted into a 6-inch diameter mold in 5 equal layers. Each layer is compacted with a 10-pound hammer falling from a height of 18-inches, with each layer receiving 56 blows. The mold is then placed in a water bath for 4-days and the vertical swell is measured under a surcharge weight of 10 pounds. After the soaking period, the sample is placed in a CBR apparatus that has a 3-square inch penetrometer. The penetrometer is pressed vertically into the soil at constant strain and the loads required to press the penetrometer are recorded. A plot of the load-strain relationship is made to determine the CBR value.

#### Maximum Dry Density/Optimum Moisture Content

The maximum dry density and optimum moisture content of the material is determined in accordance with the ASTM D1557-78 test procedure. The sample is compacted into a mold in 5 equal layers using a 10 pound hammer falling from a height of 18 inches. The diameter of the mold is either 4-inches or 6-inches depending on the proportion of gravel in the sample. The sample is compacted at various moisture contents to develop a compaction curve for the soil. The curve is usually bell-shaped with a peak indicating the maximum dry density and optimum moisture content.

#### Penetrometer Test

Penetrometer tests are performed on clayey soils to determine the consistency of the material and an approximate value of the unconfined compressive strength.

#### Torvane

Torvane tests are used to determine the approximate undrained shear strength of clayey soils. The torvane apparatus consists of a torque device with a small diameter plate that has vanes situated perpendicular to the plate. The vanes are pushed into the soil and torque is applied until failure occurs. The torque required to cause failure is converted to approximate undrained strength of the soil.

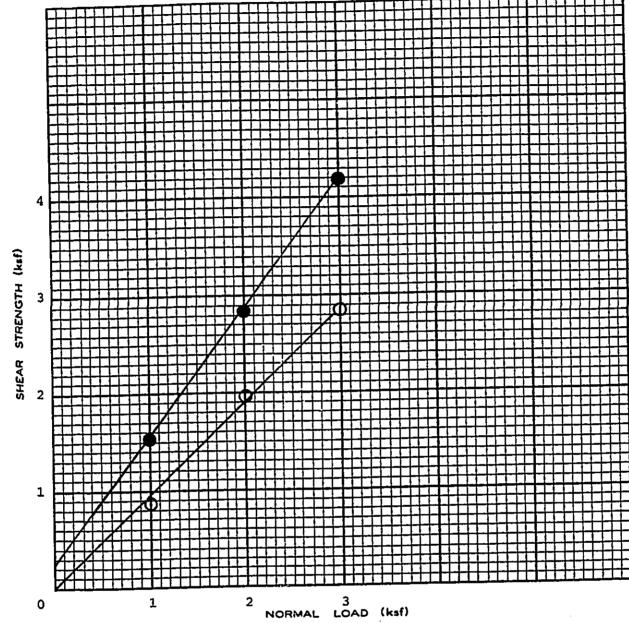
			RING NO. 1				ELEVATIO					
			ED: Pressure Driller (9" dia	meter	auger		DEPTH OF BORING (FT.): 22.5 DEPTH TO GROUNDWATER: N/A					
AT	E DR		: 10-15-96	Т	1	<del>                                     </del>	DEPTH TO	GROUNI	WAT	T	1	
DEPTH (FT.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	SAMO	BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT 1% OF DRY WT.)	PENETROMETER (TSF)	TORVANE STRENGTH
0		MH	clayey SILT (volcanic ash); few roots		}	light brown	sl. moist to moist	soft				
2 -		l	no roots					mod. stiff	28	80.8	2.75	
٠.		ll	less ashy		[	brown	moist	very stiff	43	63.7	4.50	1.73
4 -			with cobbles and gravel					stiff				
6 -			no cobbles or gravel			light brown			56	47.6	4.50	2.25
8 -		(RX)	BASALTIC ROCK			gray		mod. hard rock				
0-		(CLK)	CLINKERS			i		dense				
2 -						i						
m m												
		(RX)	BASALTIC ROCK			İ	·	soft	i		1	
y Aller								rock				
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OJE	CT NO	o.: M-2				٦		<u>.</u>	CORPORA Kal Consul	TION	3	I

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# DIRECT SHEAR TEST



	LOCATION	DEPTH (ft.)	COHESION (psf)	ANGLE OF	TEST CONDITIONS
~	B-1, S-2	2.5'	250	53°	Field Density - Peak Strength
$\frac{1}{c}$	B-1, S-2	2.5'	0	44°	Field Density - Residual Strength
<u> </u>					

	SECURET NO	TO INTERNATIONAL	PLATE
PROJECT: WAIOHULI SUBDIVISION RESERVOIR SZ-3	N-3603-E	SOILS INTERNATIONAL 99-1255 WAIUA PLACE AIEA, HAWAII 96701	4
•	1		

SOILS INVESTIGATION REPORT SERVICE ZONE NO. 4

# REPORT SOILS INVESTIGATION

PROPOSED RESERVOIR
WAIOHULI SUBDIVISION SERVICE ZONE 4
KULA, MAUI, HAWAII

for

R. T. TANAKA ENGINEERS, INC. Engineers

Project No. H-2683-F September 24, 1996



99-1255 Waiua Place Aiea, Hawaii 96701 Phone: (808) 488-0433 Fax: (808) 488-9535

335 Hoohana Street Building 7, Unit O Kahului, Maui, Hawaii 96732 Phone: (808) 877-3789 Fax: (808) 871-1592

99-1255 WAIUA PLACE, AIEA, HAWAII 96701

(808) 488-0433 FAX (808) 488-9535

September 24, 1996 Project No. M-2683-F

R. T. Tanaka Engineers, Inc. 871 Kolu Street, Suite 201 Wailuku, Maui, Hawaii 96793

Attention:

Mr. Kirk Tanaka, P.E.

#### Gentlemen:

The attached report presents the results of a soils investigation for the proposed Waiohuli Subdivision Reservoir at Service Zone 4 in Kula, Maui, Hawaii.

A summary of the findings is as follows:

- 1) The subsurface conditions at the site were explored by drilling 1 test boring to a depth of 13 feet below existing grade. The boring revealed moderately stiff to stiff, light brown clayey to a depth of 3 feet, followed by hard, gray BASALTIC ROCK to a depth of 7.5 feet. Below the BASALTIC ROCK, dense, gray CLINKERS were found to a depth of 10 feet, followed by hard, gray BASALTIC ROCK to the final depth of the boring at 13 feet.
- 2) Groundwater was not encountered in the boring at the time of the field investigation.
- Based on the findings and observations of this investigation, the reservoir foundation may bear on the underlying dense CLINKERS, underlying hard BASALTIC ROCK, or properly compacted fill.
- The upper moderately stiff to stiff clayey SILT is not suitable bearing material. Footings should either be deepened to the underlying rock or clinker layer, or the upper clayey SILT layer shall be removed and then be replaced with properly compacted fill.
- 5) Excavations are susceptible to caving at the clinker layer. Provisions shall be made to protect the excavations from caveins.

R. T. Tanaka Engineers, Inc. September 24, 1996 Page Two

Details of the findings and recommendations are presented in the attached report.

This investigation was made in accordance with generally accepted engineering procedures and included such field and laboratory test considered necessary for the project. In the opinion of the undersigned, the accompanying report has been substantiated by mathematical data in conformity with generally accepted engineering principles and presents fairly the design information requested by your organization. No other warranty is either expressed or given,

Respectfully submitted,

SOILS INTERNATIONAL

Lawrence S. Shinsato, P.E.

Vice-President

LSS:BHH:bh

This work was prepared by me or under my supervision.

LICENSED!

No. 4169-C

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## TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
SCOPE OF WORK	1
PLANNED DEVELOPMENT	1
SITE CONDITIONS	2 2 2 3
CONCLUSIONS AND RECOMMENDATIONS	4 4 4 6 6 7 7
INSPECTION	10
REMARKS	10
VICINITY MAP Plate	1
PLOT PLAN Plate	2
APPENDIX Field Investigation Laboratory Testing Log of Test Boring	

## INTRODUCTION

This investigation was made for the purpose of obtaining information on the subsurface conditions from which to base recommendations for the proposed Waiohuli Subdivision Reservoir for Service Zone 4 to be located in Kula, Maui, Hawaii. The location of the site, relative to the existing streets and landmarks, is shown on the Vicinity Map, Plate 1.

#### SCOPE OF WORK

The services included drilling 1 test boring to a depth of 13 feet below existing grade, obtaining samples of the underlying soils, conducting laboratory tests on representative samples, and performing an engineering analysis to determine foundation design parameters. The following information is provided for use by the Architect and/or Engineer:

- 1. General subsurface conditions, as disclosed by the boring.
- 2. Physical characteristics of the soils encountered.
- 3. Recommendations for foundation design, including bearing values, embedment depth and estimated settlement.
- 4. Recommendations for placement of fill and backfill.
- 5. Special design considerations.

## PLANNED DEVELOPMENT

From the information provided, the project will consist of constructing a 54-foot diameter, 0.3 million gallon water reservoir

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for a subdivision in Service Zone 4. Finished floor elevation for the reservoir will be at +2355.00'.

## SITE CONDITIONS

#### Surface

The property is located at the northwest side of Kula Highway, about 4500 feet from the highway. The project site is heavily vegetated with trees and plants.

Existing surface elevations (according to the Grading and Drainage Plan provided) range from approximately +2355' at the northwest side of the proposed reservoir to +2367' at the southeasterly side of the site.

#### Subsurface

The subsurface conditions at the site was explored by drilling 1 test boring to a depth of 13 feet below existing grade at the location shown on the Plot Plan, Plate 2. A detailed log of the boring is presented in the Appendix to this report.

The boring revealed moderately stiff to stiff, light brown clayey SILT to a depth of 3 feet, followed by hard, gray BASALTIC ROCK to a depth of 7.5 feet. Below the BASALTIC ROCK, dense, gray CLINKERS were found to a depth of 10 feet, followed by hard, gray BASALTIC ROCK to the final depth of the boring at 13 feet.

Groundwater was not encountered in the boring at the time of the field investigation.

From the USDA Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii", the site is located in an area classified as Kamaole verly stony silt loam, 3 to 15 percent slopes (KGKC). This series consists of well-drained soils on uplands that developed in volcanic ash (USDA, 1972, Plate 108, p. 59).

#### Geology

The site is located on the southwesterly flank of the Haleakala Volcano. The development of the island above sea level is believed to have occurred between later Pliocene and Pleistocene time (approximately 1 and 12 million years ago). Haleakala was built over three rift zones that trend north, southwest and east. These rift zones are studded with large cinder cones. The lava flows making up the main mass of the mountain is known as the Honomanu volcanic series which consist of thin-bedded pahoehoe and aa lava flows.

Above the Hononamu volcanics is the Kula volcanic series which consist of thicker andesitic aa flows. Most of the lava flows dip about 12 degrees. Along the southwest and east rift zones only, the volcano is capped with the Hana volcanic series (Stearns, 1966).

## CONCLUSIONS AND RECOMMENDATIONS

## General

Based on the findings and observations of this investigation, the reservoir foundation should bear on the underlying hard ROCK, dense CLINKERS, or on properly compacted fill.

## Special Consideration

- the moderately stiff to stiff clayey SILT is not suitable bearing material. Footings should either be deepened to the underlying rock or clinker layer, or the upper clayey SILT should be removed and if necessary to obtain finished grade, be replaced with properly compacted fill.
- 2) Excavations are susceptible to caving at the clinker layer. Provisions shall be made to protect the excavations from caveins.

## Foundation Design

An allowable soil bearing value of 3,000 pounds per square foot may be used for footings bearing on the on-site underlying dense CLINKERS, or on properly compacted fill. The minimum footing embedment depth shall be 18 inches below lowest adjacent finished grade.

An allowable rock bearing value of 20,000 pounds per square foot may be used for footings bearing on the hard BASALTIC ROCK.

For footings located adjacent to utility trenches, the bottom of the footing shall be deepened below a 1 horizontal to 1 vertical plane projected upwards from the edge of the utility trench.

For footings located on or adjacent to slopes, the footing shall be deepened such that there is a minimum horizontal distance of 5 feet from the edge of the footing to the slope face.

Where new footings are to be located adjacent to retaining walls or other structural elements which are not designed for surcharge loading, the new footing shall be deepened below a 45 degree plane projected upwards from the adjacent structure.

The bearing values are for dead plus live loads and may be increased by one-third for momentary loads due to wind or seismic forces. If any footing is eccentrically loaded, the maximum edge pressure shall not exceed the bearing pressure for permanent or for momentary loads.

All loose and disturbed soil at the bottom of footing excavations shall be removed to firm soil or the disturbed soil shall be compacted prior to laying of steel or pouring of concrete.

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#### Settlement

Under the fully applied recommended bearing pressure, it is estimated that the total settlement of foundation will be less than 1/2 inch.

Differential settlement between footings will vary according to the size and bearing pressure of the footing.

## Lateral Resistance

For resistance of lateral loads, such as wind or seismic forces, an allowable passive earth resistance equivalent to that exerted by a fluid weighing 300 pounds per cubic foot may be used for footings, or other structural elements, provided the vertical surface is in direct contact with undisturbed soil or properly compacted fill.

Frictional resistance between footings and slabs, and the underlying soils may be assumed as 0.4 times the dead load for the on-site dense CLINKERS or properly compacted structural fill, and 0.7 times the dead load for the underlying hard BASALTIC ROCK.

Lateral resistance and friction may be combined.

#### Slab-on-Grade

For design of concrete slabs-on-grade, a modulus of subgrade reaction of 300 pci may be used for the on-site soils, or imported

select granular material (see Site Preparation and Grading section to this report).

It is recommended that the subgrade soil be prepared in accordance with the Site Preparation and Grading section to this report.

## Slopes

Permanent fill and cut slopes of soil type materials shall not exceed 2 horizontal to 1 vertical.

Cut slopes into the underlying hard BASALTIC ROCK may be made at 1 horizontal to 2 vertical.

Exposed soil slopes shall be covered as soon as practical after construction to minimize erosion.

Fill slopes shall be constructed by either overfilling and cutting back to compacted soil, or the slope shall be track-rolled.

#### Site Preparation and Grading

It is recommended that the site be prepared in the following manner:

1. In areas to receive fill and beneath structural and pavement areas, all vegetation, weeds, brush, roots, stumps, rubbish, debris, and other deleterious material shall be removed from the site.

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If the foundations for the structure are not deepened to bear on the underlying ROCK or CLINKER, the existing clayey SILT shall be removed and if necessary to obtain finished grade, shall be replaced with properly compacted fill.

- 2. The exposed surface shall then be scarified to a depth of 6 inches, moisture conditioned to near optimum moisture content (ASTM D1557-91), and then compacted to the degree of compaction indicated below. If encountered, loose or soft areas shall be removed to firm material and the resulting depression shall be filled with properly compacted fill.
- 3. Fill and backfill material shall consist of soil which is free of organics, debris and expansive clayey material. The material shall be less than 3 inches in greatest dimension. Imported structural fill and backfill material shall contain no more than 20% fines (passing the #200 sieve).

The on-site clayey SILT is <u>not</u> suitable for use as fill and backfill.

4. Fill and backfill shall be placed in lifts not exceeding 8 inches in loose thickness. Prior to placing, the material shall be aerated or moistened to near optimum moisture content (ASTM D1557-91 test procedure).

Where fill is placed on existing ground that is steeper than 5 horizontal to 1 vertical, the existing ground surface shall be benched into firm soil as the fill is placed.

- 5. In the upper 2 feet from finished subgrade, each layer of structural fill and backfill (under and 3 feet beyond the edges of structures and pavements) shall be thoroughly compacted to at least 95 percent of the maximum dry density (ASTM D1557-91). All other fill and backfill shall be compacted to at least 90 percent relative compaction (ASTM D1557-91).
- 6. Drainage shall be provided to minimize ponding of water. Ponded areas shall be drained immediately or water pumped out without damaging adjacent structures and property. If water accumulation softens the subgrade materials, the affected soils shall be removed and replaced with properly compacted fill.
- 7. Footing excavations shall be cleaned of loose material that has fallen into the excavation prior to pouring of concrete.

It is particularly important to see that all backfill soils are properly compacted especially if these are designed to resist lateral forces.

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#### INSPECTION

During the progress of construction, so as to evaluate compliance with the design concepts, specifications and recommendations contained in this report, a representative from this office should be present to observe the following operations:

- 1. Site preparation.
- 2. Placement of fill and backfill.
- Footing excavations.

## REMARKS

The conclusions and recommendations contained herein are based on the findings and observations made at the boring location. For the purpose of providing geotechnical design information, conditions beyond the boring are assumed to be similar to those found in the boring location. If conditions are encountered during construction which appear to differ from those disclosed by the boring, this office shall be notified so as to consider the need for modifications.

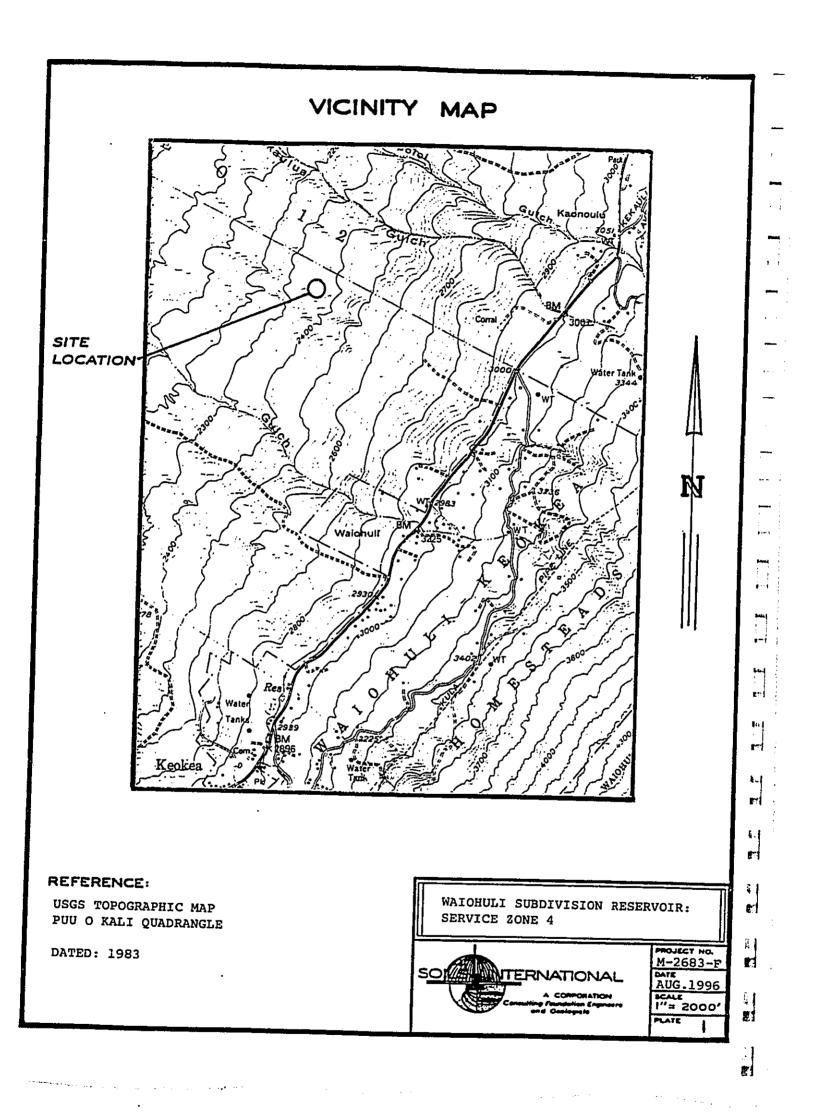
This report has been prepared for the exclusive use of R. T. Tanaka Engineers, Inc., and their respective design consultants. It shall not be used by or transferred to any other party or to another project without the consent and/or thorough review by this facility. Should the project be delayed beyond the period of one year from the

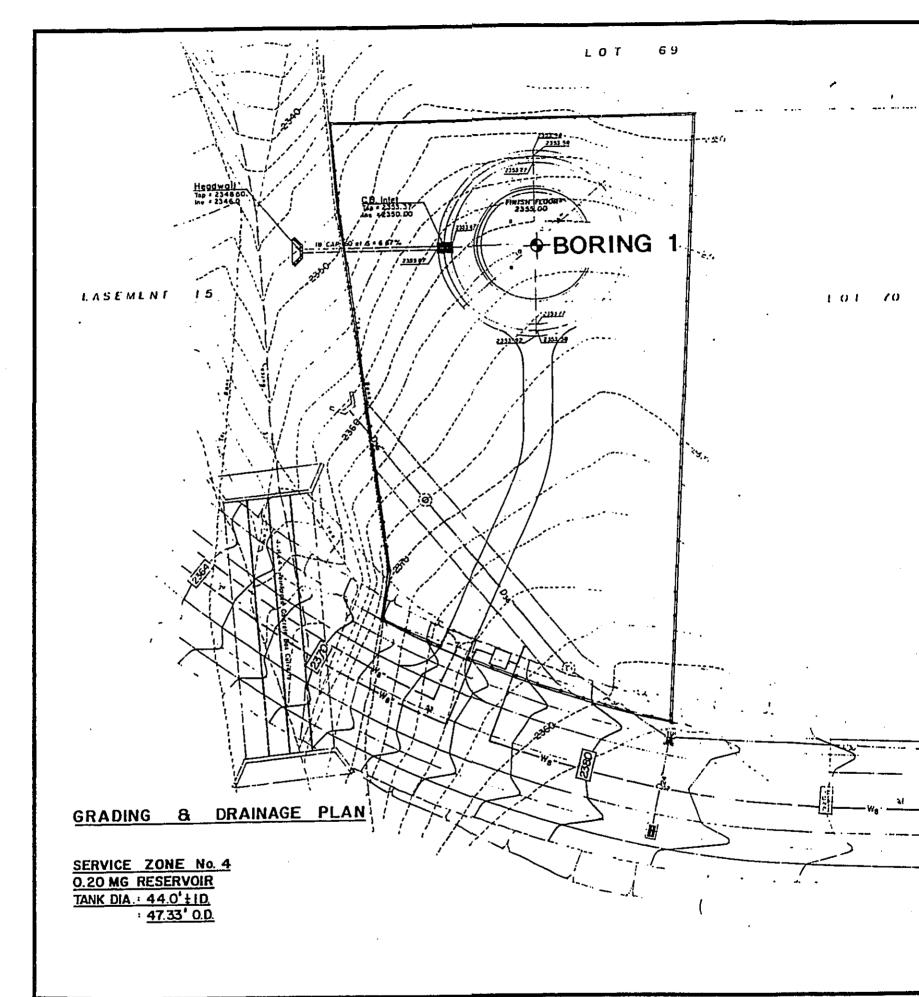
date of this report, the report shall be reviewed relative to possible changed conditions.

Samples obtained in this investigation will deteriorate with time and will be unsuitable for further laboratory tests within one (1) month from the date of this report. Unless otherwise advised, the samples will be discarded at that time.

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Log of Boring





11 X 17 PRINTED ON NO. 1000H CLEARPRINT .

Note.

Existing contours, roodway improvements and roadway finish grades (contours) as shown have been token from Construction Plans for "KULA RESIDENCE LOTS, UNIT 1", at Waiohulf, Kula, Maui, Hawaii for the Department of Hawaiian Hame Lands, State of Hawaii by Austin, Tsutsurni & Associates



PLOT	PL	AN
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SCALE: 1"=40"

APPROVED BY:

DRAWN BY

DATE: AUG., 1996

REVISED

WAIOHULI SUBDIVISION RESERVOIR: SERVICE ZONE 4

SOILS INTERNATIONAL PROJECT NO. M-2683-F

Plate 2

## <u>APPENDIX</u>

FIELD INVESTIGATION AND LABORATORY TESTING

#### FIELD INVESTIGATION

#### General

The field investigation consisted of performing explorations at the locations shown on the Plot Plan. The method used for the exploratory work is shown on the respective exploration log. A description of the various method or methods used is presented below.

#### Test Borings Using Truck-Mounted Drilling Equipment

Truck-mounted borings are drilled using a gas-powered drilling rig. The hole is advanced using continuous flight augers, wash boring and/or NX coring.

Auger drilling is used in soils where caving does not occur. The augers are 4-1/2 inch diameter continuous helical flight augers with the lead auger having a head equipped with changeable cutting teeth. Soil cuttings are brought to the surface by the continuous flights. After the bore hole is advanced to the required depth and cleaned of cuttings by additional rotation of the augers, the augers are retracted for soil sampling or in-situ testing.

In soils where caving of the bore hole occurs, the hole is advanced by wash boring or hollow-stem augering. Wash boring consists of advancing steel casing by rotary action and water pressure to flush the soil from the casing. The lead section of the casing is equipped with a carbide or diamond casing bit. After the casing has been advanced to the required depth, soil samples are obtained through the inside of the casing. Hollow-stem drilling consists of advancing the hole with 7-5/8 inch outside diameter and 4-1/4 inch inside diameter augers. The leading drill bit is connected to drilling rods through the central portion of the auger. At the required sampling depth, the interior drill rods and lead bit are removed, and the soil sample is taken by driving a sampler through the "hollow" section of the augers.

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Coring is used for hard formations such as rock, coral or boulders. The core barrel, consisting of a 5-foot long double tube, hardened steel barrel with either a carbide or diamond bit, is attached to drilling rods and set on the hard formation. The core barrel is advanced through the formation by rotation of the core barrel. Water is used to flush out the cuttings. Upon completion of the core run, the sample is removed from the core barrel and inspected. The total core recovery length and the sum of all intact pieces over 4-inch in length are measured. The length of core recovery divided by the length of the core run is the recovery ratio. The combined length of the 4-inch or longer pieces divided by the length of core run is the Rock Quality Designation (RQD). The values provide an indication of the quality of the formation.

### Test Borings Using Portable Drilling Equipment

In areas inaccessible to truck-mounted equipment, portable drilling equipment is used to drill the test boring. The boring is advanced by either 1) continuous drive sampling or by 2) using a small gas-powered drill rig with continuous flight augers, wash boring or NX coring.

Soil samples are obtained with a tripod and cathead assembly using soil sampling methods described below.

#### Test Pits Using Excavators/Hopto

Test pits are excavated using a hopto or backhoe. Material excavated from the pit and the sides and bottom of the pit are visually inspected and a continuous log of the hole is kept.

#### Explorations Using Hand Tools

In inaccessible areas requiring only shallow explorations, borings and test pits are made using hand equipment. Borings are drilled using hand augers. Test pits

are excavated using hand tools. Cuttings from the boring and/or pit are inspected and visually classified.

#### Soil Sampling

Relatively undisturbed samples of the underlying soils are obtained from borings by driving a sampling tube into the subsurface material using a 140-pound safety hammer falling from a height of 30 inches. Ring samples are obtained using a 3-inch outside diameter, 2.5 inch inside diameter steel sampling tube with an interior lining of one-inch long, thin brass rings. The tube is driven approximately 18 inches into the soil and a section of the central portion is placed in a close fitting waterproof container in order to retain field conditions until completion of the laboratory tests. Standard Penetration Test (SPT) values and disturbed soil samples are obtained with a 2-inch (outside diameter) split-barrel sampler instead of the 3-inch sampler. The number of blows required to drive the sampler into the ground is recorded at 6-inch intervals. The blow count for the last 12-inches is shown on the boring logs.

From test pit excavations, undisturbed samples are retained from cohesive type soil formations and disturbed bulk samples are retained from friable and cohesionless soil formations.

The soil samples are visually classified in the field using the Unified Soil Classification System. Samples are packed in moisture proof containers and transported to the laboratory for testing.

#### Expansion Test - Ring Swell

Expansion tests are performed on clayey soils to determine the expansion potential of the sample. The test is performed using either a remolded or relatively undisturbed field sample. The sample is placed in an expansion apparatus with a one (1) psi surcharge. The sample is saturated and the change in vertical height is recorded. The initial moisture content is varied (field moisture or air-dried) to determine the variation in expansion potential with moisture changes. The data is used to determine the expansion potential of the soil.

#### Classification Tests

The soil samples are classified using the Unified Soil Classification System. Classification tests include sieve and hydrometer analysis to determine grain size distribution, and Atterberg Limits to determine the liquid limit, plastic limit and plasticity index.

#### California Bearing Ratio Test

California Bearing Ratio (CBR) tests are performed on materials to determine the bearing strength of the soil for determination of pavement sections. The sample is compacted into a 6-inch diameter mold in 5 equal layers. Each layer is compacted with a 10-pound hammer falling from a height of 18-inches, with each layer receiving 56 blows. The mold is then placed in a water bath for 4-days and the vertical swell is measured under a surcharge weight of 10 pounds. After the soaking period, the sample is placed in a CBR apparatus that has a 3-square inch penetrometer. The penetrometer is pressed vertically into the soil at constant strain and the loads required to press the penetrometer are recorded. A plot of the load-strain relationship is made to determine the CBR value.

#### LABORATORY TESTING

#### <u>General</u>

Laboratory tests are performed on various soil samples to determine their engineering properties. Description of the various tests are listed below.

#### Unit Weight and Moisture Content

The in-place moisture content and unit weight of the samples are used to correlate similar soils at various depths. The sample is weighed, the volume determined, and a portion of the sample is placed in the oven. After oven-drying, the sample is again weighed to determine the moisture loss. The data is used to determine the wet-density, dry-density and in-place moisture content.

#### <u>Direct Shear</u>

Direct shear tests are performed to determine the strength characteristics of the representative soil samples. The test consists of placing the sample into a shear box, applying a normal load and then shearing the sample at a constant rate of strain. The shearing resistance is recorded at various rates of strain. By varying the normal load, the angle of internal friction and cohesion can be determined.

#### Consolidation Test

Consolidation tests are performed to obtain data from which time rates of consolidation and amounts of settlement may be estimated. The test is performed by placing a specimen in a consolidation apparatus. Loads are applied in increments to the circular face of a one (1) inch high sample. Deformation or changes in thickness of the specimen are recorded at selected time intervals. Water is introduced to or allowed to drain from the sample through porous disks placed against the top and bottom faces of the specimen. The data is then used to plot a stress-volume strain curve which is used in estimating settlement.

# Maximum Dry Density/Optimum Moisture Content

The maximum dry density and optimum moisture content of the material is determined in accordance with the ASTM D1557-78 test procedure. The sample is compacted into a mold in 5 equal layers using a 10 pound hammer falling from a height of 18 inches. The diameter of the mold is either 4-inches or 6-inches depending on the proportion of gravel in the sample. The sample is compacted at various moisture contents to develop a compaction curve for the soil. The curve is usually bell-shaped with a peak indicating the maximum dry density and optimum moisture content.

#### Penetrometer Test

Penetrometer tests are performed on clayey soils to determine the consistency of the material and an approximate value of the unconfined compressive strength.

#### Torvane

Torvane tests are used to determine the approximate undrained shear strength of clayey soils. The torvane apparatus consists of a torque device with a small diameter plate that has vanes situated perpendicular to the plate. The vanes are pushed into the soil and torque is applied until failure occurs. The torque required to cause failure is converted to approximate undrained strength of the soil.

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DEPTH (FT.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION		SAMPLE BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT 1% OF DRY WT.)	PENETROMETER (TSF)	TORVANE STRENGTH (TSF)
2 -		MH	clayey SILT; with sand, few gravel and roots		12 10/6*	light brown	sl. moist	mod. stiff stiff	58	29.9		
4 -		(RX)	BASALTIC ROCK; fractured, vesicular Coring Times 3.5'-7.5' 8.25 min - 1st foot 7.25 min - 2nd foot 12.5 min - 3rd foot 6.25 min - 4th foot			gray		hard rock				
6 - 8 -		(CLK)	Recovered = 4.00 feet RQD Length = 4.00 feet RQD (%) = 100%  CLINKERS Coring Times 7.5'-10' 1.00 min - 1st foot	_				dense				
10 -		(RX)	3.00 min - 1st foot 3.00 min - 2nd foot 4.00 min - 7'-7.5'  Recovered = 1.17 feet RQD Length = 0 RQD (%) = 0%  BASALTIC ROCK; fractured,	<u> </u>				hard rock				
12 -			vesicular Coring Times 10'-13' 4,00 min - 1st foot 8,25 min - 2nd foot 2,50 min - 3rd foot Rocovered = 1,83 feet									
14 -			RQD Length = 1.50 feet RQD (%) = 50% END OF BORING									
18 -			•									
20 -												
PROJ	ECT N	AME: W	/AIOHULI SUBDIVISION ESERVOIR SZ-4	_			SOM	NTERNA			PLAT	TE
PROJ	ECT NO	o.: M-2	683-F					Groseci	A CORPOR unical Const		3	

**BOTANICAL SURVEY** 

# BOTANICAL SURVEY DHHL KULA RESIDENTIAL LOT, UNIT 1 KULA, MAKAWAO DISTRICT, ISLAND OF MAUI

bу

Winona P. Char

CHAR & ASSOCIATES Botanical Consultants Honolulu, Hawai'i

Prepared for: Munekiyo & Arakawa, Inc.

October 1994

# TABLE OF CONTENTS

	<u>page</u>
INTRODUCTION	1
SURVEY METHODS	2
DESCRIPTION OF THE VEGETATION	3
Black Wattle Forest	4
Lantana-Cactus Scrub	5
Gulch Vegetation	6
DISCUSSION AND RECOMMENDATIONS	7
LITERATURE CITED	10
PLANT SPECIES LIST	12

# BOTANICAL SURVEY DHHL KULA RESIDENTIAL LOT, UNIT 1 KULA, MAKAWAO DISTRICT, ISLAND OF MAUI

#### INTRODUCTION

The ±655-acre Department of Hawaiian Home Lands (DHHL) project site, TMK: 2-2-02: 56, is found on the northwest slope of Hale-akala, near Keokea. The property is bounded to the east by Kula Highway, and on the remaining three sides primarily by undeveloped lands used for pasture. Elevation on the property ranges from about 1,800 ft. along the lower, makai boundary to roughly 3,000 ft. along the upper, mauka boundary where it abuts the Kula Highway. Annual rainfall is about 15 inches on the lower one-quarter of the property, increasing gradually as one moves upslope to 30 inches per year on the upper section.

Only about two-thirds of the project site are planned for residential development. This upper portion of the property is the most suitable for the proposed land use. The climatic conditions are pleasant, with temperatures ranging from the low 60's to the mid-80's, rainfall from 20 to 30 inches annually, and the soil conditions favorable. The site offers spectacular views of the Maui isthmus and the West Maui mountains beyond (Woolsey, Miyabara & Associates 1983).

Field studies to assess the botanical resources found on the DHHL project site were conducted on 08 and 22 to 23 September 1994. The primary objectives of the field studies were to:

- 1) provide a description of the major vegetation types;
- 2) inventory the flora; 3) search for threatened and endangered

species as well as rare and vulnerable plants; and 4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

#### SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps and recent black and white aerial photographs were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points.

Access was from the Kula Highway and then onto the main jeep road which runs the length of the property, following along the southern boundary near Waiohuli Gulch. From the main jeep road, a number of smaller side roads and bulldozer tracks can be accessed. A less well traveled jeep road on the northern portion of the property is found off of the dirt road which provides access to several privately-owned landlocked parcels.

A walk-through survey method was used. The less disturbed areas such as the larger gulches were more intensively surveyed as such areas are more likely to harbor native plant communities, and, perhaps, rare species. Notes were made on plant associations and distribution, substrate types, topography, exposure, grazing damage, drainage, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the harbarium, and for comparison with the most recent taxonomic literature.

The species recorded are indicative of the season ("rainy" vs.
"dry") and the environmental conditions at the time of the survey.
A survey taken at a different time of the year and under varying

environmental conditions would no doubt yield slight variations in the species list, especially of the weedy, annual plants.

#### DESCRIPTION OF THE VEGETATION

An earlier archaeological survey (PHRI 1989) included a very short description of the vegetation observed on the project site, then identified as the Waiohuli parcel. Black wattle forests dominated the eastern half of the parcel, while lantana and prickly pear cactus were codominate on the lower western half. A recent botanical reconnaissance assessment (Char 1994) of the lands immediately north of the study site for a proposed waterline which will serve the residential lot also described similar vegetation types in more detail.

The black wattle forest occurs on the upper section of the project site from about the 2,350-foot elevation contour up to the highway. The forest is more or less confined to Kula cobbly loam, 12% to 20% slopes, identified as "KxaD" on the soil maps (Foote et al. 1972). These are well-drained, dark reddish-brown soils found on uplands and derived from ash over pahoehoe bedrock. The lantana-cactus scrub occurs on soils mapped as "KGKC", Kamaole very stony silt loam, 3% to 15% slopes; these are dark brown to dark reddish-brown soils derived from ash over fragmental 'a'a substratum, with 'a'a outcroppings sometimes common.

These two vegetation types along with the gulch vegetation are described in more detail below. A list of all the plant species inventoried on the project site during the field studies is presented at the end of the report.

#### Black Wattle Forest

Black wattle (<u>Acacia mearnsii</u>), a native of Australia, forms a somewhat dense forest cover on the cooler, wetter, upper sections of the property, from the highway at about 3,000 ft. elevation down to about the 2,350-foot contour. The forest occurs on deep, well-developed soils. In many places, the forest appears to have been bulldozed at one time, and large stands of black wattle trees have resprouted from root suckers. In these areas, the trees are about the same size and age; the trees are mostly 18 to 25 ft. tall with trunk diameters 3 to 6 inches. Scattered through this vegetation type are mounds or piles of boulders, rubble, and trunks of larger black wattle trees. Lantana shrubs (<u>Lantana camara</u>) are locally common on these bulldozed piles and also within the small, shallow gullies.

Kikuyu grass (Pennisetum clandestinum), a native of Africa, forms somewhat low mats, about 6 inches tall, between the trees and in open areas. The cattle found throughout the property keep most of the grasses and other smaller species cropped low. Where the tree cover becomes denser, kikuyu grass may be replaced by two more shade-tolerant grass species; these are meadow ricegrass (Ehrharta stipoides) and a Panicum species. Other grasses found on this cooler upland section include a number of temperate species such as wild oat (Avena fatua), soft chess (Bromus mollis), ripgut grass (Bromus rigidus), and barley (Hordeum leporinum).

...:

Seedlings of weedy, annual species and other grasses are common along the old bulldozer tracks which criss-cross the property and along the jeep roads. These include bristly foxtail grass (Setaria verticillata), peppergrass (Lepidium virginicum), keeled goosefoot (Chenopodium carinatum), Bermuda grass (Cynodon dactylon), hairy abutilon (Abutilon grandifolium), Galinsoga parviflora, owi (Stachytarpheta dichotoma), and bull thistle (Cirsium vulgare).

A few of the black wattle trees along the lower edges of the forest, where it interfaces the lantana-cactus scrub, have died back. The curled, brown leaves and seed pods still hang from the branches, suggesting, perhaps, that the trees died of drought stress.

#### Lantana-Cactus Scrub

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This vegetation type is found at about the 2,350-foot elevation and continues downslope to the project's boundary and beyond. Basically, it consists of dense patches of lantana, a thorny shrub 3 to 6 ft. tall, and clumps of prickly pear cactus or panini (Opuntia ficus-indica), 8 to 12 ft. tall. The lantanacactus cover is roughly 50 to 60%. A mixture of grasses and smaller, mostly weedy species fills in the matrix between the prickly scrub cover. Surveying can become difficult in the areas where the cactus plants are dense.

Two variants of the lantana-cactus scrub can be recognized in the field. The first variant is lantana-cactus scrub with scattered black wattle trees. This variant is found between the 2,350-foot elevation and the 2,000-foot elevation. Trees of black wattle are found as scattered stands among the lantana and cactus. The black wattle trees tend to occur in the shallow gullies and other low-lying areas where it may be somewhat moister. Pitted beardgrass (Bothriochloa pertusa), molasses grass (Melinis minutiflora), and Natal redtop (Rhynchelytrum repens) are the most abundant grasses. Kikuyu grass becomes uncommon, probably because of the drier conditions.

The black wattle trees thin out as one moves downslope and become uncommon at the 2,000-foot contour; rainfall below this elevation is about 15 inches per year. The second scrub variant, lantanacactus with kiawe (Prosopis pallida) trees is found from here on

down. In places, the kiawe cover is 30 to 40%, but lantana and cactus are still abundant. The grass cover changes primarily to buffel grass (Cenchrus ciliaris) with smaller patches of pitted beardgrass. This lower section is drier and the vegetation more heavily grazed. Rocky outcroppings become common. The native wiliwili tree (Erythrina sandwicensis), with flower colors ranging from pale apple green to coral, is locally common in some areas along the lower boundary.

Smaller weedy herbaceous components commonly observed in the lantana-cactus scrub include hedge mustard (<u>Sisymbrium officinale</u>), peppergrass, hairy abutilon, cheeseweed (<u>Malva parviflora</u>) -- which is more abundant during the wetter months, keeled goosefoot, and false mallow (<u>Malvastrum coromandelianum</u>).

Among the smaller shrubs or subshrubs encountered are the native 'uhaloa (Waltheria americana) and 'ilima (Sida fallax). One 'ulei shrub (Osteomeles anthyllidifolia), about 7 ft. tall, is found at the interface between black wattle forest and lantanacactus scrub on a rocky outcropping. 'Ulei is an indigenous species belonging to the rose family. The hard wood was made into 'o'o or digging sticks, fish spears, and a musical instrument, the 'ukeke. The long slender flexible branches were bent into hoops for fish nets (Wagner et al. 1990).

#### Gulch Vegetation

The project site includes a portion of the Waiohuli Gulch on its southern periphery. The gulch has been eroded down to bedrock in most places, and there are large boulder-strewn areas along the dry streambed. Also occasional are a few "dry fall" areas where the streambed plunges over a steep face or overhang.

This gulch and also some parts of the smaller unnamed gulch on

the northern portion of the property remain wetter during most of the year, and thus provide a moister habitat for plants. Gulch vegetation on the project site typically consists of dense clumps of Guinea grass (Panicum maximum), from 3 to 5 ft. tall, with scattered stands of Chinaberry trees (Melia azedarach). In places, lantana shrubs form dense, prickly patches. There are extensive groves of large wiliwili trees on the lower sections of Waiohuli Gulch.

The steep gulch walls and "dry fall" sections of the streambed are damp and remain shaded during parts of the day. Thus, it is not uncommon to find small tussocks of mosses and light green-colored patches of <u>Dumotiera</u>, a thalloid liverwort, on the damp soil. Almost all the ferns found during the survey occur within the gulch areas. Other species observed only in these moister habitats include Mauritius hemp (<u>Furcraea foetida</u>), 'ape (<u>Alocasia macrorrhiza</u>), tarweed (<u>Cuphea cathagenensis</u>), four-o'clock (<u>Mirabilis jalapa</u>), 'ilihe'e (<u>Flumbago zeylanica</u>), and pamakani (<u>Ageratina riparia</u>).

Many of the plants found on the cooler upland portions of the property extend further downslope, following along the bottoms of the moist gulches. These include small patches of a very thorny blackberry species (Rubus sp.), honohono (Commelina diffusa), montbretia (Crocosmia X crocosmiiflora) -- an escaped ornamental member of the iris family, meadow ricegrass, jacaranda (Jacaranda mimosifolia), castor bean (Ricinus communis), etc.

#### DISCUSSION AND RECOMMEDATIONS

The vegetation on the DHHL Kula Residential Lot, Unit 1, is dominated primarily by introduced or alien species. The property is presently used to graze cattle, so much of the vegetation has been browsed. There are also axis deer and feral pigs on the

property. In addition, parts of the site have been bulldozed in the past, probably to control black wattle, lantana, and prickly pear cactus, and to improve pasturage for the cattle. The upper three-quarters of the property where the proposed lots will be developed appear to be the most heavily disturbed.

Certain areas do support native species. These are the larger gulches which cross the property, especially Waiohuli Gulch, and the lower section of the property where there are stands of wiliwili trees. These areas were more intensively surveyed. Several rare native species are known to occur in the area around Pu'u o Kali, between 600 and 1,400 ft. elevation (Cuddihy and Stone 1990).

Of a total of 112 plant species inventoried on the property, 95 (85%) are introduced or alien species, 2 (2%) are originally of Polynesian introduction, and 15 (13%) are native. Of the natives, 12 are indigenous, that is, they are native to the Hawaiian Islands and elsewhere, and 3 are endemic, that is, they are native only to the Hawaiian Islands. The endemic species are the kumu-niu fern (Doryopteris decipiens), wiliwili (Erythrina sandwicensis), and the native poppy or pua-kala (Argemone glauca).

None of the plants is a listed, proposed or candidate threatened and endangered species (U.S. Fish and Wildlife Service 1990, 1992, 1994). None of the plants is considered rare or vulnerable (Wagner et al. 1990). All of the plants can be found in similar environmental habitats throughout the Hawaiian Islands.

Given the findings above, the proposed development should not have a significant negative impact on the botanical resources. It is recommended, however, that areas disturbed by construction activities be revegetated as soon as possible to prevent soil

loss and erosion gullying. Native species found on the site and nearby areas should be considered for landscaping. These species are adapted to the local conditions and would require less water. Some material recommended for landscaping include wiliwili, 'ulei, 'ilihe'e, and 'ilima. There are several interesting flower color forms of the wiliwili already on the project site.

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#### PLANT SPECIES LIST -- DHHL Kula Residential Lot

A checklist of all those vascular plant species inventoried on the project site during the field studies is presented below. The species are arranged alphabetically by families within each of three groups: Ferns and Fern Allies, Monocots, and Dicots. The taxonomy of the Ferns and Fern Allies follow Lamoureux (1988), while the flowering plants, Monocots and Dicots, are in accordance with Wagner et al. (1990).

For each species, the following information is provided:

- 1. Scientific name with author citation.
- 2. Common English and/or Hawaiian name(s), when known.
- 3. Biogeographic status. The following symbols are used:
  - E = endemic = native only to the Hawaiian Islands.
  - I = indigenous = native to the Hawaiian Islands and also elsewhere throughout the Pacific.
  - P = Polynesian = plants originally of Polynesian introduction prior to Western contact (Cook's discovery of the islands in 1778); not native.
  - X = introduced or alien = all those plants brought to the islands by humans, intentionally or accidentally, after Western contact; not native.
- 4. Presence (+) or absence (-) of a particular species within each of three vegetation types recognized on the project site (see text for discussion):

bwf = Black Wattle Forest

1-c = Lantana-Cactus Scrub

g = Gulch Vegetation

Scientific name	Common name	9.1010	Vegeta	Vegetation type	ype
		Scarus	DWI	<u>1-c</u>	60)
FERNS & FERN ALLIES					
ADIANTACEAE (Maidenhair Fern Family) Adiantum hispidulum Sw. Adiantum raddianum Presl	Australian maidenhair maidenhair fern	××	1 1	f i	+ -
BLECHNACEAE (Blechnum Family) Blechnum occidentale L.	blechnum	: ×		; <b>1</b>	+ +
HEMIONITIDACEAE (Gold Fern Family) Pityrogramma calomelanos (L.) Link	silver fern	: ×	ì	ı	- +
NEPHROLEPIDACEAE (Sword Fern Family) Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern	×	1		
L PSILOTACEAE (Whisk Fern Family) Psilotum nudum (L.) Beauv.	moa, pipi	; ⊷	1	1 1	٠ +
SINOPTERIDACEAE (Cliffbrake Family) Doryopteris decipiens (Hook.) J. Sm.	kumu-niu, manawahua.	•		l	-
Pellaea ternifolia (Cav.) Link	'iwa'iwa kalamoho, lau-kahi	표 1~	+ 1	1	+ +
THELYPTERIDACEAE (Woodfern Family) Christella parasitica (L.) Levl.	woodfern, oakfern	· ×	ı	1 1	+ +
FLOWERING PLANTS					
MONOCOTS					
AGAVACEAE (Sisal Family) Furcraea foetida (L.) Haw.	Mauritius hemp	×	1	1	+

Scientific name	Common name	, ,	Vegeta	Vegetation type	type
ARACEAE (Aroid Family)		Scacus	DWI	门	ఠ
Alocasia macrorhizza (L.) Schott	'ape	ρ			
COMMELINACEAE (Spiderwort Family) Commelina diffusa N.L. Burm.	honohono	- Þ	1 .	ı	+
CYPERACEAE (Sedge Family) Cyperus gracilis R. Br.	McCoy grass	<b>∢ &gt;</b>	+ -	ı	+
<pre>IRIDACEAE (Iris Family) Crocosmia X crocosmiiflora (Lemaine ex E. Morr.) N.E. Brown</pre>	montbretia	٤ :	+	•	+
POACEAE (Grass Family)	<b>3</b>	≺	+	1	+
Avena ratua L. Bothriochloa pertusa (L.) A. Camus Bothriochloa sp.	wild oat pitted beardgrass	××	++	ı +	+ +
bromus mollis L. Bromus rigidus per	soft chess	××	+	ı	. 1
Cenchrus ciliaris I		<b>∢</b> ≻	+ +	1	1
Cynodon dactylon (1.) Pers	buffel grass	<b>:</b> ×	<b>-</b> +	۱ -	ı
	Bermuda grass, manienie crahorase	×	- +-	<b>+</b> +	٠+
Digitaria setigera Roth	itchy crabgrass. kukae.	×	+	1	
Ehrharta stipoides Labill.		12	+	1	
Eleusine indica (L.) Gaertn.	a)	×	· +	۱ ۱	ı <del>1</del>
Hordeum leporinum Link	wiregiass, goosegrass	×	+	ı	- 1
Panicim meximum 1	molasses grass	×	+	ı	ŀ
Panicum sp.		< >	+ +	+ -	+ •
Paspalum scrobiculatum L. Pennisetum clandestinum Hochst.	ricegrass, mau'u laiki	X I?	+++	+ + +	+ : :
Rhynchelytrum repens (Willd.)	kikuyu grass	×	+	ı	1
Setaria verticillata (L.) P. Beauv. Sporobolus indicus (L.) R. Br.	Natal redtop bristly foxtail Indian dropseed. rattail	××	++	++	++
		×	+	+	+

Scientific name	Common name	Status	Vegeta bwf	Vegetation type $\frac{bwf}{}$	type g
DICOTS				•	l
AMARANTHACEAE (Amaranthus Family) Amaranthus spinosus L.	spiny amaranth, pakai kuku	×	+	4	
APIACEAE (Parsley Family) Anethum graveolens L.	dil1	<b>:</b> ×	- +	<b>.</b>	1
ASCLEPIADACEAE (Milkweed Family) Asclepias physocarpa (E. Mey.) Schlechter	balloon plant	<b>:</b> ×	- +	· -	t
ASTERACEAE (Daisy Family) Ageratina riparia (Regel) R. King & H. Robinson G Artemisia sp.	pamakani	; ×	- ı	<del> </del>	. +
Bidens cynapiifolia Kunth Bidens pilosa L.	West Indian beggar's tick Spanish needle, heggar's	××	+ +	i i	+
Cirsium vulgare (Savi) Ten. Conyza bonariensis (L.) Cronq. Emilia fosbergii Nicolson Galinsoga parviflora Cav.	tick, ki, ki nehe bull thistle hairy horseweed, ilioha pualele	×××:	+++ + 1	1 1 1 1	+ + +
Gnaphalium purpureum L. Hypochoeris glabra L. Pluchea symphytifolia (Mill.) Gillis Sigesbeckia orientalis L. Sonchus oleraceus L. Tridax procumbens L. Zinnia peruviana (L.) L.	purple cudweed smooth cat's ear pluchea, sourbush small yellow crown-beard sow thistle, pua-lele coatbuttons wild zinnia	××××××:	++++++	+ 1 1 1 1 1 1	+
BIGNONIACEAE (Bignonia Family) Jacaranda mimosifolia D. Don	u	× ×	1 +	•	+ +

Scientific name	Common name	Status	Vegetation bwf 1-c	ition 1-c	type g
BRASSICACEAE (Mustard Family) Lepidium virginicum L. Sisymbrium officinale (L.) Scop.	peppergrass hedge mustard	××	+ -	+-	+
CACTACEAE (Cactus Family) Opuntia ficus-indica (L.) Mill.	prickly pear, panini	<b>&lt;</b> >	<del>-</del> -	+ .	1 .
CARYOPHYLLACEAE (Pink Family) Polycarpon tetraphyllum (L.) L. Silene gallica L.	lowered	< ××	+ + +	+ 1	+ 1
CHENOPODIACEAE (Goosefoot Family) Chenopodium carinatum R. Br.	keeled goosefoot	<b>∜</b> ≻	<b>⊦</b> -	i -	ı
CONVOLVULACEAE (Morning-glory Family) Ipomoea alba L. Ipomoea indica (J. Burm.) Merr.	moonflower, koali pehu koali 'awa, koali 'awahia	<b>∻</b> ×⊢	F 14	+ 1-	. +-
CRASSULACEAE (Orpine Family) Kalanchoe pinnata (Lam.) Pers.		ı >	- 4	<b> -</b>	<b>.</b>
EUPHORBIACEAE (Spurge Family) Euphorbia heterophylla L. Ricinus communis L.	kaliko castor bean, koli	<b>*</b> ××	F 14	1 1	+ +.
FABACEAE (Pea Family) Acacia farnesiana (L.) Willd. Acacia mearnsii De Wild. Chamaecrista nictitans (L.) Moench Crotalaria pallida Aiton Desmodium sandwicense E. Mey. Erythrina sandwicensis Degener Glycine wightii (Wight & Arnott)		* ×××××	+ ++++	' ++ ' ' ' +	+
verdc. Indigofera suffruticosa Mill.	glycine indigo, 'iniko	××	+ +	ı <del> </del>	+ +

Scientific name	Сомпоп паще	1	Vegeta	Vegetation type	ype
Leucaena leucocephala (Lam.) de wit		Scarus	bw±	1-c	<b>co</b> )
Macroptilium lathyroides (L.) Urb. Medicago lupulina L. Medicago polymorpha L.	koa-naole Wild bushbean, cowpea black medic	×××	1 1 +	1 +	+ 1
Frosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	bur clover	×	+	1 1	1 1
Senna pendula (Humb. & Bonpl. ex Willd.) H. Irwin & Barneby	kiawe	×	1	+	+
LYTHRACEAE (Loosestrife Family) Cuphea carthagenensis (Jacq.) Macbr.	tarmed Colonia	×	+	t	+
MALVACEAE (Mallow Family) Abutilon grandifolium (Willd.)	contombian cuphea	×	1	ı	+
Malva parviflora L. Halvastrum coromandelianum (L.)	hairy abutilon, mao cheese weed	××	++	++	+ 1
Sida fallax Walp. Sida rhombifolia L.	false mallow, hauuoi 'ilima Cuba inte	×н	++	+ +	+ +
MELIACEAE (Mahogany Family) Melia azedarach L.	V. Pride of	×	+	1	. 1
MENISPERMACEAE (Moonseed Family)		×	ı	+	+
Cocculus trilobus (Thunb.) DC.	huehue				
MYRTACEAE (Myrtle Family) Psidium guajava L.	enava brosso	<b></b>	+	1	+
NYCTAGINACEAE (Four-o'clock Family) Mirabilis jalapa L.	out to the second	×	+	ı	1
ONAGRACEAE (Evening Primrose Family) Oenothera stricta Ledeb, ex Link	Lour-o clock, naniahiahi	×	ı	1	+
VIITH UN I	evening primrose	>			

Scientific name	Common		Vegetation type	tion	type
	Common Hame	Status	bwf	1-1	<b>∞</b> 0∤
OXALIDACEAE (Wood Sorrel Family) Oxalis corniculata L.	yellow wood sorrel 'ihi	ţ			
PAPAVERACEAE (Poppy Family) Argemone glauca (Nutt. ex Prain) Pope Bocconia frutescens L.	, pua-ka	Н E3;	+ +	. +	+ 1
PASSIFLORACEAE (Passion Flower Family) Passiflora subpeltata Ort.	white passion flower	<b>≺</b> ;	t	1	+
PHYTOLACCACEAE (Pokeweed Family) Phytolacca octandra L.	Southern nokehowan	× :	+	+	+
PLANTAGINACEAE (Plantain Family) Plantago lanceolata L.	narrow-leaved -1	×	+	1	ı
PLUMBAGINACEAE (Leadwort Family) Plumbago zeylanica L.	"ilihe'e hilie'	× ,	+	+	1
PORTULACACEAE (Purslane Family) Portulaca oleracea L. Portulaca pilosa L.		т <b>х</b> :	1 1	, +	+ +
PRIMULACEAE (Primrose Family) Anagallis arvensis L.	scarlet pimpernel	× ;	+	1	1
ROSACEAE (Rose Family) Eriobotrya japonica (Thunb.) Lindl. Osteomeles anthyllidifolia (Sm.) Lindl. Rubus sp.	loquat, biwa 'ulei, u'ulei	ч хн	+ 11	1 1+	1 + 1
SAPINDACEAE (Soapberry Family) Dodonaea viscosa Jacq.	'a'ali'i	х н	+ 1	+	+ 1

Scientific name	Common name	Status	Vegeta bwf	Vegetation type by I-c B	:ype
SOLANACEAE (Tomato Family) Solanum linnaeanum Hepper & P. Jaeger	apple of Sodom, popolo	>	4	+	ı
Nicotiana glauca R.C. Graham Physalis peruviana L. Solanum americanum Mill.	tree tobacco poha popolo	txxi	-+ ++	- 1 1 1	1++1
STERCULIACEAE (Cacao Family) Waltheria indica L.	'uhaloa, hi'aloa, kanakaloa	¿I	+	+	+
TILIACEAE (Linden Family) Triumfetta semitriloba Jacq.	bur bush	×	+	+	+
VERBENACEAE (Verbena Family) Lantana camara L.	lantana, lakana	×	+	+	+
Stacnytarpheta dichotoma (kuiz œ Pav.) Vahl Verbena litoralis Kunth	owi, oi weed verbena	××	+ +	1 1	+ 1

SURVEY OF THE AVIFAUNA AND FERAL MAMMALS SURVEY OF THE AVIFAUNA AND FERAL MAMMALS AT DEPARTMENT OF HAWAIIAN HOMELANDS - KULA RESIDENTIAL LOTS, UNIT I, KULA, MAUI

Prepared for Munekiyo and Arakawa, Inc. by

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2 November 1994

#### INTRODUCTION

The purpose of this report is to summarize the findings of a three day (29 August, 28, 29 October 1994) bird and mammal field survey of approximately 655 acres at Kula, Maui (Fig. 1). Also included are references to pertinent literature and unpublished reports.

The objectives of the field survey were to:

- 1- Document what bird and mammal species actually or potentially occur on the property.
- 2- Provide some baseline data on the relative abundance of each species.
- 3- Note the presence or likely occurrence of any native fauna particularly those that are listed as "Endangered" or "Threatened".
- 4- Determine if the property contains any special or unique resources that if lost or altered by development might result in a significant impact on the native fauna in this region of the island.

### SITE DESCRIPTION

This long narrow property extends from 3,000 ft. elevation down to 1,800 ft. The 655 acres contain several habitat types. The higher sections are dominated by Black Wattle. The lower elevation contains Prickly Pear Cactus and Kiawe. Cleared areas along the existing ranch roads and fenceline are in pasture with Kikuyu grass. The topography of this property is steep. No wetland habitat was found on this site.

The weather during the survey was clear and cool. Winds were light. Visual and auditory observation conditions were excellent.

### STUDY METHODS

The property was surveyed on foot and by vehicle following existing roads and trails which traverse the property. Field observations were made with the aid of binoculars and by listening for vocalizations.

At scattered locations throughout the site, eight minute counts were made of all birds seen or heard. These data provide the basis for the relative abundance estimates given in Table One. Published reports of birds known from similar habitat on Maui were also consulted in order to acquire a better perspective of the

possible fauna that could occur in this region and their potential relative abundance (Pratt et al. 1987, Hawaii Audubon Society 1993). Observations of feral mammals were limited to visual sightings and evidence in the form of scats and tracks. No attempts were made to trap mammals in order to obtain data on their relative abundance and distribution.

Scientific names of birds and mammals used in this report follow those given in Hawaii's Birds (Hawaii Audubon Society 1993); A field guide to the birds of Hawaii and the Tropical Pacific (Pratt et al. 1987) and Mammal Species of the World (Honacki et al. 1982).

### RESULTS AND DISCUSSION

### Resident Endemic (Native) Birds:

The only endemic native landbird recorded on the survey was the Common Amakihi (Hemignathus virens). This species is not listed as endangered or threatened. They are the most abundant and widespread of the native landbirds. Common Amakihi will utilize habitat with second growth introduced plants as well as native forest. A total of ten Common Amakihi were tallied over the course of the field survey. The Short-eared Owl or Pueo (Asio flammeus sandwichensis) forage in agricultural fields and pastures as well as in forested upland habitats (Hawaii Audubon

Society 1993). They are frequently seen in Kula and upcountry Maui. None were recorded on this survey, however, I have seen them in this region on past occasions. This species is listed by the State of Hawaii as endangered on the island of Oahu but not on Maui. No other native resident landbirds would be expected on this property.

### Migratory Indigenous (Native) Birds:

Migratory shorebirds winter in Hawaii between the months of August through May. Some juveniles will stay over the summer months as well (Johnson et al. 1981, 1983, 1989). The most abundant shorebird species which winters in Hawaii is the Pacific Golden-Plover (Pluvialis fulva). Plover forage in open areas such as mud flats, lawns, pastures. plowed agricultural fields and roadsides. Plover are extremely site-faithful and most establish winter foraging territories which they defend vigorously. Such behavior makes it possible to accurately census the plover population in a particular area. These populations likewise remain relatively stable over many years (Johnson et al. 1989). A total 36 plover were recorded on the survey. These birds were seen along the ranch roads and in other open habitats on the site. The only other migrant which may occur in this area is the Ruddy Turnstone (Arenaria interpres). Neither the plover nor the turnstone are listed as endangered or threatened.

### Resident Indigenous (Native) Seabirds:

No seabirds were recorded nor would any be expected at this location. Predators such as dogs, cats and the Small Indian Mongoose (Herpestes auropunctatus), along with human disturbance inhibit seabird nesting at all but a few isolated locations on the main Hawaiian Islands.

### Resident (Native) Waterbirds:

No wetland habitat was found on this property. No waterbirds would be expected at this site. The endangered Nene or Hawaiian Goose (Neochen sandvicensis) occurs at higher elevation in Haleakala National Park. It would be unusual to find them on this property. Nene have been introduced recently to Kauai were they utilize ranchlands and pastures. On Maui they are normally seen at higher elevation in more alpine and subalpine habitat.

### Exotic (Introduced) Birds:

A total of 14 species of exotic birds were recorded during the field survey. Table One shows the relative abundance of each. In addition to these species other exotic birds which potentially could occur on the property include: Chukar (Alectoris chukar), Wild Turkey (Meleagris gallopavo), Cattle Egret (Bubulcus ibis), Barn Owl (Tyto alba), Red Avadavat (Amandava amandava) and Redcrested Cardinal (Paroaria coronata) (Pratt et al. 1987; Hawaii

Audubon Society 1993).

### Feral Mammals:

Small Indian Mongoose were observed on the survey. Cat tracks were also seen. Axis Deer (Axis axis) were sighted throughout the property. Based on the number of sightings and the abundance of their tracks they must be fairly numerous in this region. Records of the endemic and endangered Hawaiian Hoary Bat (Lasiurus cinereus semotus) on Maui are limited (Tomich 1986; Kepler and Scott 1990). One bat was observed at 1800 hours on 28 October. The bat was foraging over the pasture near Highway 37 at the northeast edge of the property. This species is known to roost solitarily in trees and forages for flying insects using echolocation. They have been reported from a variety of habitats including native forest, alpine habitat, agricultural lands, second growth forest, ranchlands, ponds and bays as well as in urban areas. The life history of this species is not well known. Kepler and Scott (1990) suggest that bats occur on Maui only as a "migrant", probably from the Big Island". Others (Duvall and Duvall 1991), report evidence that would suggest there may be a resident breeding population of bats on Maui.

### CONCLUSION

A short field survey can only provide a limited view of the wildlife that may use the site. The number of species and their relative abundance may vary throughout the year due to resource (food, water) availability and reproductive success. Species which are migratory will only be an important part of the faunal picture at certain times during the year. Exotic species sometimes prosper for a time only to later disappear or become a less significant part of the faunal community (Williams 1987; Moulton 1990). Thus only long term studies can provide a comprehensive view of the bird and mammal populations in a particular area. However, some general conclusions related to bird and mammal activity at this site can be made. Below is a summary of the findings of this survey.

- 1- The site was surveyed by walking and driving the roads and trails which traverse the property. All habitat types found on the property were sampled. Census data on birds were obtained at random locations throughout the property and are reported in Table One.
- 2- The migratory Pacific Golden-Plover was found on the open pasture lands and along roadsides. This is a typical wintering habitat for this species. Plover are not endangered or threatened.

- 3- The only native resident bird found on the survey was the endemic Common Amakihi. This species is the most abundant and widespread of the native forest birds. They are not listed as endangered or threatened. The native owl (Pueo) occurs in this region but was not recorded on this survey. They are not endangered or threatened on Maui. The endangered Hawaiian Goose (Nene) occurs at higher elevation in Haleakala National Park. They would be unlikely to occur on this property.
- 4- The list of exotic birds recorded on the survey (Table 1)
  was typical for this region of Maui. No unexpected sightings
  were obtained. None of these species is listed as endangered
  or threatened.
- 5- Axis Deer, Small Indian Mongoose and cats were recorded at this site. The endangered Hawaiian Hoary Bat was seen foraging above the pasture lands at the NE edge of the property. The occurrence and abundance of this species on Maui has not been extensively studied.
- 6- This property has been significantly altered by introduced vegetation and ranching. Nevertheless, native birds and mammals were recorded. I did not find any unique or special resources on this site. Disturbed second growth forest/ranch land is common in this region of Maui.

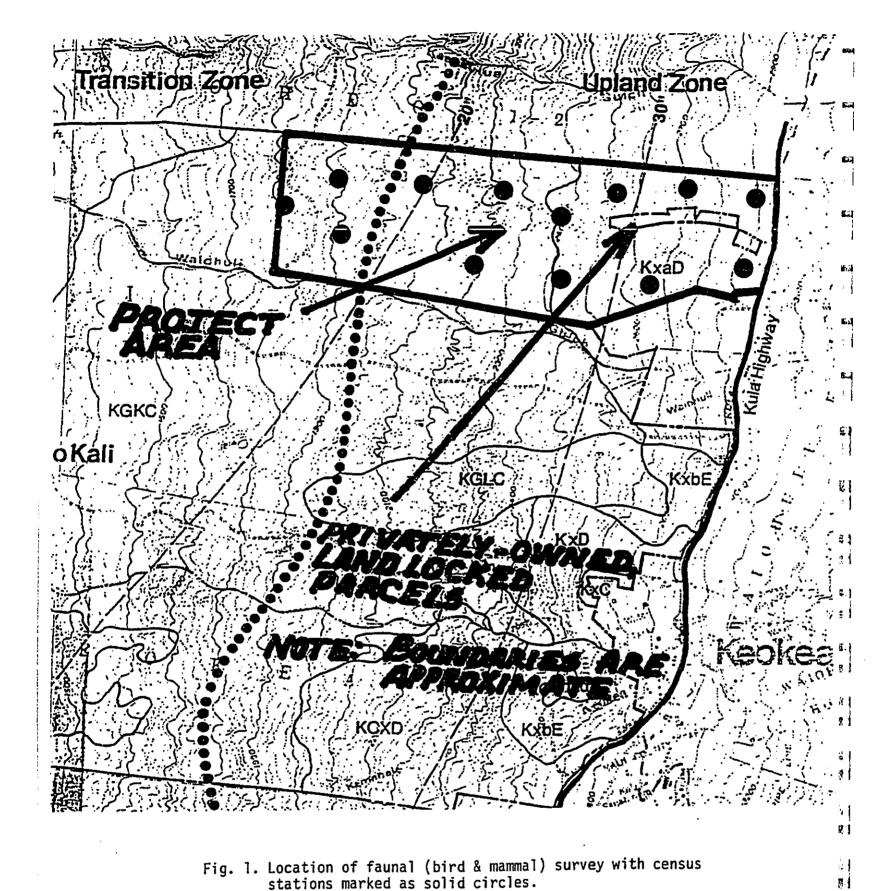


Fig. 1. Location of faunal (bird & mammal) survey with census stations marked as solid circles.

81

8

TABLE 1

Exotic species of birds recorded at the Department of Hawaiian Homelands, Kula Residential Lots, Units I, Kula, Maui.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE*
Ring-necked Pheasant	Phasianus colchicus	R = 3
Black Francolin	Francolinus francolinus	R = 3
Gray Francolin	Francolinus pondicerianus	A =12
Spotted Dove	Streptopelia chinensis	C = 7
Zebra Dove	. Geopelia striata	A =10
Eurasian Skylark	Alauda arvensis	A =13
Common Myna	Acridotheres tristis	6 = J
Leiothrix	Leiothrix lutea	9 = 3
Northern Cardinal	Cardinalis cardinalis	9 = 3
Northern Mockingbird	Mimus polyglottus	C = 7
Japanese White-eye	Zosterops japonicus	A =10
Nutmeg Mannikin	Lonchura punctulata	9 = 0
Warbling Silverbill	<u>Lonchura</u> malabarica	Ų = 4
House Finch	Carpodácus mexicanus	A =11

\*(see page 11 for key to symbols)

### KEY TO TABLE 1

Relative abundance = Number of times observed during the survey or frequency on eight minute counts in appropriate habitat.

A = abundant (ave. 10+)

C = common (ave. 5-10)

U = uncommon (less than 5)

R = recorded (seen or heard on one count only or at times other than on 8 min. counts. Number which follows is the total number of individuals seen or heard)

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ARCHAEOLOGICAL INVENTORY SURVEY

# Archaeological Inventory Survey Keokea and Waiohuli Subdivisions

Lands of Keokea and Waiohuli Makawao District, Island of Maui



Paul H. Rosendahl, Ph.D., Inc.

Archaeological · Historical · Cultural Resource Management Studies & Services

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Report 442-050289

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# Archaeological Inventory Survey Keokea and Waiohuli Subdivisions

# Lands of Keokea and Waiohuli Makawao District, Island of Maui

(TMK:2-2-02:55,56)

by

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November 1989



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## **SUMMARY**

At the request of the Department of Hawaiian Home Lands (DHHL), Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey of Keokea and Waiohuli Subdivisions, situated in the Lands of Keokea and Waiohuli, Makawao (Kula) District, Island of Maui (TMK:2-2-02:55,56). The subdivisions are comprised of 1,025 acres (351 in Keokea and 674 in Waiohuli) and range in elevation from 1,800-3,000 feet AMSL (above mean sea level). The survey field work was conducted between January 17, 1989 and March 30, 1989. During the survey, 159 sites consisting of 274 features were formally designated. Sites consisted of both single and multiple features and included a wide range of formal and functional types. Minor agricultural features in the project areas—which number in the hundreds—were not designated nor documented in detail; they were, however, generally described, and their extents and spatial relationships were plotted.

Waiohuli Subdivision has undergone extensive bulldozing. As a result, sites in Waiohuli are in generally poorer condition than those in Keokea Subdivision. Sites in Keokea are, in most instances, intact, and the area contains excellent examples of extensive agricultural and habitation complexes. Significant resources present in the project areas include heiau, human burials, intact dryland agriculture field systems, and residential complexes. These resources could be adversely affected by the proposed development.

Of the total 159 sites identified during the present survey, 108 are in Keokea and 51 are in Waiohuli. Of the 108 Keokea sites, 94 are assessed as significant solely for information content. Eighty-nine of the 94 sites are recommended for further data collection, and five of the 94 sites are recommended for no further work. Four of the remaining 14 sites are assessed as significant for information content, as an excellent example of a site type, and for cultural value. Further data collection and preservation with interpretive development are recommended for these four sites. Three of the remaining 14 sites are assessed as significant for information content and as an excellent example of a site type. For these three sites, further data collection and preservation with interpretive development are recommended. Another three sites are assessed as significant for information content and for cultural value; these three sites are recommended for further data collection and preservation as is. Three other sites are assessed as significant for information content and are tentatively assessed as

significant for cultural value. These three sites are recommended for further data collection and are provisionally recommended for preservation as is. The last site is assessed as significant for information content and as having cultural value. For this site, further data collection is recommended.

Of the 51 sites in Waiohuli Subdivision, 42 are assessed as significant solely for information content. Thirty-three of these 42 sites are recommended for further data collection, and nine of the 42 sites require no further work. Of the remaining nine sites, three are assessed as significant for information content, as excellent examples of a site type, and as culturally significant. Further data collection and preservation with interpretive development are recommended for these three sites. Two of the remaining six sites are assessed as significant for information content and are provisionally assessed as having cultural value. For these two sites, further data collection is recommended and preservation with interpretive development is provisionally recommended. The final four sites are assessed variously and require various recommended treatments (see Table 7 in Conclusions section for specific recommendations).

# CONTENTS

I .	Page
ENTRODUCTION	1
Background	1
Project Area Description	2 2
Summary of Historical Documentary Research	4
and Informant Interviews, by Helen Wong Smith, B.A.  Methods and Procedures	5
FINDINGS	7
Archaeological Sites	7 16
Limited Surface Collections  Limited Test Excavations	16
DATA ANALYSES	18
Chronology Portable Remains	18 18
CONCLUSION	27
Evaluation of Survey Methodology  Discussion	27 27
Suggested Research Questions	27
General Significance Assessments and Recommended General Treatments	
REFERENCES CITED	38
APPENDIX A: Summary of Identified Sites and Features - Waiohuli	A-1
APPENDIX B: Summary of Identified Sites and Features - Keokea	
APPENDIX C: Limited Historical Documentary Research and Informant Interviews, by Helen Wong Smith, B.A.	C-1
APPENDIX D: Site Descriptions - Waiohuli	D-1
APPENDIX E: Site Descriptions - Keokea	
APPENDIX F: Additional Site Information:	F-1

# ILLUSTRATIONS

Figure	, I	Page
•		3
1	Project Area Location Map	12
2	Site Location Map - Waiohuli Subdivision	13
3	Site Location Map - Keokea Subdivision	17
4	Distribution of Agricultural Features	21
5	Age Determination Ranges	
C-1	1938 Map Showing Project Area and LCA Locations	D-4
D-1	Site W-13, Features A and B	D- 7
D-2	Site W-21	D-8
D-3	Site W-27	D- 9
D-4	Site W-27, Cupboard (photograph)	D-10
D-5	Site W-28	D-10 D-12
D-6	Site W-32	D-12
D-7	Site W-36	D-15
D-8	C:- W7 45	10-10
D-9	C: 37 £7	D-10
D-10	G:_ 117 77	T)-T()
D-11	Circ 117 77 117-11 with I Tonighte (shotograph)	TO-10 E
D-12	Circ W On Entering to Historic Rurial (photograph)	
E-1	Cia V 7 Esperant A and B	• •••
E-2	Cir. V 27 Overhood (photograph)	10
E-3	Ci- V 20	<b>-</b> -13
E-4	City V 40 Overhood (photograph)	
E-5	Circ V 40 NE Wall of Feature A (photograph)	L-17
E-6	Cita V 49 Cannos B	
E-7	Circ V 50 Ceaning B (photograph)	A-4 - 44 - Y
E-8	C: V CA	
E-9	Circ V 60 Wall and Waterrank (photograph)	<b>~</b> -31
E-10	Circ IC 07 Burial Diagram (photograph)	<u></u>
E-11	Site K-148, Feature B (photograph)	E-41
50000	TABLES	· . · · · · · · · · · · · · · · · · · ·
Table		
1	Correlation of Site Numbers	. 8
2	Frequencies of Formal Feature Types	. 14
3	Frequencies of Functional Site Types	. 13
4	Summary of Radiocarbon Age Determinations	. 17
5	Summary of Portable Artifact Types	. 22
6	Distribution of Ecofactual Remains	. 25
7	Summary of General Significance Assessments	
•	and Recommended General Treatments	. 30
8	Lots Which Amear to Contain Sites	
ū	or Portions of Siles Recommended for Preservation	. 36
9	Residence Lots Con'aining Sites	. 37

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## INTRODUCTION

### **BACKGROUND**

At the request of the Department of Hawaiian Home Lands (DHHL), Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey of Keokea and Waiohuli Subdivisions, situated in the Lands of Keokea and Waiohuli, Makawao (Kula) District, Island of Maui (TMK:2-2-02:55,56). The overall objective of the survey was to provide information appropriate to and sufficient for satisfying the requirements of Chapter 6E, Historic Preservation, Hawaii Revised Stantes, as amended. Field investigations were conducted between January 17, 1989 and March 30, 1989 under the supervision of PHRI Supervisory Archaeologist Roderick S. Brown, and under the overall direction of PHRI Senior Archaeologist Dr. Alan E. Haun.

### **SCOPE OF WORK**

The basic purpose of an inventory survey is to identifyto discover and locate on available maps—sites and features of potential archaeological significance present within a specified project area. Formerly called a reconnaissance survey and more recently referred to as an inventory survey. the survey comprises the initial level of archaeo- logical investigation. It is extensive rather than intensive in scope, and is conducted basically to determine the presence or absence of archaeological resources within a specified project area. It indicates both the general nature and variety of archaeological remains present, and the general distribution and density of such remains. Finally, it permits a general significance assessment of the archaeological resources, and facilitates formulation of realistic recommendations and estimates for such further work as might be necessary or appropriate. Such work could include intensive surveydata collection involving detailed recording of sites and features, and selected test excavations; and possibly subsequent mitigation-data recovery research excavations, construction monitoring, interpretive planning and development, and/or preservation of sites and features with significant scientific research, interpretive, and/or cultural values.

The significance of all archaeological remains identified within the project areas was to be assessed in terms of the National Register criteria contained in the Code of Federal Regulations (36 CFR Part 60.4). These criteria are used by Department of Land and Natural Resources - Historic Sites Section (DLNR-HSS) to evaluate eligibility for both the Hawaii State and National Register of Historic Places.

The specific tasks for the current inventory survey were as follows:

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- 1. Documentary Historical Research The specific purposes of this work were (a) to locate and summarize readily available relevant documentary resources (books, maps, journals, archival records, and other materials) relating to the <u>ahupuaa</u> and project areas; (b) to integrate and synthesize the findings of this research in order to define prehistoric, early historic, and later historic land use patterns; and (c) to assess the potential for any further research that might be appropriate in connection with subsequent mitigation work required for subdivision development.
- 2. Archaeological Background Research The specific purposes of this work were: (a) to
  locate and review all prior archaeological research
  conducted within the project area ahupuaa; (b) to
  summarize the past research in terms of the extent
  and intensity of survey coverage and in terms of the
  age, function, and distribution of previously identified
  sites; and (c) to prepare a revised summary of past
  land use defined on the basis of historical
  documentary research.
- 3. Oral Historical Research The specific purposes of this work were: (a) to locate and interview knowledgeable local residents to determine their knowledge of past land use patterns and to elicit information concerning the age and function of specific sites; (b) to summarize and integrate the research findings with those from the historical documentary research and archaeological survey; and (c) to assess the potential for any further research that might be appropriate in connection with subsequent mitigation work required for subdivision development.
- 4. Inventory Survey Field Work Inventory survey field work was to consist of the following specific tasks: (a) conduct 100% coverage low-level (c. 30-50 ft altitude) aerial reconnaissance (helicopter) of the entire 1,000-acre project area, with special emphasis upon identifying all sites observed and plotting them on aerial photographs and/or maps, and identifying areas devoid of sites (e.g., mechanically altered lands); (b) conduct 100%

coverage, variable-intensity (30-to 90-ft intervals) ground reconnaissance of the entire project area, with relatively higher intensity coverage being given to undisturbed lands and relatively lower intensity coverage to mechanically altered lands; (c) record identified sites, including preparation of scaled sketch plan maps, completion of standardized PHRI site forms, and photographic recordation; and (d) conduct limited subsurface testing when necessary to accurately determine the extent (spatial and/or temporal) of site in order to assess its significance.

5. Data Analysis and Reports - Both Interim and Final reports were to be prepared. The Interim report was to summarize (a) the relevant project background, (b) field work completed and findings, (c) preliminary interpretation and evaluation of findings, (d) assessment of potential development impacts upon significant remains, and (e) specific recommendations for any further archaeological work that might be appropriate and/or required. The Final Report was to include (a) the full description of project findings, (b) interpretation and evaluation of these findings, and (c) specific recommendations and justifications for any subsequent mitigation work that might be necessary or appropriate.

### PROJECT AREA DESCRIPTION

Both proposed subdivisions are situated on the western slope of Mt. Haleakala, in Makawao (Kula) District, Island of Maui (Figure 1). The Keokea parcel consists of 351.41 acres (142.22 hectares), and the Waiohuli parcel consists of 673.99 acres (272.76 hectares). Combined, the two parcels total 1,025.40 acres (414.99 hectares). Each subdivision comprises the north-central portion of the ahupuaa which bears its name. The parcels are both bounded on the east by Highway 37. The northern and western boundaries of both parcels are fenced. Waiohuli Gulch more or less marks the southern boundary of the Waiohuli parcel. The southern boundary of the Keokea parcel is delineated by a high, stone cattle wall.

Both parcels are characterized by gentle to moderately steep west-facing dissected alluvial and volcanic slopes. Elevation in the Keokea parcel ranges from 2,225-2,850 ft AMSL, and in the Waiohuli parcel ranges from 1,800-3,000 ft AMSL. Drainages in the Keokea parcel are small and, for the most part, are poorly defined. Three large guiches extending east to west dissect the Waiohuli parcel; the guiches are fed by many smaller channels which drain the intervening slopes. Soils over all of the Keokea parcel and

the eastern majority of the Waiohuli parcel are well-drained, with medium to moderately fine-textured subsoils of the Pu'u Pa-Kula Pane association. The eastern periphery of the Waiohuli parcel is overlaid with well-drained very stony soils and fine- to medium-textured subsoils of the Keawakapu-Makena association (Foote et al 1972). The soils in both parcels are derived from decomposed lava flows and ash of the Kula and Hana Volcanic Series which are, respectively, eight and four hundred thousand years old.

Both parcels are dominated by introduced vegetation including black wante (Acacia decurrens Willd.), Christmasberry (Schinus terebinthifolius L.), lantana (Lantana camara L.), prickly pear or panini (Opuntia megacantha Salm-Dyck), koa-haole (Leucaena glauca L.), kiawe (Prosopis pallida L. Benth), grasses dominated by Kikuyu grass (Pennisetun clandestinum Hochst) and Chinaberry (Melia azedarach L.). Endemic vegetation includes abundant ilima (Sida spp.) and occasional wiliwili (Erythrina sandwicensis Degener).

Black wattle forests dominate the eastern halves of both parcels, probably as a result of the extensive and recurrent ground disturbance associated with recent habitation in higher elevations. Lantana is a dominant plant in the lower western portions of both parcels. Lantana is almost impenetrably dense in western Keokea where it is interspersed by occasional prickly pears. In western Waiohuli, lantana and prickly pear co-dominate and impair movement and visibility.

## PREVIOUS ARCHAEOLOGICAL WORK

The only early previous archaeological work conducted in the project area was by Thrum (1907) and Walker (1931). Thrum included Papakea, Kaumeheiwa, and Molohai heiau on a list of Maui heiau sites he compiled in the early decades of this century. Later, the three heiau were placed on the Hawaii Register of Historic Places. Walker listed and described 26 heiau in the Kula region.

In 1986, DHHL contracted B.P. Bishop Museum to monitor trailblazing for subdivision fences and to conduct an archaeological reconnaissance survey of both of the present proposed subdivisions (Riford 1987). This effort resulted in the discovery of 113 archaeological sites and "more than 252 archaeological features." During the study, the above-mentioned heiau and a diversity of prehistoric and historic agricultural, residential, and ceremonial sites were recorded. The survey focused on areas where residential lot awards are proposed. More than 410 acres of the total c. 1,025 acres comprising the project area were not examined during that survey.

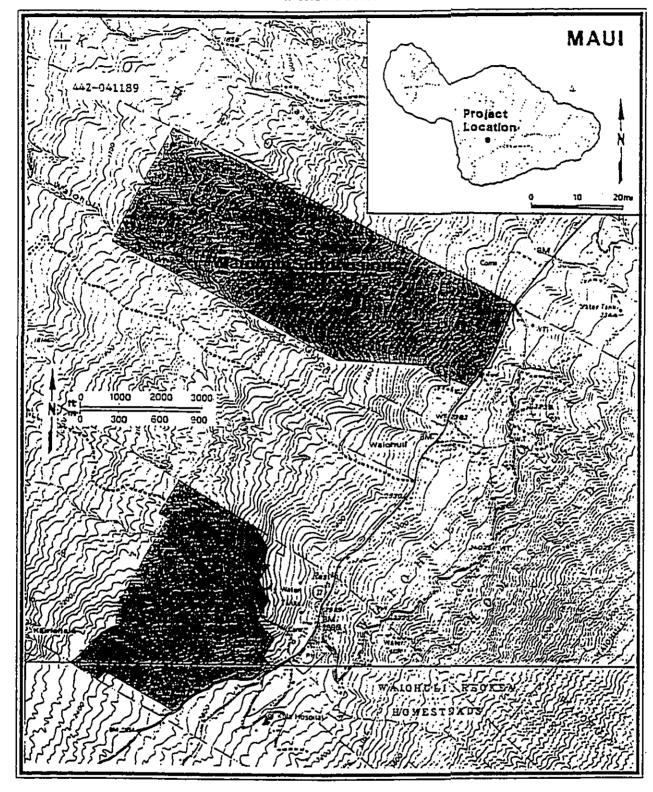


Figure 1. PROJECT AREA LOCATION MAP

Keokea and Waiohuli Subdivisions
Lands of Keokea and Waiohuli, Makawao District, Island of Maui
(TMK:2-2-02:55,56)
PHRI Project No. 88-442 April 1989

21

### SUMMARY OF LIMITED HISTORICAL DOCUMENTARY RESEARCH AND INFORMANT INTERVIEWS

The complete limited historical documentary research for the present project was conducted by PHRI Research Historian Helen Wong Smith, B.A.. Her report includes information obtained from the usual historical sources found in libraries, and information from other sources such as land and tax records, archaeological reports, maps, and various other manuscripts. The information in Wong's report is organized into five sections: Early Historical Accounts, Heiau in the Project Area, Land Commission Award (LCA) Information, Land Use and Tenure Information, and Informant Interviews.

Early accounts concerning the Makawao District generally either describe the area or relate early historical events. Ashdown (n.d.)' writes, "kula-o-ka-ma'o-ma'o or Land of Mirages, where lost souls wandered until they could find their way to rest. The rain of Makawao is described by Mrs. Miverva Kalama to Sterling (n.d.) in this way: "ukiu rain = a soft drizzle (the ua Kama'aina of Makawao) when the kiu rain cloud from Makawao meets the Naulu rain cloud from Kula then the rain comes, the typical Makawao rain. Other early accounts, by Fornander and Kamakau, mention Makawao in relation to early historical events.

Three heiau are present in Keokea project area—Molohai, Papakea, and Kaumiumimua heiau. Ashdown (1971:46) mentions other heiau in Keokea and Waiohuli—Ho'ola and Ho'oula Ua heiau in Keokea and Kaimupeelua heiau in Waiohuli. Other heiau mentioned by historic writers in the Makawao district include Kailua heiau (Thrum 1909:44), and Pa'uhu, Mahea, Kaumuopahu (or Kaunuopahu), Po'onahoehoe and Mana heiau. The latter heiau is now part of a modern cemetery (Ashdown 1971:57).

Although there were many small parcels granted in Keokea and Waiohuli, the Indices states that Keokea was Crown Land from the beginning and that Waiohuli was approved as such in 1890 by Kalakaua. The numerous parcels may be a result of an experiment conducted by the Kamehameha III's administration prior the Great Mahele concerning trial fee ownership runs. In a report by Riford (1987), 11 Land Commission Awards (LCA) either within or bordering the Keokea parcel and eight LCAs within the

Waiohuli parcel are listed. The bulk of the parcels are designated as <u>kula</u> land and houselots (1987).

Concerning land use and tenure, Kula has been used primarily for agriculture throughout history. C. Speakman, in his book entitled <u>MOWEE</u> mentions the fervor of cash-cropping in Kula:

During the gold [potatoes] rush, hundreds of Hawaiians were going into business for themselves on Maui-growing potatoes and hauling them to the port where they were snapped up and shipped to San Francisco. The Maui fields were called Nu Caliponi, or New California; potatoes were gold, and a fortune could be dug out of the ground by one man (1978:116).

In addition to Irish potatoes, the Kula farmers planted corn, beans, onions, Chinese cabbage, round cabbage, sweet potatoes, wheat and other grains, and even cotton. In the early 1970s, 35% of Hawaii's vegetables were grown in Kula, including a large percentage of the state's head lettuce, dry onions, and tomatoes. Much of the remaining land was devoted to livestock breeding by about 20 full and part-time ranchers. Today the cash crops in Kula are vegetables other than corn and potatoes, and flowers.

Wong's report includes information on Kula Sanatorium, and also includes informant interviews. Kula Sanitorium was founded for the care of tuberculosis sufferers. Initially the sanitorium consisted of two tent-houses which accomodated 12 patients. The tent-houses, which included kitchen and dining facilities, was financed by the County and Territory and cost \$500.00. The first permanent ward was built by W.E. Foster, former patient and superintendent. Wong's informant interviews provide information primarily on Kaonoulu Ranch, for which the interviewees once worked.

According to Wong, during this century, the project area has been used primarily for cattle grazing, hence the many archaeological sites obscured by grasses and lantana. If further historical documentary research is conducted for the project area. Wong suggests that a check be made for awards given out during the Kingdom of Hawaii and that the following topics be addressed: prehistoric environment and occupation in the area, as evidenced by historical documents; and local and regional cultural and residential sequences.

<sup>\*</sup> References in summary are listed in Appendix C.

### METHODS AND PROCEDURES

### Field Work

The current field work was accomplished in five phases: preliminary field inspection, aerial (helicopter) survey, variable-intensity pedestrian survey, site recording, and limited surface collections and excavations.

Preliminary Field Inspection - PHRI Senior Archaeologist Dr. Alan E. Haun conducted a preliminary field inspection of portions of both Waiohuli and Keokea subdivisions in order to assess the project area terrain and vegetation with regard to logistical problems which might be faced by survey crews. In addition, Dr. Haun visited several previously recorded archaeological sites in each subdivision to evaluate the adequacy of existing archaeological records.

Helicopter Survey - On January 11, 1989, a low-level (30-50 ft. altitude) aerial reconnaissance survey was made of approximately 60% of both subdivisions. The areas surveyed included all portions of the project areas not obscured by black wattle forests (thus, eastern upslope portions were not examined aerially). Thirty-eight archaeological sites and/or features were identified from the air—34 in the Keokea parcel and four in the Waiohuli parcel. Each site/feature was flagged with weighted pink surveyor's tape, was labeled with a temporary aerial survey (AS) number, and was plotted on 1"=200' aerial photographs. A brief and very preliminary description of each site was recorded during the flight; these descriptions were upgraded during the subsequent variable-intensity 100% survey and recording phases of the field work.

Variable - Intensity 100% Coverage Ground Survey - The variable intensity ground survey began on January 17, 1989 and was completed on February 22, 1989. A crew of five archaeologists supervised by PHRI Supervisory Archaeologist Roderick S. Brown swept the entirety of both proposed subdivisions. Transects were spaced at 15-40 meter intervals. Transect spacing was determined exclusively by the surface integrity of the area being transected. In areas where no mechanical or erosional disturbance was evident, the survey interval was maintained at 15 meters. In disturbed areas the interval was increased to as wide as 40 meters. Surveyors were instructed to walk zigzag courses to search first for "islands" of undisturbed ground, and then to search within these "islands" for archaeological sites. The zigzagging resulted in an estimated maximum effective survey interval of 30 meters.

Locational control was maintained by plotting the course of each sweep on aerial photographs and/or 1"=200'scale topographic maps, and by marking each archaeologist's start and end points on each sweep with labeled surveyor's tape. As sites and features were encountered, each was marked with pink-and-blue surveyor's tape on which was labeled the project number (88-442), a temporary site number, and the date and name of the surveyor on whose transect the site was discovered. Each site was described in a field notebook at the time of discovery and was plotted on 1"=200' aerial photographs. Notation was made as to whether the site bore the (sometimes labeled) orange flagging with which some sites were marked by the Bishop Museum survey crew. Also noted were the direction and distance to nearby DHHL lot corner markers (where they existed) and the presence of aerial survey site markers.

Site Recording - Site recording began on February 22, 1989, immediately after the variable-intensity ground survey was completed. To facilitate the recording, two archaeologists were added to the field crew. The crew was divided into two teams of three persons each—one recorder, one mapper, and a rover, who measured, photographed, and described features and marked each site with an aluminum tag and flagging. Sites were recorded on standard PHRI site and feature forms. Scaled sketch maps were prepared of representative features and/or of the overall site configuration. Vegetation hampered visibility of, and even access to, some features, but the majority of features were adequately recorded.

During the pedestrian survey, sites and features were numbered as they were encountered. The numbering systems in each subdivision are independent. Temporary site numbers are prefixed by either "W-" (for Waiohuli) or "K-" (for Keokea). Site features were assigned letter designations (A,B,C,etc.).

During the pedestrian survey some sites of questionable nature were numbered. In some instances, subsequent examination of the questionable sites indicated they were natural or the result of recent ground disturbance; hence, the site was eliminated from site lists. Other sites were preliminarily recorded as separate entities and later were combined with other nearby sites and subsumed under a single site number. When sites were combined, the lowest site number was retained and other numbers were deleted; hence, the gaps in the numbering sequence. During the recording phase, many previously undiscovered sites were identified and were assigned numbers.

### Data Management

Data management, cartography, and report production were computerized. Preliminary site and feature data gathered during the ground survey were entered from the field notebooks into formatted dBASE IV files. Output from these preliminary files included formatted listings of site and feature information and direct electronic input of site location coordinates [easting (X), northing (Y) and elevation (Z)] to the computer-aided drafting program. Output of these data allowed recording crews to return to sites with

printouts containing preliminary site descriptions and with contour maps illustrating the locations of the sites to be recorded.

Soon after the recording of each site and feature, the data were entered into dBASE IV files. These data files were formatted to allow direct output of revised site and feature location maps and the extraction of selected data in tabular format for inclusion in the Interim and Final reports. In addition, report-ready site survey records and site/feature descriptions were generated from the data files.

## **FINDINGS**

### ARCHAEOLOGICAL SITES

During previous archaeological surveys of Waiohuli and Keokea subdivisions (Riford 1987), 113 sites consisting of 252 component features were identified. Three of the 113 sites, all heiau, were assigned SIHP site numbers—Papakea Heiau (50-50-10-1036), Molohai Heiau (50-50-10-1037) and Kaumeheiwa Heiau (50-50-10-1039). The remaining 110 sites were assigned temporary numbers. As part of the present work, the work on the earlier survey was consulted. It was found that records for 77 of the previously identified sites were incomplete. In addition, when an attempt was made to relocate the earlier sites in the field, definite field identifications were often impaired by unclear locational information in the report and by the lack of site markers in the field.

The present survey resulted in the formal identification of 159 sites consisting of 274 features. During the present survey, 53 previously identified sites were relocated. These sites were reassigned PHRI temporary numbers. Table 1 correlates previously identified sites with PHRI temporary site numbers. Figures 2 and 3 depict the locations of all identified sites. Appendices A and B summarize the sites and their component features. Appendices D and E provide detailed descriptions for each site and feature.

Appendices D and E include for each site:

- Site numbers either State Inventory of Historic Places (SIHP) numbers, Bishop Museum temporary numbers, if previously assigned, or PHRI temporary site numbers. PHRI temporary numbers are one, two, and three-digit numbers prefixed by "K-" or "W-";
- A site type designation provides formal feature type for sites consisting of a single feature, or designates the site as a complex if site includes more than one feature. Also lists total number of features present;

- A description of site topography a brief description of the terrain in the area of the site;
- 4. A listing of site vegetation lists principal components of the vegetation within and in the vicinity of the site;
- A statement of site condition overall state of preservation of the site (poor, fair, good, or excellent);
- An assessment of site integrity degree of historic modification by human agencies (unaltered, partially altered, and completely altered) and nature of modifications, if any;
- A probable age indicates probable/possible age of the site (i.e., historic or prehistoric);
- A functional interpretation probable or possible (\*) functions for each site; or, if function cannot be determined, assigns indeterminate function. For sites with multiple functions, functions separated by "/";
- Feature dimensions maximum length, width, and maximum area. Dimensions immediately followed by a description of feature construction, associated portable remains, and other descriptive information; and
- A site description a brief overall description of the site listing types of constituent features, portable remains present, if any, and other site data.

Appendix F provides UTM coordinates, elevations, and proximity to water for all sites.

<sup>\*</sup> State Inventory of Historic Places (SIHP) site designation system: all four-digit site numbers prefixed by 50-50-10 or 50-50-14 (50=State of Hawaii, 50=Island of Maui, 10 or 14=USGS 7.5' series quad map ["Puu o Kali" or "Makena," respectively]).

Table 1. CORRELATION OF SITE NUMBERS

PHRI emporary Number	BPBM Site Number (T-)	SIHP Site Number
W1		2344
W- 2	6	2345
W- 3	7	2039
W- 4	8	2346
W- 5		2347
W- 6	_	2348
W- 8	<del>-</del>	2349
W- 10	_	2350
W- 11	5	2040
W- 12		2351
W- 13	-	2352
W- 14	_	2353
W- 15		2354
W- 17	_	2355
W- 18		2356
W-20		2357
W- 21	_	2358
W- 27	36	T039
W- 28		2042
W- 30	110	2359
W- 31		2360
W- 32		2361
W- 35	105	2362
W- 36	_	2043
W- 37	104	2363
W- 42	<b>75</b>	2364
W- 45	72	2044
W- 46	71	2365
W- 47	107	2366
W-48	108	2367
W-49		2368
W- 55	_	2369
W- 57	_	2370
W- 58		2371
W- 59	81	2372
W- 60	<u></u>	2373
W- 65	_	2374
W- 67	_	2375
W- 71	101	2376
W- 73	101	2377
W- 75	86-87	2378
W-77	0 <del>0-0</del> 7	2378
W- 80		2380
** - 40		∪ەت.

Table 1. (cont.)

Table 1. (cont.)		
PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
W- 83		2382
W- 88		2383
W- 90	_	2384
W- 96		2385
W- 97		2386
W- 98	69-70*	2387
W-101		2388
<b>K-</b> 1	15	2046
K- 2	16	2047
K- 3	14	2028
K- 4	19	2048
K- 5		2049
K- 6		2029
K- 7	22	2030
K- 8	_	2050
K- 9	38	2051
K- 10	-	2052
K- 11	39	2053
K- 12		2054
K- 13	_	2055
K- 14		2056
K- 16		2057
K- 19		2058
K- 20		2059
K- 21		2060
K- 25	_	2061
K- 26	64	2062
K- 27	62	2063
K- 29	63	2064
K- 30		1037
K- 31	13	2065
K- 32		2066
K- 35	<u> </u>	2067
K- 36	_	2032
K- 39		2068
K- 40	<del></del>	2069
K-41		2070
K-42		2071
K- 44	•	2072
K- 45	60	2073
K- 46	60	2074
K- 48	61-17-58	2033
K- 50		2075
K- 51	<u> </u>	2076
K- 52	31	2077

Table 1. (cont.)

PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
K- 53		2078
K- 54	30	2079
K- 55	_	2080
<b>K-</b> 57	_	2081
K- 59	_	2082
K- 60	_ _ _	2083
K- 62	_	2084
K- 63	_	2085
K- 64		2034
K- 65		2086
K- 69	37	2087
K- 70	27	2088
K- 71		2089
K- 76		2090
K- 78		2091
K- 79	_	2092
K- 80	46	2093
K- 81	_	1036
K- 84	55	2095
K- 85	_	2096
K- 87	25	2097
K- 89		2098
K- 90	_	2099
K- 95	_	2300
K- 96	_	2301
K- 97	— — — —	2302
K- 98	_	2303
K- 99	3	2304
K-100	_	2305
K-101	24	2306
K-102		2307
K-103	<u></u>	2308
K-105	_	2035
K-106	_	2310
K-107		2311
K-108	_	2312
K-109	<del></del>	2313
K-109 K-110	48	2314
K-111	70	2036
K-111 K-112	43	2315
K-112 K-115	43 42	2316
K-115 K-116		2317
K-118	41	2318
	<del></del> 40	2319
K-120	40	
K-124 K-127	<del>-</del>	2037 2320

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Table 1. (cont.)

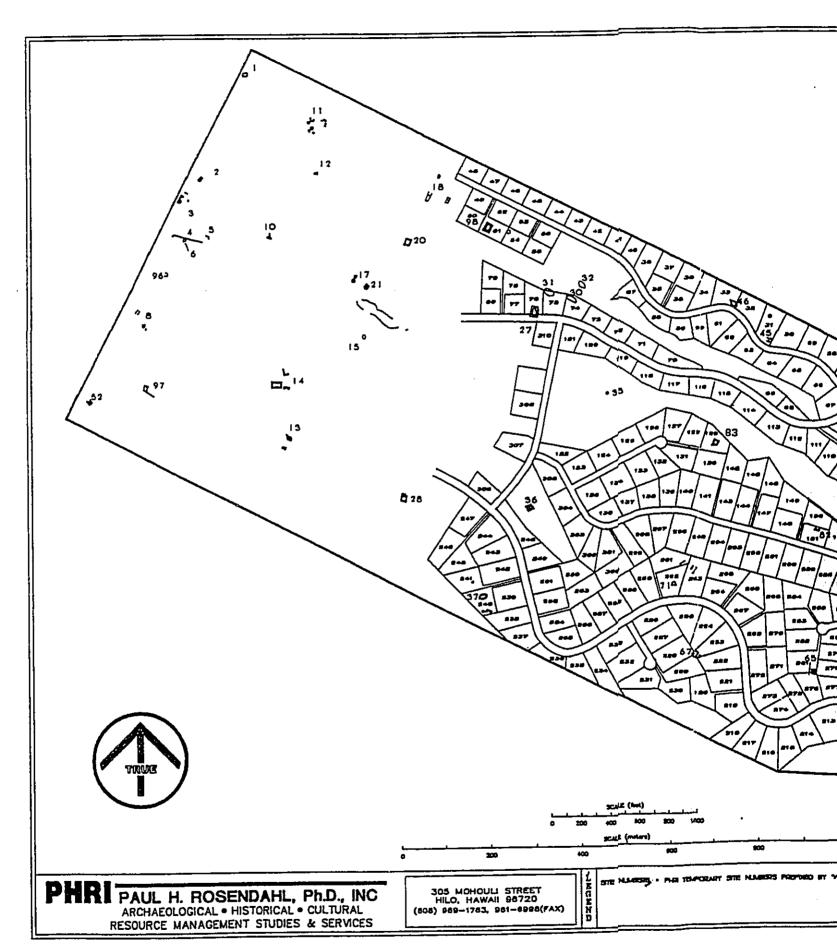
Table 1. (cont.)		
PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
K-130		2038
K-131	<del></del> -	2321
K-134	_	2322
K-135	<del>_</del>	2323
K-137		2324
K-140		2325
K-142		2326
K-143		2327
K-146	<del></del>	2328
K-148	<u> </u>	2329
K-149	_	2330
K-152		2331
K-200	<u>-</u> -	2332
K-201		2333
K-202	_	2334
K-203	-	2335
K-204		2336
K-205		2337
K-206	I	2338
K-207	45	2339
K-208		2340
K-209		2341
K-210	_	2342
K-211		2343

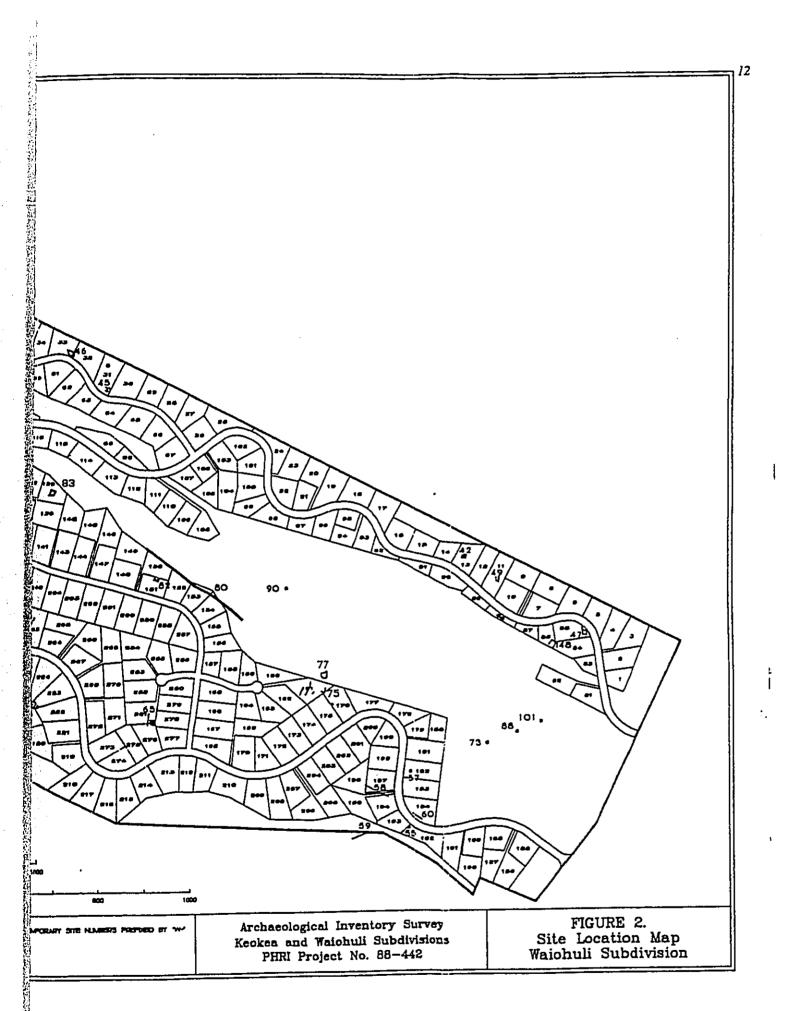
Of the 159 sites identified, 61 were complexes (sites consisting of more than one feature). In Waiohuli, nine complexes comprised of 21 features were identified, and in Keokea 52 complexes comprised of 156 features were identified. Ninety-eight of the identified sites consisted of single features (42 in Waiohuli and 56 in Keokea). Feature types present at sites include: wall, enclosure, terrace, mound, overhang, upright, wall, lithic scatter, alignment, cave, platform, bridge, and burial. Table 2 lists the frequencies of formal feature types recorded.

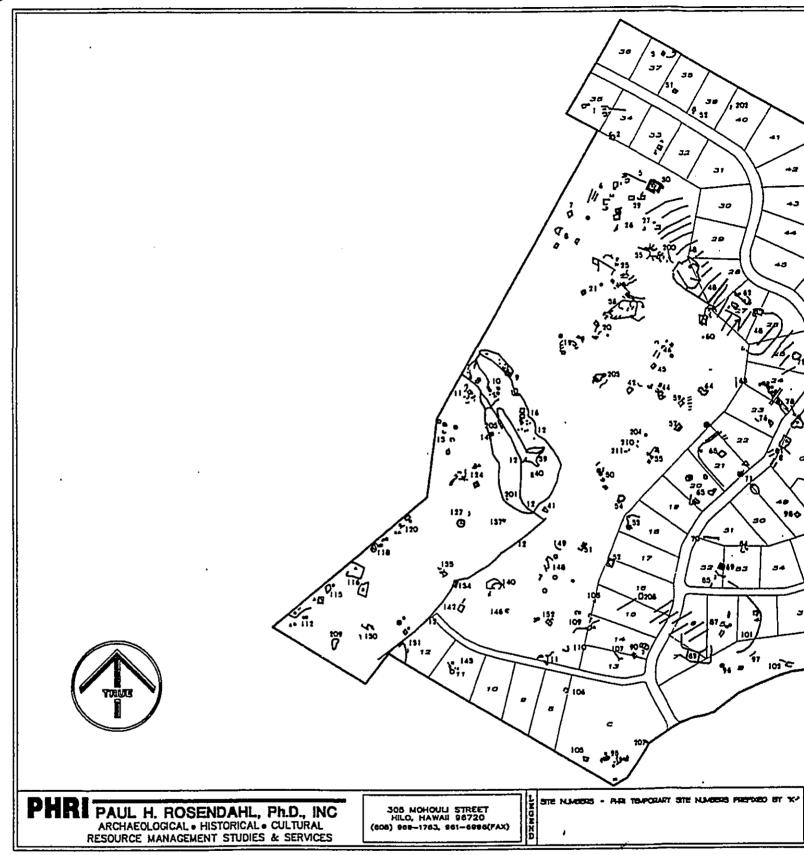
Probable functional interpretations were made for most sites. Site functions included: agricultural, habitation, religious, animal (cattle) control, burial, transportation, storage, roadway, lithic reduction, and indeterminate. The frequencies of functional site types are listed in Table 3.

Sites were interpreted as habitation sites if they appeared to have been permanent or semi-permanent residences. Habitation sites are those which include archaeological features traditionally associated with dwellings. In the project area, habitation features include enclosures, platforms, terraces, and C-, L-, and U-shaped walls. No sites in the project area were interpreted as temporary habitation sites; however, several sites did include features traditionally associated with temporary habitation-such as C-, L-, and U-shaped walls and overhang shelters. Also, no habitation sites in the project area were "open" sites habitation sites not associated with stone architecture. This was because such open sites, if they existed, would have been manifested by surface exposures of midden, artifact scatters, and soil discolorations-none of which were likely to have been seen through the dense vegetative cover which characterizes most of both subdivisions.

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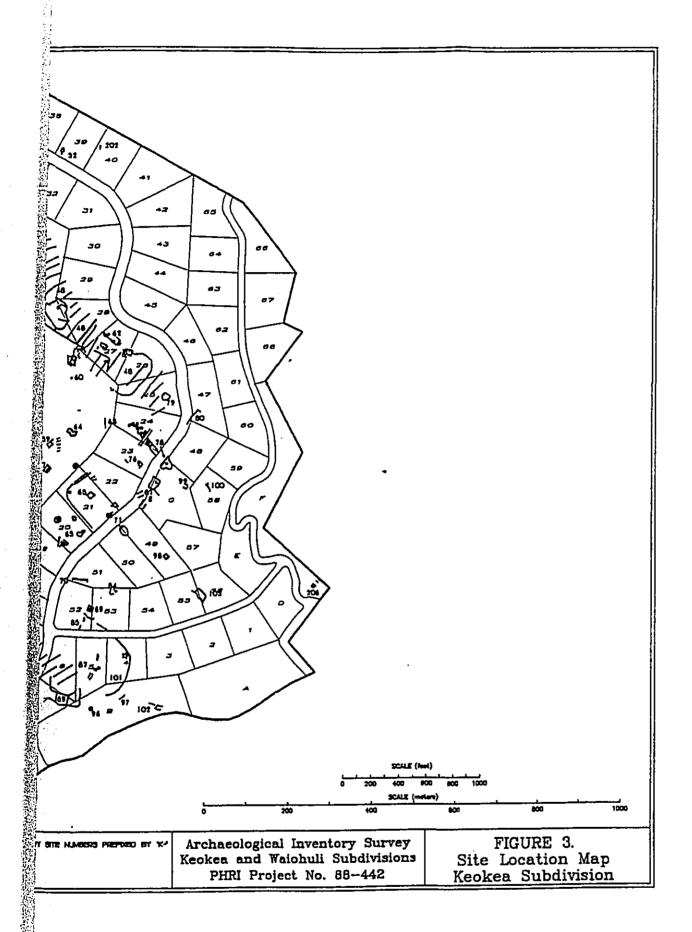


Table 2.
FREQUENCIES OF FORMAL FEATURE TYPES

Formai Type	Number	Percen
	WAIOHULI	
Alignment	1	1.59
Bridge	1	1.59
Human Bone	1	1.59
Cave	1	1.59
Enclosure	30	47.62
Lithic Scatter	1	1.59
Mound	4	6.35
Overhang	3	4.76
Platform	. 1	1.59
Terrace	5 2	7.94
Upright		3.17
Wall	13	20.63
WAIOHULI TOTAL:	63	100.00%
	KEOKEA	
Cairn	1	0.47
Enclosure	139	65.88
Heiau	1	0.47
Lava Tube	2	0.95
Lava Tube Enclosure	1	0.47
Mound	3	1.42
Overhang	21	9.95
Paved Area	1	0.47
Platform	6	2.84
Sink	1	0.47
Stone	1	0.47
Structure	1	0.47
Теттасе	17	8.05
Wall	16	7.58
KEOKEA TOTAL:	211	100.00%

Nine sites were interpreted as religious or possibly religious, and 10 were interpreted as burials or potential burials. These include the previously recorded heiau, notched-rectangular enclosures, features with free-standing uprights and/or coral, large stepped and paved terraces, and features known or suspected to contain human remains. Several sites in the vicinity of Molohai Heiau in Keokea (a likely candidate for interpretation as an ahupuaa-level heiau) include a relatively high density of features tentatively assigned a religious function. Among these are Sites K-2, -3, -6, -29,

and -48. In addition, many large and probably high-status residential features, densely clustered agricultural features, and other features were found proximate to the heiau. For example, nearby Site K-78 consists of a series of stepped, paved terraces extending for more than 120 meters; the site may be a heiau (ili level?). In addition, the land between K-78 and Molohai Heiau—very much like what persists throughout the Keokea subdivision and nearby surrounding lands—is regularly terraced and includes at least six large features.

Table 3.
FREQUENCIES OF FUNCTIONAL SITE TYPES

Formal Type	Number	Percent
	WAIOHULI	
Agriculture	8	15.69
Animal Control	5	9.80
Burial*/Ag.	1	1.96
Habitation/Ag.	23	45.10
Burial		3.92
Indeterminate	2 2	3.92
Lithic Reduction	1	1.96
Religious	i	1.96
Religious*	i	1.96
Religious*/Hab.	3	
Transportation	3	5.88
Habitation	1	5.88
		1.96
WAIHOULI TOTAL:	51	100.00%
	KEOKEA	
Agricultural	5	4.63
Animai Control	6	5.55
Animal Control/Ag.	3	2.78
Burial*/Hab./Ag.	3 3	2.78
Burial	1	0.93
Burial/Habitation	2	1.85
Burial/Ag.	1 .	0.93
Tool Manufacturing	1	0.93
Habitation	22	20.37
Habitation*/Ag.	1	0.93
Habitation/Ag.	48	44.44
Habitation*/An. Cont.	1	0.93
Habitation/Indeterminate	i	0.93
Habitation/Ag/An. Cont.	4	
Indeterminate	2	3.84
Religious*/Ag.	-	1.85
Religious/Hab./Ag.	I 1	0.93
Religious*/Hab./Ag.	ı.	0.93
Religious	1	0.93
Temp. Habitation	I	0.93
Temp. Hab./Ag.	I	0.93
Water Tank	1	0.93 0.93
KEOKEA TOTAL:	108	100.00%

<sup>\*</sup> Tentative Function

One hundred thirty-nine enclosures were identified in Keokea Subdivision of which 127 were tentatively assigned a habitation function. This is a density of one major habitation feature for every 2.76 acres. Walls were found throughout both subdivisions. These varied in thickness, height, and construction. The historical documentary research for the present project suggests that most walls were built within the last century. Indeed, the majority of the walls appear to have been constructed in historic times to control ranging cattle.

During the present project, two extensive wall complexes of probable historic origin were recorded (W-4 and K-12). Site W-4 consists of a series of walls and wall segments bordering both sides of the northernmost large gulch in Waiohuli; these walls and segments apparently served to keep cattle out of portions of the gulch. Site K-12 consists of a meandering series of long and substantial walls situated in the southwest portion of Keokea subdivision. K-12 includes the long straight wall which marks the southern boundary of the Keokea project area. Aside from barbed wire and occasional posts in and associated with Site W-4, no historic artifacts were found in association with the walls.

Extensively scattered throughout both subdivisions were hundreds of minor agricultural features (mounds and terraces) which were found associated with most of the recorded sites. Most of these features were not formally recorded; instead, their distributions were plotted (Figure 4) and they were referred to in the records of formally recorded sites as being present in the site area. Recorded sites not associated with minor agricultural features were exclusively those found in areas where mechanical ground alteration had almost certainly obliterated them. This is particularly true in Waiohuli where perhaps 50% of the surface of the subdivision has been bulldozed. In the Waiohuli parcel, major residential features may have been bulldozed; this would account for the low density of sites in that subdivision, however, it is clear that the bulldozer operator made occasional attempts to avoid them.

The spatial associations between the various formal and functional feature types in Waiohuli have been so thoroughly obscured by ground disturbance that, aside from

focusing on a few small locales, any attempt to analyze site and feature distributions can be expected to yield very limited and unreliable results. This does not hold true in the Keokea subdivision where recent mechanical disturbance is primarily limited to areas along the eastern subdivision boundary and along the few roads which traverse the subdivision.

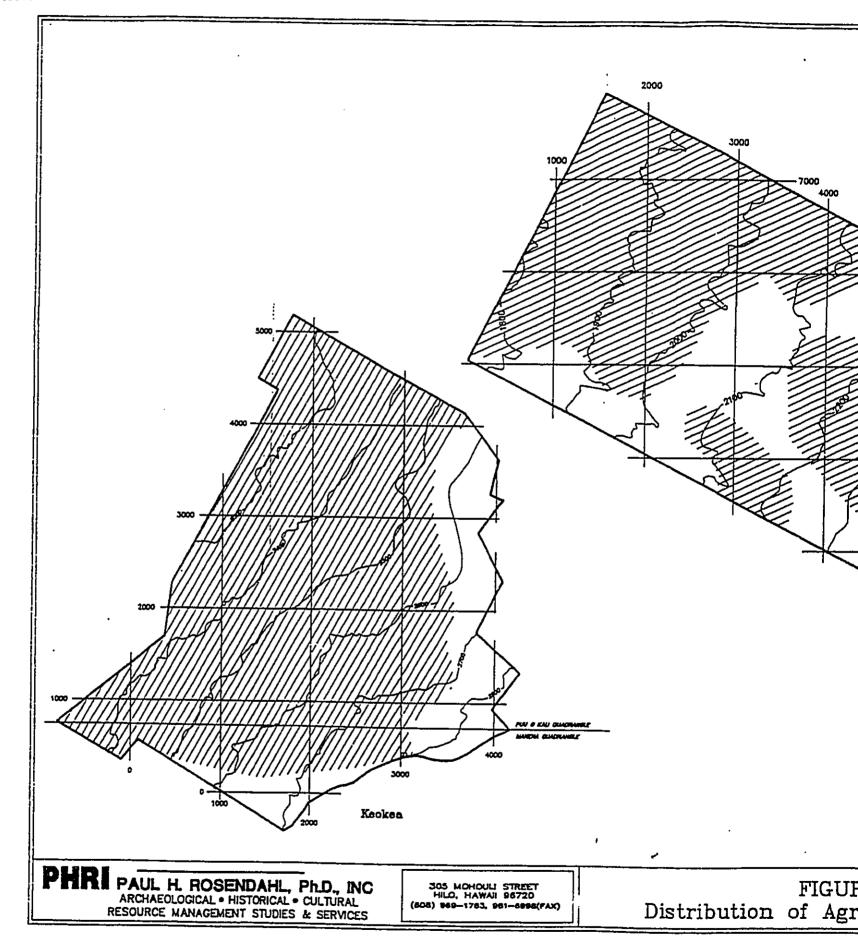
In Keokea, several of the residential features showed signs of having been disassembled in order to use their stones for building materials (Sites K-52 and K-90). In both Keokea (Site K-107) and Waiohuli (Site W-90), there was evidence that stone walls at the entrances to burial caves had been removed.

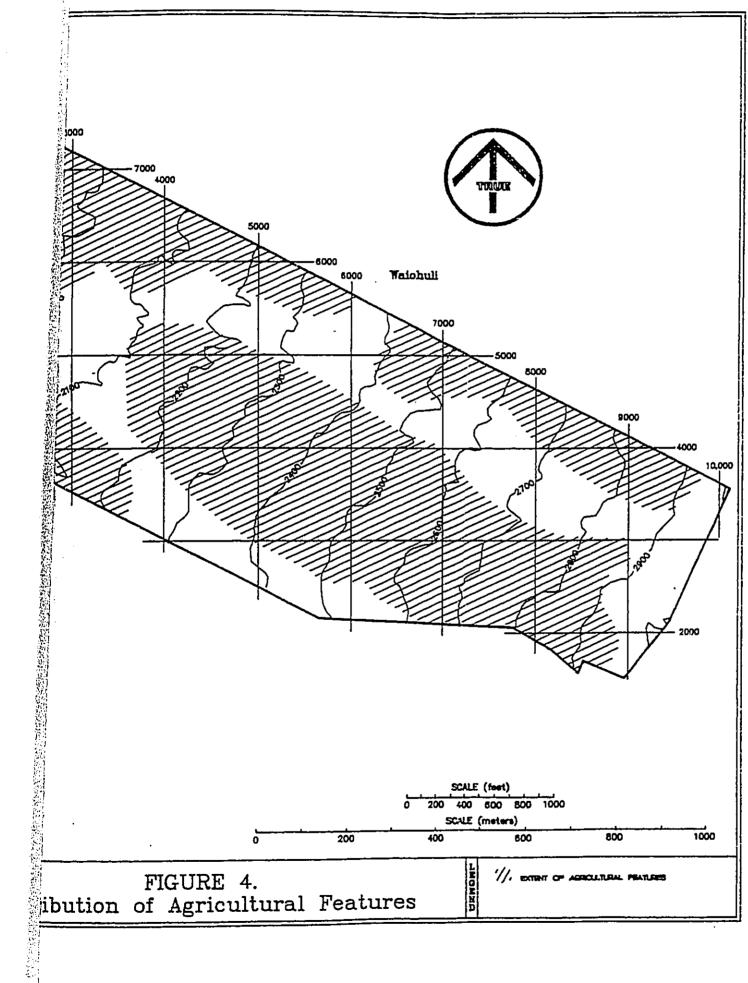
### LIMITED SURFACE COLLECTIONS

Surface collection was limited to the recovery of four artifacts considered threatened by either collection by amateurs or displacement by natural forces. The artifacts were all indigenous Hawaiian types—a small polished basalt adze, a retouched, utilized basalt core, a retouched basalt flake tool, and a scoria abrader.

### LIMITED TEST EXCAVATIONS

Limited test excavations were undertaken to recover charcoal for radiocarbon dating and to assess the depth and constituents in cultural strata at selected features. The features excavated included a sample of the major formal feature types present. Nineteen test excavations (12 in Keokea and seven in Waiohuli) were conducted. Each excavation was taken down to a maximum depth of 50 cmbs (centimeters below surface) or to sterile soil. The test excavations yielded ecofactual material and 112 artifacts, including abraders, a flaked lithic tool, and flaked lithic debitage. The ecofacual materials included medium mammal, small mammal bone, fish bone, marine shell, kukui (Aleuriues moluccana [L.] Willd.), gourd, and floral remains. Twelve of the excavation units (at 12 separate features) yielded marine faunal remains. Nine units yielded terrestrial faunal remains. The test units also yielded radiocarbon samples, of which 17 were submitted for dating analysis.





# DATA ANALYSES

#### CHRONOLOGY

DISTRICTURE DESCRIPTION DE PROPRIÉTA DE L'ESTA DE SIGNA DE SE SE L'ASSESSE DE L'ASS

Seventeen ash-charcoal samples from 15 sites were submitted to Beta Analytic Laboratories in Coral Gables, Florida for age determination analyses. The samples were collected from subsurface contexts within a number of feature types—including heiau, rectangular and circular enclosures, a paved platform, and a C-shaped wall—and from outside of an overhang shelter. Radiocarbon age determinations are summarized in Table 4 and are graphically illustrated in Figure 5.

One sample (from Site K-7, TP-1, 40-50 cmbs) contained insufficient carbon for dating. A sample from Site W-3 produced a modern (post AD 1950) date. The other 15 date ranges span 1,210 years (AD 680-AD 1890). Site K-7, Feature A, a rectangular enclosure tentatively assigned a permanent habitation function produced the earliest date (680-1060 AD). As insufficient carbon was recovered from the lowest level excavated at Site K-7, Feature A (40-50 cmbs), the dated sample (from 30-40 cmbs) does not represent the oldest strata in the feature. In addition, the lowest level excavated was not taken down to sterile strata. The early date for Feature A-which in structural form is similar to enclosures associated with much later dates—and other data suggests that the area of the feature has been inhabited on a fairly permanent basis for at least a millenium. Questions concerning intensity of occupation at the site and the evolution at the site of adaptive strategies over time will require further data collection and analysis and will require sound chronological determinations.

The remaining 14 date ranges span AD 1270-modern dates. Eight of these ranges were derived from samples taken from sites tentatively assigned religious functions. One of the eight ranges and three other ranges were from sites at which human remains are known to be present, or are suspected (from W-11, K-3, K-111, and K-130). The earliest of these ranges. AD 1270-1490, was derived from Feature A, Site W-11. Feature A is a C-shaped wall; however, it is unlike other C-shapes in that it opens toward the prevailing northeast winds—which indicates it most likely did not serve as a shelter. Feature A is associated with alignments and substantial mounds, some of which are tentatively interpreted as burials. Site K-3 is an enclosure and Sites K-111 and K-130 are overhang shelters.

An excavation at Site W-27 yielded two samples from separate, arbitrary strata (10cm) between 30 and 50 cmbs. The excavation was placed within the paved interior of the structure. Beneath the pavement was what appeared to be domestic midden, suggesting that the dates do not necessarily relate to the construction and use of the heiau itself but perhaps to pre-heiau occupation. This same observation pertains to the other substantial paved structures excavated and/or dated. In every case, once the paving was breached, apparent domestic deposits were encountered. One is led to deduce from this that the features tested were not as elaborate in construction early on; that the structures were either nonexistent during early occupation at their location or that they were less elaborate and were added to or rebuilt over time. The relationships between the dated samples and the form of the structures from which they were taken must await more detailed study.

#### PORTABLE REMAINS

One hundred twelve artifacts including abraders, a flaked lithic tool and flaked lithic debitage were recovered from 19 test excavations. Thirty-seven pieces of volcanic glass from nine sites and 60 pieces of flaked basalt from eight sites were recovered during excavations. Three sites yielded polished basalt flakes and one site yielded a shark tooth. Two pieces of coral were recovered from two sites (Table 5). Four artifacts—an abrader, an adze, a flaked lithic tool, and a utilized flake—were collected from the surface of four separate sites.

Marine ecofactual remains included Gastropoda, bivalves, fish, and Echinoidea (Table 6). Terrestrial faunal remains included remains of small, medium, and large mammals, and several pieces of unidentified remains. Floral remains included unidentified charcoal, gourd, and four kukui fragments. The excavated ecofactual remains do not constitute representative site or feature samples. They were collected as a by-product of excavations aimed primarily at collecting datable materials. They are, however, informative in that they demonstrate that a wide range of activities occurred throughout the project area over perhaps 1,200 years.

Table 4.
SUMMARY OF RADIOCARBON AGE DETERMINATIONS

PHRI Lab.No. RC-	Lab. No. BETA-	Provenience	C-14 Age Yrs. B.P. (one sigma)	C-13/ C-12 Ratio	C-13 Adjusted C-14 Age Yrs. B.P.	*Calendric Range Yrs. AD
KEOKEA						
K-3						
513	30811	Fea. A, TU-1 Layer I/II 0-22 cmbs	180 <u>±</u> 50	-24.0	200±50	1640-1890 1910-1955#
K-6						
514	30812	Fea. A, TT-1 Layer II, 17-48 cmbs	260 <u>±</u> 60	-24.1	270 <u>+</u> 60	1470-1680 1739-1805 1935-1955#
K-7						
515	30813	Fea. A, TP-1 Layer I-4 30-40 cmbs	1020±100	-19.3	1110±100	680-1060 1077-1125 1135-1157
530		Fea. A, TP-1 Layer I-5 40-50 cmbs			<del></del>	Insufficient Carbon
15.40						
K-48 518	30815	Fea. B, TP-2 Layer I-4 30-40 cmbs	30 <u>±</u> 70	-15.0	190 <u>±</u> 70	1518-1591
K-64						
517	30814	Fea. A., TP-1 Layer II/III 6-50 cmbs	330 <u>:</u> ±80	<b>-22.9</b>	360±70	1420-1660
K-105						
519	30816	Fea. A. TP-1 Layer III 20-40 cmbs	310±50	-26.3	290±50	1470-1670 1775-1793 1947-1953
K-111						
520	30817	Fea. A, TP-1 Layer II 6-20 cmbs	110 <u>+</u> 70	-23.2	140±70	1640-1955#

<sup>\*</sup>Calibrated according to Stuiver and Pearson (1986). Range at two sigmas.

<sup>#</sup>Denotes influence of bomb C-14.

Table 4. (cont.)

		···	Table 4. (cor	ıt.)		
PHRI Lab.No. RC-	Lab. No. BETA-	Provenience	C-14 Age Yrs. B.P. (one sigma)	C-13/ C-12 Ratio	C-13 Adjusted C-14 Age Yrs. B.P.	*Calendric Range Yrs. AD
K-124 521	30818	Fea. A, TP-1 Layer III 13-57 cmbs	110 <u>±</u> 60	-21.7	160 <u>±</u> 60	1640-1955#
K-130 522	30819	Fea. A, TP-1 Layer II · 4-16 cmbs	100.2 <u>±</u> 0.7% Modern	-10.4	220±50 1859-1861 1921-1955#	1523-1566 1629-1696 1726-1818
WAIOHU	LI					
W-3 523	30820	Fea. A. TP-1 Layer I-1 0-30 cmbs	100.5 <u>+</u> 0.8% Modern	-24.3	100.4±0.8% Modern	****
W-11 524	30821	Fea. A, TP-1 Layer I-1 0-35 cmbs	530 <u>±</u> 90	-24.5	540 <u>+</u> 90	1270-1490
W-27 525	30822	Fea. A, TP-1 Layer I-4 30-40 cmbs	430 <u>±</u> 70	-22.0	480 <u>±</u> 70	1305-1360 1380-1510 1598-1617
526	30823	Fea. A, TP-1 Layer I-5 40-50 cmbs	390 <u>+</u> 90	-21.4	450 <u>+</u> 90	1300-1365 1370-1650
W-28 527	30824	Fea. A. TP-1 Layer I-2/3 10-30 cmbs	430 <u>+</u> 90	-22.5	470 <u>+</u> 90	1290-1640
W-36 528	30825	Fea. A. TP-1 Layer I-5 40-50 cmbs	450 <u>±</u> 50	-23.9 ·	470 <u>±</u> 50	1397-1482
W-45 529	30826	Fea. B, TP-1 Layer II 18-30 cmbs	100±50	-11.1	330 <u>±</u> 50	1450-1660

RANGES
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Figure

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2000	HiRI Leboratory Number RC VG		514	515	518	517	519	520	521	522	523	524	525 526	527	528	at 3	676
AD CALENDAR DATE 1300 1400 1500 1500 1600 1900		RECERT XXIII ARIA ARIA ARIA ARIA ARIA ARIA ARI	XXX XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	680-1157	XXXXXXX	MANAMANAMANAMANAMANAMANAMANAMANAMANAMAN	инининини и и	хилинихилихихихихихих	MANAGEMENTAL	MIN X MINIM MINIM X X MIN	Hodurn	пкинкиник	XXXXX HENEKKEREKEKE KIL KILKHEREKEKEKEKEKEKEKEKEKEKEKEKEKEKEKEKEKEK	тиниппппппппппппппппппппппппппппппппппп	XXXXXXX	TXXXXXIIXXXIXXXXXXX	
PROVENIENCE 1200		2028, Fee. A. TU-1, I/II, 0-22 cmbs	ĺΙ		2033, Fee. B. TP-2, I-4, 30-40 cmbs	2034, Fee. A. TP-1, II/III, 6-50 cmbs	2035, Fea. A, TP-1, III, 20-40 cabs	2036, Fen. A. TU-1, II, 6-20 cmbs	2037, Fee. A. TP-1, III, 13-57 cabe	2018, Fas. A. TP-1, II, 4-16 cabs	2039, fee, A, TP-1, I-1, 0-30 cmbs	2040, Fes. A, TP-1, I-1, 0-35 cabs	2041, Fee. A. TF-1, I-4, 30-40 cabs 2041, Fee. A. TF-1, I-5, 40-50 cabs	2042, Fes. A. TP-1, I-2/3, 10-30 cabs	2043, Fas. A, TP-1, I-5, 40-50 cmbs	2044, Fes. B, TP-1, II, 18-30 cabs	

Table 5.

SUMMARY OF PORTABLE ARTIFACT TYPES (SUBSURFACE)

		K-3	3	K-6			K-30	20	}			K-48		
Material	Fea.	, ,	A Total	Fea. A		Fea.			Tot 81		Fea.			Total
	I	TP-1		TP-1		TP-1	17			TP-1				1
	H	H		I	1-2	1-3	1-4	1-5		-	1-1		Total	
INDIGENOUS FLAKED STONE														
Basalt	<b>-</b>	6	10	7	m	ო	7		6	2	-		6	7
Volcanic Glass	<b>—</b>	ı	-	7	ı	7	7	1	4	m	-	٠,	l m	φ
SUBTOTAL FLAKED STONE	2	6	11	4	3	5	4	-	13	5	2	ص ا	5	10
TOOLS				,							}			
Polished basalt														
flakes	-	1	7	ı	t	ı	1	ı	t	ı	ı	ı	ı	İ
Shark tooth	1	1	1	t	1	1	1	1	ı	7	1	1	: :	-
SUBTOTAL TOOLS	1		2					,	,	-		,		,
TOTAL INDIGENOUS	6	01	13	4	3	5	4	-	13	9	2	m	5	11

ble 5. (Cont.)

	K-64	K-105	K-111	K-124	H-39			₩-27	27		
Material	Fee. A	_	Fea. A	Fea. A	Fea. A		Į,	ea. A			Total
	TP-1	TP-1	TP-1	TP-1	TP-1		•	TP-1			
	H	Ħ	II	II	I-1	I-1	I-2	I-3	I-4	[2]	
INDIGENOUS											
FLAKED STONE Regelt	-	(	1	r	1		,	•			ı
Volcanic Glass	۱ ۱	1 1	ıν	וי	1 1	<b>→</b> 1	າ ໝ	- 4		ı <b>-</b>	ر 14
SUBTOTAL FLAKED STONE		ı	5	3	1		11	5	-	1	19
TOOLS											
Polished basalt											
flakes	t	1	ı	ı	ı	ı	ı	t	1	1	1
Shark tooth	1	1	ı	ı	1	1	1	1	1	1	1
SUBTOTAL TOOLS	,		1	,			,	,	۱,	١	ı
THE TANTABULAS	-	-	u	,			:			,	5
TOTAL INDIGENOUS	-	-	n	77	ı	-	11	n	<b>-</b>	<b>-</b>	13

Table 5. (Cont.)

		K-28			3	W-36				M-45		
Material	Fes	1. A	Fea. A Total		Fea. A	ļ	Total		Fea. B	1	tai	Grand
	TP-1	-			TP-1				TP-1			Toral
	1-2	1		I-2	I-2 I-4	I-5		Н	H	III		
INDIGENOUS												
FLAKED STONE Basalt		7	α	a	c	r	•	•	,	,	•	
Volcanic Glass	٠.	٠ ۱	o -	0 1	<b>7</b> 1	7	7.1	-	m d	7	<b>.</b>	09
	•		-	t	ı	ı	ı	1	**	-	4	37
SUBTOTAL FLAKED STONE	2	7	6	89	2	2	12		9	m	10	97
TOOLS												
Polished basalt												
flakea	ı	ı	1	ı	ı	ı	ı	Į				•
Shark tooth	ı	ı	ı					i	ı	1	i	7)
		ı	l	1	ı	ı	ſ	ı	1	t	ı	
SUBTOTAL TOOLS	,	,	,		,	,		1	,	1	,	7
												•
TOTAL INDIGENOUS	7	7	6	8	7	7	12	1	و	۳	2	101

Table 6.

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PIDINIFICATION OF ECOENOTION NATIONS	
i	
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	K-3		K-6	K-7		K-32		K-36			-	K-48		1
CATEGORY	Fea. A	Fea.	8. A	Fea.	A I	Fea. A	:	Fea.	m   1	1		Fea. B	7-1 6	7
	=	-		1			#	1	7	ı		1	1	H
HARINE INVERTEBRATES														
GASTROPODA	•												1	
Strombue meculatue	+	ı		t 1	1	1	ı	ı	:	) 			ı	
Cypraeldae	ı	ı	1	ı +	i	ı	1	:	ı	; i			ı	
Conidae	•	,	ı	1	1	ı	ı			•			1	
Nerita picea	ı	1	ı	+	t	ı	1	t	1	!		1	ı	
BIVALVIA														1
Tellinidae	i	1	ı	1	1	+	1	ı	,	1		1	t	
OTHER											ļ			
Echinoidea	ı	+	1	+	1	1	•	ı	1	+		1	+	
BONE											ļ			1
Fish	ı	+	+	1	1	i	ı	ı	+	+	T	1	١	
Hemmal	+		1	1	+	+	ı	1	+	T	_	1	1	
Large	+	+	ı	1	1	1	ı	ı	1	'	•	1	1	
Hedium	t	1	1	1	1	1	ı	ı	,	+	•	1	1	
Small	t	+		+	+	1	+	1	ı	1		1	+	
Unidentified	ı	+	ı		1	1	t	1	1	1		1	+	
VEGETAL REMAINS						}								1
Charcoal	ı	1	1	1	ı	ı	ı	ı	ı	,		;	1	
Gourd	ı	1	1		I	1	t	ı	ı	'		1	1	
Aleurites moluccans	1	+	ı	·	t	ı	1	t	,	'	1	1	1	
NON-ECOFACTUAL REMAINS	S													
Coral	f .	+	,	ı .	1	1	ı	1	ı	,		1		
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	Fea. A	K-105 Fea. A	K-111 Fee. A	K-124 Fee. A	K-136 Fea. A	H-27 Fea. A	W-28 Fea. A	교립	Fea.	N-45
HARINE INVERTEBRATES GASTROPODA Strombus maculatus Cyprseidae Conidae	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1111	1 1 1 1	111		+111	1111	7	1 + 1 1	++11
BIVALVIA Tellinidae	,	. '	1	'		t	,	1		,
OTIIER Echinoidea	+	1	1	•	1	1	ı	,	1	1
BONE Fish Hammal Large Hedium Small Unidentified		+ + 1 1 1 1	1111++	1111+1	1111+1	1111+	+ 1 1 1 1 +			
VEGETAL REHAINS Charcoal Gourd Aleurites moluccans	111	11+	1 1 1	1 1 1	111	111	1 1 1	1 1 1	1 1 1	1 1 +
NON-ECOFACTUAL REMAINS Coral	1	1	1	1	1	1	ı		,	1

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#### CONCLUSIO

# EVALUATION OF SURVEY METHODOLOGY

The archaeological inventory survey of Waiohuli and Keokea Subdivisions involved low-level aerial survey of approximately 60% of each subdivision and intensive (15-30 m interval) pedestrian survey of 100% of both subdivisions. During both aerial and pedestrian surveys, dense lantana, panini, wattle, ilima, and high grass consistently limited surface visibility to 10-20 percent of the ground surface, effectively eliminating the possibility of finding surface portable remains and minor agricultural features. As a result, the survey was focused on identifying substantial residential and agricultural features.

Even major, large-stacked boulder and cobble residential features were found to be thoroughly overgrown with panini and/or lantana, or were buried under waule deadfalls. Because of this, the sites had to be considerably cleared and wall segments had to be probed for prior to preparing sketch maps. Nevertheless, excepting perhaps features in areas completely obscured by large, impenetrable panini thickets (areas totaling c. one acre), all major archaeological features in both subdivisions were identified during the survey.

#### **DISCUSSION**

The overall data suggests that Keokea Subdivision was intensively expoited in a variety of ways for at least two-thirds of the entirety of Hawaiian prehistory. There is evidence in the project area for change over time, spatial variety, functional (behavioral) variety, and interaction with peoples in other (coastal) areas.

The picture that the overall data for Waiohuli Subdivision presents is less clear due to the extensive historic disturbance in the area, especially in regard to the density of feature types and the temporal ranges of features. The feature types in the area (heiau to agricultural mounds) do, however, reflect a full range of activities. If the low site density in Waiohuli is not due to removal of sites by bulldozing, then prehistoric and historic occupation of the area was very different from nearby Keokea. For example, Kaumeheiwa Heiau in Waiohuli is not as densely surrounded by agricultural, habitation, and religious features as could be expected if it were in Keokea. It exists in relative isolation when compared with Molohai Heiau in Keokea. Agricultural features in Waiohuli are as widespread as those in Keokea, but they are not found in as high densities. The same goes for habitation

and religous features in Waiohuli. There are other "non-archaeological" differences between the two areas. For example, three major gulches and an extensive and well-developed contributary drainage system in Waiohuli may have transported surface water out of the immediate area before much could be absorbed. Keokea has no such drainage system. This could render the Waiohuli area effectively drier than Keokea and make the area less suited for agriculture. In turn, the limited productivity of the land might have substantially limited the population.

Even if the lower feature density in Waiohuli is a direct result of surface bulldozing, it is still possible that subsurface remains are still present and are relatively intact. Unless the presense of subsurface remnants of features is demonstrated in Waiohuli, comparisons between the distributions of sites and features in Keokea and Waiohuli cannot be made with confidence, nor can the distributions within the Waiohuli Subdivision itself be addressed.

The historical documentary research suggests that the Kula region was intensively cultivated during the early historic period. Apparently, this was especially true during the gold rush years in California, when the influx of miners created a demand for food which the potato farmers in Kula in part filled. The historical documentation suggests that the farmers during this period did not make substantial modifications to the land (terraces, etc.) but instead "...followed the natural contour of the land..." Whether Keokea and Waiohuli subdivisions were under intensive cultivation during this period is open to question. The lack of historic period artifacts in association with residential and agricultural features suggests they were not.

### SUGGESTED RESEARCH QUESTIONS

Future research in the Kula area should address, at a minimum, the following questions.

- 1. When was the Kula area and each site and feature first occupied?
- 2. Were the occupations brief, intermittent, continuous, or long-term?
- 3. Which sites and features represent contemporaneous occupation and/or use?
- 4. Do some formal site/feature types appear earlier in the archaeological record than others?

- 5. Are earlier sites functionally different from later sites?
- 6. How are the archaeological resources distributed with regard to environmental factors like elevation, distance from water, soil types, geomorphic features and vegetation communities?
- 7. How are archaeological resources distributed relative to each other? Do particular site and feature types tend to occur together?
- 8. What are the relationships between the archaeological resources in the Kula area and those elsewhere?
- 9. How do the distributions and densities of archaeological sites and features relate to the distribution and density of prehistoric people in the Kula area?
- 10. Can particular behaviors be associated with formal site and feature types—which behaviors with which formal types?
- 11. Do the archaeological data correlate well with the ethnographic and historic records?
- 12. Do the archaeological data from Kula support the interpretations made concerning similar sites and features in similar areas?

# GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

To facilitate State and County review, general significance assessments and recommended general treatments for all identified sites are summarized in Table 1. Significance categories used in the site evaluation process are based on the National Register criteria for evaluation, outlined in the Code of Federal Regulations (36 CFR Part 60). The Hawaii State Historic Preservation Office (SHPO) uses these criteria for evaluating cultural resources. Sites determined to be potentially significant for information content (Category A. Table 1) fall under Criterion D, which defines significant resources as ones which "have yielded, or may be likely to yield, information important in prehistory or history" (36 CFR Sec. 60.4). Sites potentially significant as representative examples of site types (Category B, Table 1) are evaluated under Criterion C, which defines significant resources as those which "embody the distinctive characteristics of a

type, period, or method of construction...or that represent a significant and distinguishable entity whose components may lack individual distinction." Sites with potential cultural significance (Category C) are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (Draft Report, August 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historical depth" (1985:1). The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value" (1985:7).

Of the total 159 sites identified during the present survey, 108 are in Keokea and 51 are in Waiohuli. Of the 108 Keokea sites, 94 are assessed as significant solely for information content. Eighty-nine of the 94 sites are recommended for further data collection, and five of the 94 sites are recommended for no further work. Four of the remaining 14 sites are assessed as significant for information content, as an excellent example of a site type, and for cultural; value. Further data collection and preservation with interpretive development are recommended for these four sites. Three of the remaining 14 sites are assessed as significant for information content and as an excellent example of a site type. For these three sites, further data collection and preservation with interpretive development are recommended. Another three sites are assessed as significant for information content and for cultural value; these three sites are recommended for further data collection and preservation as is. Three other sites are assessed as significant for information content and are tentatively assessed as significant for cultural value. These three sites are recommended for further data collection and are provisionally recommended for preservation as is. The last site is assessed as significant for information content and as having cultural value. For this site, preservation "as is" is recommended.

Of the 51 sites in Waiohuli Subdivision, 42 are assessed as significant solely for information content. Thirty-three of these 42 sites are recommended for further data collection, and nine of the 42 sites require no further work. Of the remaining nine sites, three are assessed as significant for information content, as excellent examples of a site type, and as culturally significant. Further data collection and preservation with interpretive development are recommended for these three sites. Two of the remaining six sites are assessed as significant for information content and are provisionally assessed as having cultural value. For these two sites, further data collection is recommended and

preservation with interpretive development is provisionally recommended. The final four sites are assessed variously and require various recommended treatments (see Table 7 for specific recommendations).

Table 8 lists lots which contain or appear to contain sites or portions of sites that are tentatively recommended for preservation. The uncertainty as to whether lots contain or do not contain sites is due to problems concerning lot boundaries. These problems are due to (a) possible inaccurate boundaries/locations on maps and aerial photographs provided

by DHHL, (b) problems of determining precise boundaries and locations in the field due to vegetation and terrain changes that have occurred since preparation of the photographs and maps, and (c) missing DHHL lot comer markers. In all, 19 lots in Keokea and 5 lots in Waiohuli contain or appear to contain sites recommended for preservation. In order to accurately determine exactly which lots contain sites or portions of sites, the sites must first be individually staked out in the field. Following this, the DHHL will have to restake the boundaries in question.

Table 7. SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS WAIOHULI PARCEL

Site or	<u> </u>	ignifican	ce Categ	Ory	Rec	ommend	ed Trans	
Feature No.	A	X	В	C	FDC	NFW	PID	PAI
W-1	+							
W-2	÷	_	•	-	+	-	•	_
W-3	_	•	-	•	+	•	-	-
W-5	T	•	-	•	+	-	-	•
W-6	T _	•	-	•	+	-	-	-
W-8		-	•	-	+	-	-	-
W-10	+	•	-	•	+	-	-	
W-12	+	•	-	•	+	-	-	-
W-13	+	-	-	-	+	-	-	
W-14	. T	•	-	•	+	-	-	
W-15	<b>T</b>	•	-	-	+	-	-	-
W-17	T .	•	-	•	+	-	-	-
W-18	T	•	•	-	+	-	•	
W-20	<b></b>	-	•	-	+	-	-	
W-21	-T*	-	•	-	+	-	-	•
W-31	+	-	•	•	+	-	-	
	+	-	•	-	+		_	_

# General Significance Categories:

- A = Important for information content, further data collection necessary (PHRI=research value);
- X = Important for information content, no further data collection necessary (PHRI=research value, SHPO=not significant);
- B = Excellent example of site type at local, region, island, State, or National level (PHRI=interpretive value); and
- C = Culturally significant (PHRI=cultural value).

# Recommended General Treatments:

- FDC = Further data collection necessary (further survey and testing, and possibly subsequent data recovery/mitigation excavations);
- NFW = No further work of any kind necessary, sufficient data collected, archaeological clearance recommended, no preservation potential (possible inclusion into landscaping suggested for consideration);
- PID = Preservation with some level of interpretive development recommended (including appropriate related data recovery work); and
- PAI = Preservation "as is," with no further work (and possible inclusion into landscaping), or minimal further data collection necessary.

The second of th

<sup>\*</sup> Provisional assessment; definite assessment pending results of further data collection.

Table 7. (cont.)

# WAIOHULI PARCEL

		-:500700	Categor	~	Rec	<u>ommende</u>	d Tream	nent
Site or Feature No.	A	X	B	·C	FDC	NFW	PID	PAI
reaute No.								
W-37	+	-	•	-	+	-	-	-
W-42	+	-	-	-	+	-	-	-
W-46	+	-	-	•	+	-	-	-
W-48	+	-	•	-	+	•	-	-
W-49	+	-	-	-	+	•	•	-
W-55	+	-	-	•	+	-	-	-
W-65	+	-	-	-	+	-	-	-
W-67	+	-	-	-	+	-	-	-
W-71	+	-	-	-	+	-	-	-
W-73	+	-	•	-	+	•	-	•
W-75	+	-	-	-	+	-	•	-
W-77	+	-	-	•	+	•	-	•
W-82	+	-	-	-	+	-	•	-
W-83	+	-	_	-	+	-	-	-
W-96	+	-	-	-	+	-	-	•
W-97	+	•	-	•	+	•	-	-
W-98	+		_	•	+	•	-	-
17-50								
Subtotal: 33	33	-	•	-	33			
W-4		+	-	-	•	+	•	-
W-47	•	+	•	-	-	. +	•	•
W-57	-	+	-	•	-	+	•	•
W-58	-	+	-	•	•	+	-	-
W-59	-	+	•		<b>-</b> .	+	•	•
W-60	-	+	-	-	-	+	•	•
W-80	-	+	-	•	-	+	-	•
W-88	-	+	-	•	-	+	•	-
W-101	-	+	-	<u>.</u> .		+		
Subtotal:	9 -	9		•		9		
W-27	+	•	+	+	+	-	+	-
W-28	+	-	+	+	+	-	+	•
W-36	+	•	+	+	+	<u> </u>	· +	
Subtotal:	3 3	•	3	3	3		3	•
W-45	+	-	+		+	•	+	
Subtotal:	1 I	•	1		1		1	•

Table 7. (cont.)

#### WAIOHULI PARCEL

Site or	_	Si	mificano	e Catego	orv	Rec	ommend	ed Treatr	nent
Feature No.		A	Х	В	C	FDC	NFW	PID	PAI
W-11		+	-	-	•	+	-		*
Subtotai:	1	1	-	•	1	1	•		1
W-30		+	-	_		+		*	-
W-32		+	-	-	*	+	-		-
Subtotal:	2	2	-	-	2	2	•	2	-
W-90		+	-	-	+	+	-	•	+
Subtotal:	1	1	•	-	1	1		•	1
W-35		+	•	•	+	+		_	-
Subtotal:	1	1	•	•	1	1	•	•	_
Waiohuli Total:	51	42	9	4	8	42	9	6_	2

### KEOKEA PARCEL

Site or	Si	gnificano	e Catego	orv	Rec	ommende	d Tream	nent_
Feature No.	A	Х	В	C	FDC	NFW	PID	PA
K- 1	+	-	_	-	+	•	<b>-</b> , ·	-
K- 2	+	-	-	-	+	• .	-	•
K- 4	+	-	-	•	+	-	-	-
K- 5	+	-	-	-	+	-	-	-
K- 7	+	-	-	-	+	-	•	-
K- 8	+	-	-	-	+	-	-	-
K- 10	+	-	-	-	+	-	-	•
K- 11	+	-	-	•	+	-	-	-
K- 13	+	-	-	-	+	-	-	•
K- 14	+	-	-	. <del>-</del>	+	-	-	-
K- 16	+	-	-	-	+	•	-	•
K- 19	+	-	-	•	+	-	-	-
K- 21	+	-	-	•	+	-	•	-
K- 20	+	-	-	•	+	-	-	•
K- 25	+	-	-	-	+	•	•	-
K- 26	+	•	-	-	+	•	-	-
K- 27	+	-	-	-	+	-	-	•
K- 31	+	-	-	-	+	•	-	-
K- 32	+	-	•	-	+	-	•	•

Table 7. (cont.)

#### KEOKEA PARCEL

Site or	Significance Category				Recommended Treatment				
Feature No.	A	Х	В	C	FDC	NFW	PID	PA	
K- 35	+	-	-	_	+	_	_		
K-42	+	•	•	-	+		•	-	
K- 52	+	-	-	-	+	•	_		
K- 53	+	-	-	-	+	-	-		
K-203	+ '	-	-	•	+	•	•	_	
K- 9	+	-	-	<b>-</b> .	+				
K- 65	+	-	-	•	+	•			
K- 76	+	-	-	-	+				
K- 85	+		-	-	+			_	
K-120	+	-	-		+	-	-		
K-124	+	-			+				
K-140	+	_	_	_	+	_	_	_	
K-143	+		_	_	+	_	_	_	
K- 36	+		_	_	+		_	_	
K- 39	+	_	_	_	+	_	_	_	
K-41	· +	_	-	_	•	-	. <u>-</u>	•	
K- 44	<u>.</u>	_		•	+	-	-	•	
K- 45	<b>-</b>	_	-	•	+	•	•	•	
K-46		•	-	•	+	•	•	•	
K- 50	T .	•	•	-	+	•	•	•	
K- 50 K- 51		•	• `	-	+	•	•	•	
K- 51 K- 54	* <b>**</b>	•	-	-	+	•	•	-	
K- 55	+	•	· <del>-</del>	•	+	-	-	-	
	<b>+</b>	•	-	. •	+	•	•	•	
K- 57	+	-	-	•	+	•	-	-	
K- 59	+	•	•	-	+		-	•	
K- 64	+	•	-	-	+	•	-	•	
K- 69	+	•	-	-	+	-	•	-	
K- 70	+	•	-	, <del>-</del>	+	-	<b>-</b> ,	-	
K- 79	+	• .	-	-	+	-	•	•	
K- 90	+	-	-	-	+	-	• •	•	
K- 81	+	-	-	-	+	-	•	•	
K- 84	+	•	-	-	+	-	•	•	
K- 89	+	-	-	-	+	-	-	-	
K- 95	+	•	-	-	+	-	-	•	
K- 96	+	•	-	-	+	-	-	-	
K- 97	+	-	-	-	+	-	-		
K- 98	+	-	•	•	+	-	-	_	
K- 99	+	-	-		+	-	•	-	
K-101	+	-	•	-	+	•	•	•	
K-102	+	-	-	-	÷	-	-	-	
K-103	+	-	_	-	· +	-	-	•	
K-105	+	-	_	_			-	•	
K-106	• +	-	_	_	+	-	_	_	
K-108	+				+	-	_	-	

Table 7. (cont.)

### KEOKEA PARCEL

Site or Feature No.	<del>-</del>	Significa	ince Cate	gory	Recommended Treatment				
remure No.	A	X	В	C	FDC	NFW	PID	PA	
K-109	+								
K-110	+	_	-	•	+	•	•	•	
K-111	+	_	•	-	+	•	•	•	
K-112	+	_	-	-	+	•	-	•	
K-116	+	_	-	-	+		-	•	
K-118	+	•	-	-	+	-	•	-	
K-127	+	•	-	-	+	•	•	•	
K-130		•	-	•	+	•	-	_	
K-131	+	•	-	•	+	-	-	-	
K-135	+	-	-	-	+	•	-	•	
K-137	+	•	•	-	+	-	-	_	
K-137 K-142	+	-	-	_	+	-	-	_	
	+	•	•	•	+	•	_	_	
K-146	+	-	•	-	+	_		•	
K-148	+	-	•	-	+	_		•	
K-149	+	-	-	_	+	_	_	•	
K-152	+	-	-	_	+		•	•	
K-200	+	-	_		+		•	-	
K-201	+	-	-	-	+	-	-	-	
K-202	+	-	-		Ξ	•	. •	-	
K-204	+		•	_	<b>T</b>	-	•	-	
K-205	+	•	•			- '	•	-	
K-206	+	-	_	_	<del>*</del>	•	· •	-	
K-208	+	_	_	•	+	-	<b>-</b> '	•	
K-209	+	_	_	•	+	•	-	-	
K-210	+	_	-	•	+	•	-	-	
K-211	+		-	-	+	•	· <b>-</b>	•	
Subtotal: 89	89		<u> </u>		89		<del>-</del>		
K- 30	+			—— <i>-</i> —			<u> </u>	<u> </u>	
K- 62		•	+	+	+	•	+	•	
K- 78	+	-	+	+	+	•	+	-	
K-115	*	-	+	+	+	-	+	-	
	<del></del> -	-	+	+	+	-	+	-	
Subtotal: 4	4	•	4	4	4	•	4		
K- 12	-	+							
K- 60	-	+	•		-	+	•	•	
K- 63	-	+	•	_	•	+	-	-	
K- 80	-	+		_	•	+	•	•	
K-100	-	+	-	-	-	+	-	•	
Subtotal: 5	0	5				5			

Table 7. (cont.)

#### KEOKEA PARCEL

Cian an	Sign	ificance	Categor			mmende	d Treatm	nent
Site or Feature No.	A	X	В	C	FDC	NFW	PID	PAI
							+	
K- 29	+	-	+	•	+	_	+	•
K- 40	+	•	+	-	+	_		•
K- 48	+	•	+	<u> </u>	<del></del>			
Subtotal: 3	3	-	3	•	3		3	<u>.</u>
K- 87	+		-	+	+	-	-	+
K-107	+	_	-	+	+	-	•	+
K-207	+	•	•	+	+	-	•	+_
Subtotal: 3			•	3	3	•	-	3
							_	*
K- 3	+ .	-	-	*	+	-	•	*
K- 6	+	-	•	-	+		-	*
K- 71	+	-	-					
Subtotal: 3	3	•	-	3	3		-	3
K-134	+	_	•	+	· •	-	-	+
Subtotal: 1	1		-	1		-		1
Keokea Totai: 108	103	5	7	11	102	5	7_	7
Waiohuli Total: 51	51	9	4	8	42	9	6	2
Grand Total: 159	154	14	11.	19	144	14	13	9

• •

Table 8.

LOTS WHICH APPEAR TO CONTAIN SITES OR PORTIONS OF SITES RECOMMENDED FOR PRESERVATION\*

I or No	ubdivision	Waiohuli Subdivision			
Lot No.	Site No.	Lot No.	Site No.		
5 13 14 21 22 23 24 25 26 27 28 29 37 48 49 50 58 A	87 107 107 71 71 78 48,78 48,62 48,62 48 48 3 78 71 71 78 78 78	30 31 74 75 76	45 45 30 30 27		

<sup>\*</sup> See page 29 for explanation of uncertainty regarding boundaries of lots in relation to sites.

Table 9.

RESIDENCE LOTS CONTAINING SITES

Lot No. Site No.		Waiohuli Subd	ivision_
Lot No.	Site No.	Lot No.	Site No.
11	143 A	in .	49
12	12, 131	13	42
12	131, 131 A-C	2-33	46
13-14	90, 107	51-54	98
14	109, 109 A	74	30
15	108	75	31
16	208	76	27
16-17	52, 52 A-B	84-85	47
18	53	84-85-86	48
19-20-21-22	65	129	83
20	65 D-G	149-150-152-153-154	80
21	65 C, 71 B	150-151	82
21-22	65 A-B, 71 A	161-175-176	75
21-49-50	71	182-183	57
23	76, 76 A-B	184	60
23-24	63, 78 A	192	55
23-24-48-49	78	194-196-197	58
24	78 B-E	222-223-224-228-229	67
25 25	76 B-E 79	777-223-224-278-223	07
26-27	79 48 C	240-241	37
20-27 27	48 D	262	71
27-28		202 276-277-278-281	65
29-28	62, 62 A-C		45
29-28 29-28-27-26-25	48 A 48	31	43
	-		
33	4, 4 A-B		
34 24 25	2, 2 A-B		
34-35 36	1 B		
35	1 A		
4	K-101		
5-6-7	K-87, 89		
8	K-106		
20	K-71B		
24	K-48		
37	K-3		
38	K-31		
39	K-32		
40	K-202		
49	K-98		
51	K-70		
52	K-69, 85		
53	K-69, 84		
55-56	K-103		

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t.

# APPENDIX A

# SUMMARY OF IDENTIFIED SITES AND FEATURES - WAIOHULI

*0'	/						<b></b>	
*Site/ Feature Number		Tentative Functional	_ <u>M</u>		Value		Field V	
		Interpretation	R	I	C	DR	SC	EX
1	Enclosure	Habitation/Ag.	М	L	L	+	+	+
2	Enclosure	Habitation/Ag.	М	L	L	+	+	+
3	Тептасе	Habitation/Ag.	Н	L	L	+	<b>.</b>	+
4	Wall	Animal Control	L	L	L	-		
5	Overhang	Indeterminate	М	L	L		_	+
6	Lithic Scatter	Lithic Reduction	М	L	L	+	+	-
8	Enclosure	Habitation/Ag.	М	L	L	+	+	+
10	Тептасе	Agriculture	М	L	L	+		+
II A B C D E F	Complex (6+) Wall Mound Mounds Mound Platform Mound	Burial**/Ag.	М/Н	L	L/H	+	-	+
12	Terraces	Agriculture	М	L	L	+	·	+
13 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	<b>L</b> .	+	•	+
							_	

<sup>\*</sup> PHRI temporary site numbers.

# Cultural Resource Management - Value Mode Assessment-

Nature:

R = scientific research

I = interpretive

C = cultural

Degree:

H = high

M = moderate

L = low

+ Field Work Tasks:

DR = detailed recording (scaled drawings, photographs, and written descriptions)

SC = surface collections

EX = test excavations

<sup>\*\*</sup>Possible functional interpretation

# SUMMARY OF IDENTIFIED SITES AND FEATURES - WAIOHULI (cont.)

Site/ Feature	and a contact	Tentative Functional		RM V		F	ield W Task	
Number	т Туре	Interpretation	R	I	C	DR	SC	E
14 A B	Complex Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	+
č	Wall,L-shaped							
15	Enclosure	Habitation/Ag.	М	L	L	+	-	+
17 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	M	L	L	+	-	+
18 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	M	L	L	+	-	+
20	Enclosure	Habitation/Ag.	М	L	L	+	+	+
21	Enclosure	Habitation/Ag.	М	L	L	+	-	+
27	Enclosure	Relig.(Heiau/Hab.)	н	н	H	,+	-	+
28	Enclosure	Religious**/Hab.	Н	н	H	+	_	+
30	Alignment	Religious**	L/H	L/H	L/H	+	-	+
31	Overhang	Habitation/Ag.	M	L	L	+	-	+
32	Upright	Religious**	L/H	L/H	L/H	+	+	+
35	Human Bone	Burial	L	·L	Н	+	+	-
36	Enclosure	Religious**/Hab.	• н	Н	H	+	+	+
37 A B	Complex (2) Enclosure Wall, U-shaped	Habitation/Ag.	М	L	L	+	•	+
42	Enclosure	Habitation/Ag.	M	L	L	+	-	+
45 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	н	н	L	+	•	+
46	Enclosure	Ḥabitation/Ag.	M	L	L	+	_	+

SUMMARY OF IDENTIFIED SITES AND FEATURES - WAIOHULI (cont.)

Site/ Feature	Formal Site/Feature				alue sess.	Fi	eld W Task:	
Number	Туре	Interpretation	R	I	C	DR	SC	EX
47	Enclosure	Animal Control	L	L	L	-	-	-
48	Wali	Agriculture	М	L	L	+	+	+
49	Terraces	Agriculture	М	L	L	+	-	+
55	Overhang	Temp. Habitation	М	L	L	+	+	+
57	Upright Slab	Indeterminate	L	L	L	•	-	
58	Wails	Animal Control	L	L	L	-	•	
59	Wall	Transportation	L	L	L	-	-	
60	Wail	Animal Control	L	L	L	-	-	•
65	Enclosure	Habitation/Ag.	M	L	L	+	•	+
67 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	M	L	L .	+	•	+
71	Enclosure	Agriculture	M	L	L	+	-	+
73	Walls	Agriculture	М	L	L	+.	-	+
75	Wall	Habitation/Ag.	М	L	L	+	+	+
77	Enclosure	Agriculture	М	L	L	+	-	+
80	Wall	Animal Control	L	L	L	-	-	
82	Тепасе	Habitation/Ag.	М	L	L	+	-	+
83	Enclosure	Habitation/Ag.	М	L	L	+	-	+
88	Waii	Transportation	L	L	L	-	-	
90	Cave	Burial	H	L/H	H	+	+	+
96	Wall	Agricultural	M	L	L	+	+	+
97	Enclosure	Habitation/Ag.	M	L	L	+	+	+
98	Enclosure	Habitation/Ag.	М	L	L	+	+	+
101	Bridge	Transportation	L	L	L		•	-

Section 1. A land to the section of the section of the section of the section of the section of the section of

# APPENDIX B

# SUMMARY OF IDENTIFIED SITES AND FEATURES — KEOKEA

*Site/ Feature	Formal Site/Feature	Tentative Functional		RM V	aine sess.	+F	ield W Tasks	
Number	Туре	Interpretation	R	I	C	DR	SC	EX
1 A B	Complex (2) Platform Terrace	Habitation/Ag	М	L	L	+	-	+
2 A B	Complex (2) Enclosure Enclosure	Habitation/Ag	М	L	L	+	-	+
3 A B	Complex (2) Enclosure Enclosure	Burial**/Hab./Ag	<b>M/H</b>	L	L/H	+	•	+
4 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	M	L	L	+	•	+
5 A B	Complex (2) Platform Enclosure	Temp. Habitation/ Agriculture	М	L	L	+	•	+
6 A B C D	Complex (4) Enclosure Mound Enclosure Enclosure	Burial/Hab./Ag.	М/Н	L	L/H	+	•	+

<sup>\*</sup> PHRI temporary site numbers.

# Cultural Resource Management - Value Mode Assessment-

Nature:

R = scientific research

I = interpretive

C = cuiturai

Degree:

H = high

M = moderate

L = low

+ Field Work Tasks:

DR = detailed recording (scaled drawings, photographs, and written descriptions)

SC = surface collections

EX = test excavations

<sup>\*\*</sup>Possible functional interpretation

Site/ Feature	Formal Site/Feature	Tentative Functional				Field Work Tasks		
Number	Туре	Interpretation	R	I	С	DR	SC	EX
7	Complex (2)	Habitation/Ag.	Н	L	L	+	•	+
Α -	Enclosure							
В	Enclosure							
8	Complex (3)	Habitation/Ag.	М	L	L	+	-	+
Α	Enclosure							
В	Enclosure							
С	Enclosure							
9	Complex (3)	Habitation/Ag.	М	L	L	+	-	+
Α	Overhang							
B	Enclosure							
С	Enclosure						,	
10	Complex (7)	Habitation/Ag.	H	L	L	+	-	+
Α	Enclosure							
В	Enclosure							
С	Enclosure							
D	Enclosure							
E	Enclosure							
F	Enclosure							
G	Platform							
11	Terrace	Habitation/Ag.	M	L	L	+	-	+
12	Wall	Animal Control	L	L	L :	<b>-</b>	-	-
13	Complex (6)	Habitation/Ag.	H	L	L	+	-	+
Α	Enclosure							
В	Enclosure	•						
С	Enclosure							
D	Enclosure							
E F	Enclosure							
F	Enclosure							
14	Enclosure	Habitation	M	L	L	+	-	+
16	Complex (3)	Habitation/Ag.	М	L	L	+	•	+
Α	Enclosure							
В	Enclosure							
С	Enclosure							
19	Complex (4)	Habitation/Ag.	н	L	L	+	+	+
A	Enclosure							
В	Enclosure							
С	Enclosure							

Site/ Feature	Formal Site/Feature	Tentative Functional		M Vai le Ass		Field Work Tasks			
Number	Туре	Interpretation	R	I	C	DR	SC	EX	
20 A B . C	Complex (3) Enclosure Terrace Enclosure	Habitation/Ag.	М	L	L	+	•	+	
21 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	Н	L	L	+	-	+	
25 A B C D E F	Complex (6) Enclosure Wall Enclosure Enclosure Enclosure Wall	Habitation/Ag./ Animal Control	H	L	L	+		+	
26 A B	Complex (2) Enclosure Platform	Habitation/Ag.	М	L	L	+	-	+	
27 A B	Complex (2) Overhang Enclosure	Habitation/Ag.	M	M	L	+	•	+	
29 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	н	M	M	+	•	+	
30 ·	Heiau	Religious/Heiau	Н	н	Н	+	-	+	
31	Enclosure	Habitation	M	L	L	+	-	+	
32	Тептасе	Habitation	М	L	L	+	•	+	
35 A B	Complex (2) Enclosure Overhang	Habitation/Ag.	н	L	Ľ	+	-	+	
36 A B C D	Complex (5) Enclosure Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	н	L	L	+	•	+	

Site/ Feature	Formal Tentative Site/Feature Functional			M Val					
Number	Туре	Interpretation	R	I	С	DR	SC	EX	
39	Overhang	Habitation	М	L	L	+	+	+	
40 A B	Complex (2) Enclosure Overhang	Habitation	H	М	L	+	-	+	
41	Overhang	Temp. Habitation	М	L	L	+	-	+	
42	Enciosure	Habitation	Н	L	L	+	-	+	
44 A B C D	Complex (4) Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	H	L	L	+	•	+	
45	Enclosure	Habitation/Ag.	М	L	L	+	-	+	
46 A B C	Complex (4) Structure Enclosure Enclosure Enclosure	Habitation/Ag.	<b>M</b>	L	L.	+	•	+	
48 A B C D	Complex (4) Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	H	Н	Н	+	•	+	
50 A B C	Complex (3) Enclosure Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	+	
51	Enclosure	Habitation/Ag.	M	L	L	+	-	+	
52 A B	Complex (2) Enclosure Paved Area	Habitation/Ag.	M	L	L	<b>+</b>	•	+	
53 A B	Complex (2) Enclosure Terrace	Habitation/Ag.	M	L	L	+	-	+	
54	Enclosure	Habitation/Ag.	M	L	L	+	-	+	

Site/ Feature	Formal Site/Feature	Tentative CRM Value Functional Mode Assess.				Fi	eld Wo	
Number	Туре	Interpretation	R R	i I	C C	DR	Task: SC	EX
55 A B C	Complex (3) Enclosure Overhang Enclosure	Habitation/Ag.	Н	L	L	+	•	+
57	Enclosure	Habitation/Ag.	М	L	L	+	-	+
59	Enclosure	Habitation/Ag.	М	L	L	+	-	+
60	Wall	Animal Control	L	L	L	-	-	-
62 A B C	Complex (3) Enclosure Enclosure Enclosure	Relig./Habit. Ag./Burial	Н	Н	Н	+	-	+
63	Wall	Animal Control	L	L	L	-	-	
64	Enclosure	Habitation/Ag.	M	L	L	+	-	+
65 A B C D E F G	Complex (7) Enclosure Walls Enclosure Enclosure Enclosure Enclosures Enclosures	Habitation/Ag.	Н	L	L	+	•	+
69	Enclosure	Water Tank	· <b>M</b>	L	L.	. +	+ '	
70	Теттасе	Agriculturai	М	L	L	+	+ .	+
71 A B C	Complex (3) Enclosure Enclosure Mound	Burial**/Habit.	М/Н	L	L/H	+	•	+
76 A B	Complex (2) Terrace Wall	Habitation/Ag.	М	L	L	+	-	+

Site/ Feature	Formal Tentative Site/Feature Functional			Va de Ass		Fie	id Wo	
Number	Туре	Interpretation	R	I	C C	DR	SC	EX
78 A B	Complex (6) Terraces Terrace	Rel."/Hab./Ag.	Н	н	Н	+	+	+
C D E F	Platform Complex Enclosure Enclosure							
79	Enclosure	Agriculture	M	L	L	+	-	+
80	Wail	Animal Control	L	L	L	-	-	-
81 A B	Complex (2) Enclosure Enclosure	An. Contr./Ag.	M	L	L	+	-	+
84	Wall	Indeterminate	М	L	L	+	•	+
85	Walls & Terraces	An. Contr./Ag.	М	L	L	<b>,+</b>	-	+
87 A B	Complex (2) Platform Mound	Burial	н	L	H	<b>+</b>	•	<b>, +</b>
89	Тепасе	Habitation	М	L	L	+	•	+
90	Enclosure	Habitation	н	L	Ľ	+	-	+
95 A B C	Complex (3) Enclosure Terrace Wall	Habit/Ag.	M	L	L .	+	•	·· +
96	Enclosure	Habitation	М	L	L	+	•	+
97	Wall	Agricultural	M	L	L	+	•	+
98	Enclosure	Habitation/Ag.	M	L	L	+	•	+
99	Enclosure	Habitation	M	L	L	+	•	+
100	Wall	Animal/Control	L	L	L.	-	-	•

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Site/ Feature	Formal Site/Feature	Tentative Functional		CRM Value  Mode Assess.				Field Work Tasks			
Number	Туре	Interpretation	R	I	C C	DR	SC	EX			
101	Mounds & Wall	An. Control/Ag.	М	L	L	+	•	+			
102	Terrace & Wall	Habitation/Ag.	М	L	L	+	-	+			
103	Overhang	Habitation/Ag.	М	L	L	+	-	+			
105	Enclosure	Habitation/Ag.	н	L	L	+	-	+			
106	Stone	Tooi Manufac.	М	L	L	+	+	+			
107	Overhang	Burial/Ag.	н	L	н	+	+	+			
108	Enclosure	Habitation	М	L	L	+		+			
109 A B	Complex (2) Overhang Terrace	Agriculture	М	L	L	+	-	+			
110	Wall	Agricultural	М	L	L	+	-	+			
111 A B C	Complex (3) Overhang Terrace Overhang	Habitation	М	L	L	+	•	+			
112 A B C	Complex (3) Overhang Enclosure Wall	Habitation/Ag. Animal Control	М	L	<b>L</b> .	+	<b>-</b>	+			
115 A B	Complex (2) Enclosure Enclosure	Habitation	Н	H	M	+	-	+			
116 A B	Complex (2) Enclosure Enclosure	Animal Control	М	L	L	+	-	+			
118 A B C	Complex (3) Enclosure Enclosure Enclosure	Habitation/Ag. Animal Control	М	L	L	+	•	+			

Site/ Feature	Formal Tentative Site/Feature Functional			M Va de As		Field Work Tasks			
Number	Туре	Interpretation	R	I	C	DR	SC	EX	
120 A B C	Complex Paved Terrace Lava Tube Enclosure	Habitation/Ag.	М	L	L	+	-	+	
124 A B C	Complex (3) Enclosure Overhang Enclosure	Habitation/Ag.	М	L	L	+	-	+	
127 A B	Complex (2) Enclosure Overhang	Habitation/Ag.	М	L	L	+	-	+	
130	Enclosure	Habitation/Ag.	М	L	L	+	-	+	
131 A B C	Complex (3) Overhang Enclosure Enclosure	Habitation/Ag. Animal Control	M	L	L	+	•	+	
134	Enclosure	Religious**/ Habitation	н	L	M	+	-	+	
135 A B	Complex (2) Lava Tube Waii	Habitation/Ag.	М	L	L	+	<b>-</b> ·	+	
137	Enclosure	Habitation/Ag.	M	L	L	<b>.</b> +	-	+	
140 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	L	+	•	+	
142	Enclosure	Habitation/Ag.	Н	L	L	+	-	+	
143 A B	Complex (2) Enclosure Overhang	Habitation/Ag.	М	L	L	+	-	+	
146	Enclosure	Habitation	М	L	L	+		+	
148 A B C D	Complex (4) Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	+	

Site/			TID PEA			MEO IX	LA (	cont.)
Feature	Formal Site/Feature Type	Tentative Functional		RM V		Fi	eld W	
Number		Interpretation		Mode Assess.			<u>s</u>	
			R	I	C	DR	SC	EX
149	Overhang	Habitation	M	L	L	+	•	+
152	Complex (2)	Habitation/Ag.	н	L	L	+	_	+
A B	Platform Enclosure					·		•
200	Overhang	Habitation	М	L	L	+		+
201	Enclosure	Habitation	М	L	L	+	-	+
202	Enclosure	Habitation	М	L	L	+	-	+
203	Enclosure	Habitation/Ag.	н	L	L	+		+
204	Enclosure	Habitation	М	L	L	+	•	+
205	Overhang	Habitation	M	L	L	+	-	+
206	Lava Tube Enclosure	Habit.**/Ag.	M	L	L	+	-	+
207	Sink	Burial/Habitation	н	L	L	+	+	+
208	Enclosure	Habitation	M	L	L	+,	-	+
209	Enclosure	Agricultural	M	L	L	+		+
210	Overhang	Habitation	М	L·	L	+	-	+
211	Тептасе	Habitation	М	L	L	+		+

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### APPENDIX C

#### LIMITED HISTORICAL DOCUMENTARY RESEARCH KEOKEA AND WAIOHULI SUBDIVISIONS INVENTORY SURVEY by Helen Wong Smith, B.A.

Keokea and Waiohuli Subdivisions are situated in the ahupua'a of Keokea and Waiohuli, Makawao District (Kula), Island of Maui. Makawao can be translated: "Watchful eyes of Wa-o" (timeless or eternity). Sterling (n.d.) notes that "Makawao includes the ancient districts of Hamakualoa and Hamakauapoko..." For this reason, historical citations regarding Hamakuapoko and Hamakualoa are included within this report.

This report includes information obtained from the usual historical sources found in libraries, and information from other sources such as land and tax records, archaeological reports, maps, and various other manuscripts. Much information was obtained from the files of the Maui Historical Society, which houses the personal notes of E. Sterling and I. Ashdown. The information in this report is organized into five sections: Early Historical Accounts, Heiau in the Project Area, Land Commission Award (LCA) Information, Land Use and Tenure Information, and Informant Interviews.

#### EARLY HISTORICAL ACCOUNTS

Early accounts concerning the Makawao District generally either describe the area or relate early historical events. Areal descriptions usually concern the atmosphere or weather. Ashdown (n.d.) writes, "kula-o-ka-ma'o-ma'o or Land of Mirages, where lost souls wandered until they could find their way to rest." The rain of Makawao is described by Mrs. Miverva Kalama to Sterling (n.d.) in this way: "ukiu rain = a soft drizzle (the ua Kama'aina of Makawao) when the kiu rain cloud from Makawao meets the Naulu rain cloud from Kula then the rain comes, the typical Makawao rain."

A passage in Edward G. Beckwith's <u>Journal of a Tour</u> on <u>Maui</u>, also speaks of the unusual Makawao rain (Sterling n.d.):

We noticed a peculiar meteorological phenomen through the whole ride. The trade wind which blows from the ocean across the Northwestern slope of Haleakala, is highly charged with vapor, which is condensed by the cool mountian air, and falls in abundant rains over the region of Makawao. Along the west side of the mountains about half way to the summit, lay a long line of cumulo stratus clouds, and between this and the nimbus there was

but little space. The former lay along side of the mountain, apparently immovable, while the latter would advance and recede, now coming very near and coquertishly scattering its shining rain-drops beneath the very head of immovable—cumulus, and now retreating as though afraid of its more dignified companion. While mentioning this latter peculiarity to a gentleman this evening, he remarked that it was this feature of the clouds which gave the place its name - Makawao, Mako=to be afraid, wao=a cloud (HMCS June 5, 1854). [Sterling notes that this is incorrect, that "afraid translates maka'u and ao is cloud. Pukui et al (1974) indicates the literal translation of Makawao is "forest beginning."

The Sterling and Ashdown manuscripts also provide these two descriptions of Makawao. Sterling's description is somewhat poetic; Ashdown's description is curiously intermixed with what may be a legend:

"O native sons of those sections, the ones who watch for the dancing (haa) of the naked ones (olohe) on the plains of Kama'oma'o, where the iwa birds dwell in the ukiuku rain of Makawao..." S. W. Nailiili "E noho ana oe e oe ehoolono iki mai ana" Ke Au Okoa, Nov. 6, 1865. Hamakuapoko and Hamakualoa (Sterling n.d.).

In the area of Wahine'oma'o (now called the "Baseball Park" above the modern Poli-Poli camp) and nearby Lua-ma-ma-ne, was a structure said to be for bird catching ceremonies because that region was full of birds. The 'Oma'o bird is known as the Hawaiian Thrush, and they were plentiful and provided green feathers. The Woman of 'Omao' dwelt at Mamane and she was called Mamao because she was of such very high rank. She was so sacred that others must keep their distance. A handsome lesser chief fell in love with her beauty and tried to win her. Of course this was kapu. Her heart was heavy with the knowledge that because he came near to her shadow he had to be punished. A high priest conducted ceremonies of purification at the temple there and revived happiness. Today the Mamane trees are stunted and soon the foreign trees such as California Redwood, Norfolk Pines and others will be replacing the former green verdure (Ashdown 1971:46).

In 1873, Isabella Bird toured the Hawaiian Islands and wrote of her experiences to her sister back home in Edinburgh. These are her impressions of Makawao:

It is very pretty here, and I wish all invalids could revel in the sweet, changeless air. The name signifies "ripe bread-fruit of the gods." The plantation is 2000' above the sea, and is one of the finest on the islands; and owing to the slow maturity of the cane at so great a height, the yield is from 5 to 6 tons an acre. Water is very scarce; all that is used in the boiling-house and elsewhere has been carefully led into concrete tanks for storage, and even the walks in the proprietor's beautiful garden are laid with cement for the same purpose. He has planted many thousand Australian eucalyptus trees on the hillside in the hope of procuring a larger rainfall, so that the neighbourhood has quite an exotic appearance. Below, the coast is black and volcaniclooking jutting into the sea in naked lava promontories, which nature has done nothing to drape (Bird 1974:228).

Early accounts which mention Makawao in relation to early historical events include those by historians Kamakau and Fornander:

When Kekaulike heard that Alapa'i, the ruling chief of Hawaii was at Kohala on his way to war against Maui, he was afraid and fled to Wailuku in his double war canoe named Ke-aka-milo. He sailed with his wives and children..., his officers, war leaders, chiefs, and fighting men, including warriors, spearmen, and counselors. Some went by canoe and some overload, and the fleet landed at Kapa'ahu at the pit of 'Aihako'ko in Kula [old name for Makawao]. Here on the shore the chiefs prepared a litter for Kekaulike and bore him upland to Haleki'i in Kukahua (Kamakau 1961:69).

Ke-a-ulu-moku was another celebrated man of Kalaniopu'u's day. His father was the great chief Kau-ua-kahi-akua-nui, son of Lono-maka'i-honua and Kaha-po'ohiwi, but his mother belonged to Naohaku in Kohala. He was celebrated as a composer of war chants, chants of praise, love chants, prophetic chants, and genealogical chants. When he went back to Hawaii with Kalaniopu'u he was homesick for the two Hamakua districts of Maui [Hamakua is within Makawao District] here

he had lived with Kamehameha-nui and Kahekili. His love for the place found expression in a chant he composed, of which the following is an excerpt:

Affectionate longing, ibid Aloha, Aloha Aloha wale o'u Affection for my maku-a la (foster) parents, e o'u makua. my parents, Aloha wale o'u Affection for my makua parents Mai na 'aina Who belong to Hamakua, Hamakua, The two districts of He mau 'aina Hamakua elua, Hamakua No'u mua kaikua'ana Where my elder brothers live.

i naho ai.

He ala pali na'u he My hillside trails are theirs mau ali'i ia to rule (Kamakau 1961:112).

During the fleeing of Kekaulike, Kahekili was carrying on the war on Oahu and suppressing the revolt of the Oahu chiefs, (Kamakau dates this 1785) a serious disturbance on Maui had occurred which gave him much uneasiness. It appears that he had given the charge of his herds of hogs that were running in the Kula district and on the slopes of Haleakala to a petty chief named Kukeawe. This gentleman, not satisfied with whatever he could embezzle from his master's herds, made raids upon the farmers and country people of Kula, Honuaula, Kahikinui, and even as far as Kaupo, robbing them of their hogs, under pretext that they belonged to Kahekili. Indignant at this tyranny and oppression, the country people rose in arms and a civil war commenced. Kukeawe called the military forces left by Kahekili at Wailuku to his assistance; a series of battles were fought, and finally Kukeawe was killed at Kamaole-i-kai, near Palauea, and the revolted farmers remained masters of the situation (Fornander 1969:228).

This uprising of the country people was called the "Battle of the pig-eating Ku-keawe" ('Aipua'aa-Ku-keawe) (Kamakau 1961:142).

#### HEAIU IN THE PROJECT AREA

Three heiau are present in Keokea project area—Molohai, Papakea, and Kaumiumimua heiau. Molohai heiau, situated at an elevation of 2,275 feet above sea level, was initially described by Walker (n.d.), who described 26 heiau in the Kula region of which Molohai is the fourth

largest. Walker about 1930 listed Molohai heiau as being 65 by 90 ft and constructed of rough a'a. Walker surmised that the heiau was probably originally L-shaped; however, this could not be determined definitely, as the heiau had deteriorated and portions of it had been rebuilt as a modern wall. According to Walker, the front of the heiau was double terraced, and within it were a large court and a platform, set off by a low wall. In 1973, the Historic Sites office recorded the heiau as including narrow, terraced platform steps along the walls, three stone mounds, an alignment of stones, and a rectangular platform. Due to its size and good condition, Molohai heiau has been placed on the State Register of Historic Places.

Papakea heiau is situated mauka of Molohai at an elevation of 2,300 ft above sea level. Walker (1931) describes the heiau as "an open platform of a a construction 45'x88'...the front double-terraced to a height of 4'...some coral seen but no pebbles." While surveying the heiau in 1973, a Historic Sites office archaeologist was told by a local informant that a house and cistern once stood on the site. The archaeologist and informant surmised that rocks from the heiau were utilized in constructing the cistern and that Walker's measurement of the heiau excluded the property line of the house. Ashdown (1971:46) cites this heiau as a fishing shrine.

Kaumiumimua hejau, according to M. Riford (1987), is situated makai of Papakea, on a large gully overlooking Ma'alaea Bay. In 1931, Walker commented that the hejau had been much disturbed and that the remains of a platform were present in the northern corner and near the entrance. A survey of the hejau by the Historic Sites office in 1973 indicated that the east and south walls evidence two and possibly three separate construction periods.

Ashdown (1971:46) mentions other heiau in Keokea and Waiohuli—Ho'ola and Ho'oula Ua heiau in Keokea and Kaimupeelua heiau in Waiohuli. Ho'ola heiau (Health temple) is sinated just behind the Kula Sanarorium. Ashdown writes, "Ho'oula Ua heiau," a place for praying and offering gifts to bring rain." She also writes, "long before the forest was denuded...near Polipoli Spring area, there was farm where 'awa was cultivated and there stood a temple to Lono." Kaimupeelua heiau is located in the Waiohuli project area. Although the heiau originally measured 17 by 25 meters, much of it has been reduced to rubble by cattle (Historic Sites Register 1973).

Other heiau mentioned by historic writers in the Makawao district include Kailua heiau (Thrum 1909:44), and Pa'uhu, Mahea, Kaumuopahu (or Kaunuopahu). Po'onahoehoe and Mana heiau. The latter heiau is now part of a modern cemetery (Ashdown 1971:57).

#### LAND COMMISSION AWARDS

Although there were many small parcels granted in Keokea and Waiohuli, the Indices states that Keokea was Crown Land from the beginning and that Waiohuli was approved as such in 1890 by Kalakaua. The numerous parcels may be a result of an experiment conducted by the Kamehameha III's administration prior the Greaty Mahele concerning trial fee ownership runs. Kuykendall (1968:283) recounts the reasons for such trial fee ownership runs:

It will be remembered that the year 1845, during which the new land law was written and in part enacted, was disturbed by an anti-foreign agitation, accompanied by a rather pointed suggestion that lands be given or sold to the common people and that the legislative committee, in its reply to the petitions of the people, approved the idea of selling land to Hawaiian subjects. This was directly in line with suggestions contained in Dr. Judd's report as minister of the interior, and there were frequent allusions to the subject in the proceedings of the legislature. The agiration among the people probably hastened the decision of the government to make an experimental beginning without waiting for the new law to go into operation. The places selected for the experiment were the Makawao district of Maui and Manoa valley on Oahu.

During the King's tour of Maui in December, 1845, and January 1846, the party visited Makawao and it was announced that the entire district, with the exception of McLane's plantation, was to be offered for sale to the people in fee simple. Rev. J.S. Green, pastor of the Hawaiian church at Makawao, undertook to manage the business of selling the land. In afterwards relating his experience in connection with the project, Green said he called the people together, showed them his instructions from the government, and explained the plan to them

A few of them purchased at once, others had less confidence that lands thus purchased would be secure, but soon abandoned their scruples, while others still could not for a long time, be persuaded that there was not some catch about it—some design to enrich the chiefs at their expense. But nearly all of these were finally talked out of their suspicions & took up each a small piece of land.

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<sup>\*</sup> Letter in Polynesian, July 14, 1849.

Another missionary, Rev. Richard Armstrong, assisted the enterprise by making surveys. The land was sold at \$1 per acre, and nearly a 100 parcels were taken up, most of them ranging from 5 to 10 acres. Altogether about 900 acres were purchased by the people of the district.

In a report by Riford (1987), 11 Land Commission Awards (LCA) either within or bordering the Keokea parcel and eight LCAs within the Waiohuli parcel are listed. The bulk of the parcels is designated as kula land and houselots (1987). Kula land is described by Handy and Handy (1972:510) as "open country, or plain, as distinct from valley...and has often been used as a term to distinguish between dry, or 'kula land' and 'wet-taro land'". As indicated in Kuykendall's account, kula plots were cultivated for personal use, but many tenants were involved in ranching and cash crops. A map of the project area showing LCA locations was obtained from the Tax Map Bureau in Honolulu (Figure A-1: "Portion of Kula, Makawao, Maui TMK 2-2-02"). The map shows nine LCAs within or abutting Keokea and Waiohuli. LCA 8452:19, in the ahunuaa of Koheo I and 2, abuts the Waiohuli project area on the northern side.

#### LAND USE AND TENURE

In their discussion of Hawaiian sweet potato planting techniques, Handy and Handy (1972) mention the Kula area of Maui and describe it as "[w]here potatoes are planted in crumbling lava with humus, as on eastern Maui and in Kona, [in] Hawaii the soil is softened and heaped carelessly in little pockets and patches using favorable spots on slopes...[r]ocky lands in the olden days were walled up all around with the big and small stones of the patch until there was wall (knaiwi) about 2' high" (Handy and Handy 1972:131).

Handy (1940:161) also mentions Kula in his early work entitled The Hawaiian Planter:

KULA was always an arid region, throughout its long, low seashore vast stony kula lands, and broad uplands. Both on the coast, where fishing was good, and on the lower westward slopes of Haleakala a considerable population existed. So far as I can learn Kula supported no Hawaiian taro, and the fisherman in this section must have depended for vegetable food mainly on poi brought from Waikapu and Wailuku across the plain to supplement their sweet potato staple diet.

Kuykendall (1968:313) writes of the time when Kula crops turned from subsistence crops to commodities:

... Before that time the whalers had created a limited market for fresh vegetables, fresh meat, and fruit; the great increase in the number of whaleships after 1840 caused a corresponding increase in the demand for such products of the soil. In bulk and value, potatoes (sweet and Irish) ranked first in this traffic. In the early days only sweet potatoes had been obtainable at the islands, but after 1830, if not sooner, cultivation of the Irish potato was taken up and during the 1840s and 1850s became of great importance. It was shortly before 1840 that Irish potatoes were first raised in the Kula district, which proved to be so well adapted to them that it soon came to be called the "potato district." Jarves describes the region as it appeared to him in July 1846.

It ranges along the mountain (Haleakala) between 2000 and 5000 feet elevation, for the distance of 12 miles. The forest is but partially cleared, and the seed put into the rich virgin soil. The crop now in the ground is immense. The fields being all in blossom have a fine appearance, spreading as they do, over the broad surface of the mountain.

From this upland region the potatoes were carried down to the shore and taken to Lahaina or were sold directly to ships which called at Kalepolepo. In the spring of 1847 it was estimated that the crop would amount to 20,000 barrels...In 1854, G.D. Gilman estimated that the local Hawaiian market, including whaleships, could be depended on to consume about 20,000 barrels of Irish potatoes.

The influx of gold seekers together with the comparative neglect of agriculture in California created a demand for potatoes and other vegetables, as well as for sugar, molasses, and coffee, which began to be felt strongly in 1847, but the potato "boom" commenced in the fall of 1849. At the beginning of November a correspondent wrote from Maui to the Polynesian:

The call for [potatoes] is loud and pressing, as some vessels bound for California have taken as many as 1,000 barrels each. The price is high, and the probablity is that the market can not be supplied this autumn. Kula, however, is full of people. Strangers from Wailuku, Hakamakua, and Lahaina are there

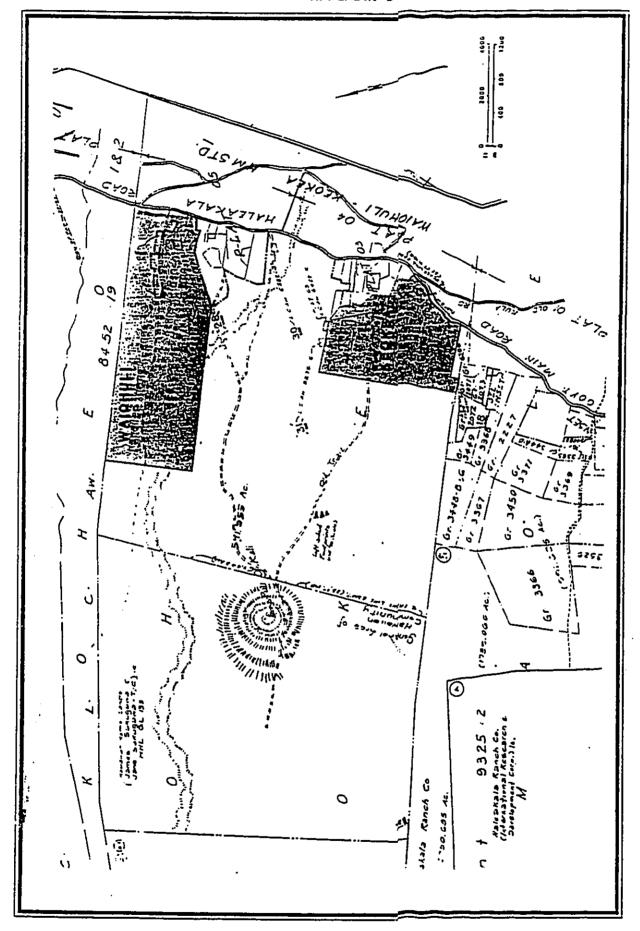


Figure C-1. 1938 MAP SHOWING PROJECT AREA AND LCA LOCATIONS

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preparing the ground and planting, so that if the demand from California shall be as urgent next spring as it is now the people will reap a rich harvest... They often repeat the saying of a foreigner, who after visiting the mines of California, came back to Maui quite satisfied, and said to his neighbors at Waikapu, "California is yonder in Kula. There is the gold without the fatigue and sickness of the mining country."

The foreigner's remark caught the fancy of the Hawaiians and they were soon referring to Kula as "Kalifonia" or "Nu Kalifonia" and working with great diligence to extract the wealth from the rich pay dirt on the slopes of Haleakala. To encourage the spirit of enterprise which had been thus awakened among the native people, the privy council voted to have the government lands in Kula surveyed and divided into small lots of from 1 to 10 acres and offered for sale to the natives at a price of \$3/acre (see page 5 of this report) (1968:321)."

C. Speakman, in his book entitled MOWEE also mentions the fervor of cash-cropping:

During the gold rush, hundreds of Hawaiians were going into business for themselves on Mauigrowing potatoes and hauling them to the port where they were snapped up and shipped to San Francisco. The Maui fields were called Nu Caliponi, or New California; potatoes were gold, and a fortune could be dug out of the ground by one man. The potato boom was short lived, and, when the prices dropped, the Hawaiians lost interest. Perhaps the problem was that Hawaiians did not share the white man's concept of time (1978:116).

The Chinese were among those who took advantage of this agricultural opportunity. During the 1840s, Chinese farmers leased lands in Kula. Their initial success motivated many Chinese to move to that region and lease land for farming. They moved from places such as Makawao, Paia, and Wailuku on Maui, Kohala on the Big Isle, and from Honolulu. Some went to Kula directly from China. The vast majority of Chinese, about 95%, were Hakkas from Kwangung Province. During the 1840s, most Kula Chinese acquired their farmland by lease or deed from the haole ranchers or Hawaiian homesteaders. Much of this land was owned by the Hawaiian govenment, which leased it to the ranchers, who in turn subleased it to the Chinese. In some cases, the farmers made their lease payments in farm produce, in lieu of monetary transaction. One family which leased land

from Ulupalakua Ranch paid five bags of corn for every acre of land they farmed (Interview, Willie Fong IN Mark 1975). Although by the mid-1850s, the demand for Kula potatoes had diminished, the Chinese population continued to grow. By between 1880 and 1910 approximately 80 Chinese families had moved to Kula; by 1900 there were some 700 Chinese living there. For a period of 30 to 40 years, Kula supported a thriving community which included Chinese and English schools, Christian churches, a Hung Men society, gambling joints and opium dens, general stores, and dozens of operating farms and cattle ranches (Mark 1975).

In addition to Irish potatoes, the Kula farmers planted corn, beans, onions, Chinese cabbage, round cabbage, sweet potatoes, wheat and other grains, and even cotton. When the Hawaiian market showed no demand for corn, the farmers used the corn to raise pigs, ducks and chickens, and marketed the animals instead. When the corn, potatoes, and other crops were harvested, they were packed and transported on mule teams or wagons to Kahului and Makena harbors, and were then shipped to Honolulu. Those who lived in the southern districts of Keokea and Kamaole usually brought their produce to the Makena landing. Most of Kula's produce, poultry, and beef was sent to two or three markets in Honolulu Chinatown, including Wing Hong Yuen and Sing Loy. The two stores, in turn, supplied Kula's general stores with Chinese dry goods and staples such as rice, flour, sugar, and canned milk (Mark 1975).

Early farming in Kula was adapted to the topography. In planting crops, rather than terracing the land, the farmers followed the natural contour of the land and depended on moist air and rainfall rather than irrigation. Until 1905, there was little water piped into the area, and during droughts—which occurred every several years—the farmers had to pack barrels of water on mules from Polipoli Springs, or from the beach or Olinda, both about 8 miles away (Mark 1975). An article in newspaper The Honolulu Advertiser points out the changes in the topography in Kula and its affect on the water supply:

Before 1850 Kula was supplied with moisture naturally through the existence of a large forest. "That forest was cut down when land was cleared in Kula to open farm plots in 1850. This was in answer to the demand for food in California during the gold rush....by ranchers clearing for pasture." Secondary result of clearing forests was destruction of existing fresh water ponds in Kihei on the Maaloaea (sic) Bay coast below Kula. When forest was cleared, water was free to rush down the mountains carrying soil from Kula and filling with

mud, the ponds for which Kihei was once famous. Meanwhile Kula is dependent on pipe from Waikamoi watershed (Korte 1962 A:15).

In 1905 the Kula Pipeline was built during perhaps the worst drought in Kula history. The water source for the pipeline was discovered in Olinda, northeast of Kula. The contractor who built the pipeline was a prominent Kula resident named Shim Mook, and labor was supplied by the men and women of the area (Mark 1975).

In 1911 the Hawaiian government released a large amount of public land, and it became possible for citizens to purchase property in Kula. The sale of the land was advertised in English and Hawaiian newspapers, but word was somehow not communicated to the Chinese, whose lives these land sales would most affect. According to the Hawaiian Church Chronicle (Oct. 1911:12), the Kula Chinese were not aware of what was taking place until the land was sold and the Hawaiians came and told them that the property belonged to them. They (Chinese) had relied on the information which they had received that the disposal of the land would not take place for a considerable time." Faced with eviction. the Kula Chinese decided determinately to remain on the land and organize themselves. Ninety-eight young residents signed a petition expressing the desire of the Chinese to be allowed to reside on certain lots their families had farmed for many years. In a letter to the Commissioner of Public Lands dated September 27, 1911, Governor Frear suggested that leases be made to occupants of unsold lots for approximately 10 years, subject to withdrawal for homestead purposes. Then, as the older children of those families reached 18 years of age, they would be able to apply for the lots as homesteads. In October 1911 the Hawaiian Church Chronicle reported that the government had promised to do so under these terms. Chinese who applied for homesteads and were granted them were given three years to improve their lot ... after that period, they could apply for a "right of purchase" lease, and then buy the land outright from the government. Before this special arrangment was arrived at. however, a number of Kula farmers saw their land divided into homesteads and leased to others. These farmers, with the loss of their farmland, were forced to move out of Kula and change their livelihoods.

During the 1910s and 1920s many families left Kula for various reasons: severe drought which ruined crops and killed livestock, soil which was reaching depletion level after years of harvesting and tilling, lack of educational opportunities for children, and loss of land due to parceling homesteads. In 1918 another mass exodus occurred—some 40 families left Kula because the land they were leasing was sold to a man named Harold Rice, who intended to use the

land for ranching. In the book <u>Mowee</u>, the author writes regarding the sale of farms to Rice: "The leases to the land had not expired, but the farmers were unaware of their right to challenge the eviction" (Speakman 1978: 143). It is some of this land that Rice acquired from the farmers that made up Kaonoulu Ranch, in which the project area resides.

In the early 1970s, 35% of Hawaii's vegetables were grown in Kula, including a large percentage of the state's head lettuce, dry onions, and tomatoes. Much of the remaining land was devoted to livestock breeding by about 20 full and part-time ranchers (Project Measure Work Plan - Lower Kula Irrigation Project," Board of Water Supply, Maui County, Sept. 1971) The cash crops in Kula were no longer corn and potatoes, but a variety of vegetable and flowers produced by some 35 family-operated farms ranging in size from five to 50 acres. As of 1975, the agricultural yield of the irrigated soil was still very high (Mark 1975).

Sugar cultivation has played a major role in Honuaula and Makawao. In the spring of 1846 there were six establishments on the western slope of Mt. Haleakala manufacturing sugar and molasses (Kukendall 1968:316). Since the general vicinity of the present project area has been used historically for small farms and ranching, Kula sugar cultivation will not be discussed here.

A report on Kula would not be complete without some mention of Kula Sanatorium, founded for the care of tuberculosis sufferers. The sanitorium is located mauka of the project area at an elevation of 3,000 feet (The Honolulu Advertiser 9/20/85 B:3). Land for the sanatorium was requested by Bill Pogue in 1909. Initially the sanitorium consisted of two tent-houses which accomodated 12 patients. The tent-houses, which included kitchen and dining facilities, was financed by the County and Territory and cost \$500.00. The first permanent ward was built by W.E. Foster, former patient and Superintendent. Around 1932, the Hawaiian Homes Commission granted 100 acres to the sanitorium, and in 1937 a new sanatorium was constructed (Jones 1940).

The following general information relevant to Keokea and Waiohuli ahupua'a is from The Maui News:

3-26-04 - P. Cockett has been appointed manager of Waiohuli Cattle Ranch.

4-27-07 - On last Sunday morning, J.P. Inaina was installed pastor of the Keokea Hawaiian church in Kula. A large audience was present. Rev. I. D. Iaea preached the sermon and Rev. M. Lutero gave the right hand of fellowship. The charge to people and pastor was given by Rev. R.B. Dodge. Rev. D.N. Opunui offered the installing prayer.

12-16-32 - Formal approval of the newly acquired land in Keokea which is now being turned into a baseball park for the people of Kula, was given by the Board of Supervisors on Thursday. A resolution requesting the Commissioner of Public Lands to effect the exchange of lands between the territory and the owner was adopted by the Board. Slightly over two acres are involved in the transaction.

#### INFORMANT INTERVIEWS

On April 20, 1989 the author, accompanied by Mr. Dan Auwai, Department of Hawaiian Homes Lands - Maui Manager, conducted oral history interviews with two former employees of Kaonoulu Ranch-William Poepoe and Henry Kekiwi. William Poepoe was employed by the ranch for some 46 years and retired in 1983. Mr. Poepoe was born on Ulapalakua Ranch and started working for Kaonoulu Ranch at the age of nine, at which age he planted molasses grass (scattering seeds) for the cattle to feed on. By age 11, he was working full-time for Kaonoulu Ranch. Mr. Pcepoe said that Harold W. Rice, the founder of the ranch, owned, in addition to lands leased, over 18,000 acres. After Mr. Rice's death, his son, Oskie Rice, took over. Oskie Rick employed 15 full-time ranch hands. Mr. Poepoe said that the cattle raised on the ranch were taken to Makawao for slaughter. In addition to beef cattle, there were also dairy cattle.

Mr. Poepoe also provided additional information on the general Kula area. According to him, near Pu'u Kali (Red Hill) they grew corn, and within the caldera of Pu'u Kali is a fence that the Army erected during WWII for target practice. On the Kamaole-Keokea border there was once a Hawaiian settlement. Mr. Poepoe said there were paved sidewalks and gravesites there. He once took a tombstone from there, until the foreman asked where he got it and pointed out what it was. He then returned it.

Mr. Henry Kekiwi was the last foreman for Kanoulu Ranch (under Rice ownership). He presently lives in the Foreman's house, which the ranch provided along with five other houses for ranch hands. According to Mr. Kekiwi, when he retired after 42 years with the ranch, the ranch had 2,500 head of canle. Mr. Kekiwi provided general information on the area of the ranch. According to him, stone walls throughout the ahupua'a were built in the 1800s. On ranching practices, Mr. Kekiwi said that the cattle would graze in the lower lands near Pu'u Kali during the winter months, then around June, they would be taken mauka. Mr. Kekiwi noted that Hawaiian Homes Land wraps around the land of a Mr. George Tanji, who has lived on the land many

years growing cabbages and pigs. Mr. Kekiwi also noted that Rice sold kuleana land in the area to a Dupont and that Hawaiians and Chinese would move from Pu'u Kali area to further up Keokea during summer. Mr. Dan Auwai said the name Kaonoulu is derived from Cornwell who originally owned the land. A check with the Hawaii State Archives, however, shows Kaonoulu listed as an 'ili, so the name is most likely traditional.

Driving down the old Haleakala Road starting at Keokea gate, where the agricultural parcels that Hawaiian Homes is allocating are located, Mr. Kekiwi noted that the heiau from second gate left of Haleakala Road had ti leaves growing on its side, which indicates a fresh water supply in the area. He also pointed out many heiau in the general vicinity of Molohai and Papakea in Keokea, and in Waiohuli. He was not privy to the names of any of them nor was he aware of any stories about them. Mr. Kekiwi pointed out that when ranching, one is busy looking for cattle, not for heiau. Along Haleakala Trail, which was used by Kaonoulu Ranch extensively during its ownership by the Rice family, he pointed out "footprints" imprinted in the lava rock. These footprints are outside the project area, on the way to Pu'u o Kali, also known as Red Hill (see Figure A-1 for location of footprints and locations of other sites mentioned in the interviews). The footprints numbered three, were of various sizes, and were all of the left foot. During an interview with William Poepoe, he said the right sides to the footprints were somewhere on Molokai. Mr. Kekiwi noted that before the ranch, the land was (probably) inhabited by Chinese; the Chinese used the walls but they were not necessarily built by them. Mr. Kekiwi said that the barbed wire fences along the walls were put up by the ranch hands, especially when parts of a wall would fall off, to prevent the cattle from crossing over. When asked by Mr. Auwai about a barbed wire fence that surrounded a small area outside the project area, Mr. Kekiwi said that it was probably put up by pakalolo growers and not the ranch hands.

#### CONCLUSION

During this century, the project area has been used primarily for cattle grazing, hence the many archaeological sites obscured by grasses and lantana. For the purposes of this report, a general overview of agricultural activities was given. If further historical documentary research is conducted for the project area, it is suggested that a check be made for awards given out during the Kingdom of Hawaii and that the following topics be addressed: prehistoric environment and occupation in the area, as evidenced by historical documents; local and regional cultural (including residential sequences.

1978

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# APPENDIX D

## WAIOHULI SITE AND FEATURE DESCRIPTIONS

SITE NOS.: STATE: 2344 PHRI: W-1 BPBM:—

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

TO THE PROPERTY OF THE PROPERT

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

**DIMENSIONS:** 7.8 m long by 10.0 m wide; c. 78 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This feature is a rectangular enclosure. Facing in places on both the inside and outside of the walls. Upright facing stones are present in the northeast and southwest corners. North wall is an alignment. All walls curve outwards. Walls range in height from 10 to 90 cm. Agricultural features, mounds and crude terraces surround the enclosure.

SITE NOS.: STATE: 2345 PHRI: W-2 BPBM: T-6

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 3.6 m wide; c. 29 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This is a long, narrow enclosure. The walls show no signs of having been faced. Near the center of the west wall a short wall segment extends westward for 1.5 meters. Scattered mounds, modified outcrops, and crude terraces surround the feature.

SITE NOS.: STATE: 2039 PHRI: W-3 BPBM: T-7

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, kiawe and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 19.6 m long by 10 m wide; c. 196 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This is a complex, rectangular paved terrace with a 1.0 m high faced wall on the northwest. The west wall extends southward beyond the terrace and retains a lower earthen terrace. The paved surface of the terrace overlies 25 cm thick cultural deposit. Alignments border the south and east sides of the earthen terrace. Agricultural

features; crude terraces, mounds and modified outcrops are scattered around the site.

SITE NOS.: STATE: 2346 PHRI: W-4 BPBM: T-8

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 78.0 m long by 1.0 m wide; c. 78 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: This site is part of a complex of historic stone walls all of which are associated with a major eastwest drainage. The wall is constructed of stacked boulders and cobbles. It follows the bottom of a narrow drainage. A barbed wire fence begins at the east end of the wall.

SITE NOS.: STATE: 2347 PHRI: W-5 BPBM: --

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.0 m long by 3.8 m wide; c. 11 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: This overhang was possibly utilized. The evidence for use consists of a single boulder which

appears to have been placed on the dripline in the center of the entrance. The interior is 1.0 m high.

SITE NOS.: STATE: 2348 PHRI: W-6 BPBM: —

FORMAL TYPE: Lithic Scatter

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 7.3 m long by 2.8 m wide; c. 20 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Lithic Reduction DESCRIPTION: Basalt flakes are on a small bedrock outcrop. The bedrock has scars on it which suggest that a cobble was smashed against it. There are c. 12 flakes (5-10

cm) and numerous smaller flakes on the bedrock.

SITE NOS.: STATE: 2349 PHRI: W-8 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, kiawe, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 5.5 m long by 8.1 m wide; c. 45 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Semi-rectangular structure with some internal facing on the east wall. The walls of the enclosure are collapsed and have been altered both by cattle and bulldozer cuts on the south and SE sides. A wing wall extends SW 2.8 m from the SW corner. The structure walls are compiled of stacked boulders and cobbles up to 70 cm in height. Mounds and modified outcrops are present south of the site.

SITE NOS.: STATE: 2350 PHRI: W-10 BPBM: —

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini. 'ilima, kiawe and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.6 m long by 5.3 m wide; c. 35 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: T-shaped terrace; at the SW corner of the terrace is an outcrop. The terrace wall is composed of stacked boulders, cobbles and pebbles. It retains a c. 10 sq m area of soil.

SITE NOS.: STATE: 2040 PHRI: W-11 BPBM: T-5

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 23.0 m long by 18.0 m wide; c. 414 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial\*/Agriculture DESCRIPTION: This complex includes a C-shaped enclosure, a wall, mounds, and a platform. Some mounds are possible burials; the largest (Feature E) is faced on one side. The C-shaped enclosure is unusual in that it opens to the northeast. Rough terraces, small mounds and modified outcrops, all probable agricultural features, surround the site.

FEATURE: A

FORMAL TYPE: C-shaped enclosure TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, kiawe and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.6 m long by by 2.4 m wide; c. 9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the NE. Feature is comprised of stacked cobbles up to 40 cm high. A test pit in this feature produced only a few scattered pieces of charcoal, potentially indicating it is not a habitation feature as it's orientation also suggests. The charcoal produced a calendric age range of AD 1270-1490.

FEATURE: B

FORMAL TYPE: Mound

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 2.0 m long by 1.2 m wide; c. 2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Mound is roughly circular and rounded in profile. It is comprised of basalt cobbles and boulders stacked 40 cm high. The feature is more substantial than most of the agricultural mounds in the vicinity.

FEATURE: C

FORMAL TYPE: Mounds

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, kiawe

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 6.6 m wide; c. 53 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Four small mounds and one associated rubble wall. This portion of the site appears to be agricultural in nature. The mounds are too small for burials, and the wall appears to be a portion of a collapsed terrace situated along the edge of the drainage. The mounds average 6.5 cm in

diameter and 40 cm in height.

FEATURE: D

FORMAL TYPE: Mound

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, kiawe

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 1.9 m long by 1.9 m wide; c. 4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: This is a large mound comprised of stacked basalt cobbles and boulders. It is roughly rectangular in plan and rounded in profile. The mound is 60 cm in height. It is more substantial than most of the agricultural mounds in the vicinity.

<sup>\*</sup> Tentative, temporary, or provisional.

INTEGRITY: Altered

FEATURE: E PROBABLE AGE: Prehistoric FORMAL TYPE: Platform FUNCTIONAL INTERPRETATION: Habitation/ TOPOGRAPHY: Dissected alluvial slope Agriculture VEGETATION: Lantana, panini, 'ilima, and grasses DESCRIPTION: Two enclosures; one square and the other **CONDITION: Fair** trapezoidal. Associated agricultural mounds and terraces INTEGRITY: Unaitered surround these features and extend c. 40 m to the northeast. DIMENSIONS: 3.0 m long by 3.0 m wide; c. 9 sq m PROBABLE AGE: Prehistoric FEATURE: A (Figure D-1) DESCRIPTION: This feature appears to be a mostly FORMAL TYPE: Enclosure collapsed platform which probably contains a burial. The TOPOGRAPHY: Dissected alluvial slope 90 cm high structure is comprised of stacked boulders and VEGETATION: Lantana, panini, 'ilima, and grasses cobbles. A c. 2 m long segment of the exterior facing CONDITION: Good remains intact along the west side. The remaining sides are INTEGRITY: Altered collapsed. A small piece of decomposing coral is present on DIMENSIONS: 8.0 m long by 6.0 m wide; c, 48 sq m the surface of the feature. PROBABLE AGE: Prehistoric DESCRIPTION: Trapezoidal enclosure; possible wall FEATURE: F extension off NW corner. Small terrace at NW corner. Most FORMAL TYPE: Mound of the west wall is collapsed. The SE corner is faced TOPOGRAPHY: Dissected alluvial slope externally. The walls average 40 cm in height, are core-VEGETATION: Lantana, grasses, panini, kiawe filled (filled portion is narrow), and are comprised of CONDITION: Good stacked boulders and cobbles. INTEGRITY: Unaltered DIMENSIONS: 1.8 m long by 1.4 m wide; c. 3 sq m FEATURE: B (Figure D-1) PROBABLE AGE: Prehistoric FORMAL TYPE: Enclosure DESCRIPTION: The is a large mound comprised of TOPOGRAPHY: Dissected alluvial slope stacked basalt cobbles and boulders. It is roughly rectangular VEGETATION: Lantana, panini, 'ilima, and grasses in plan and rounded in profile. The mound is 60 cm in CONDITION: Good height. It is more substantial than most agricultural mounds INTEGRITY: Unaltered in the vicinity. DIMENSIONS: 6.1 m long by 6.0 m wide; c. 37 sq m PROBABLE AGE: Prehistoric SITE NOS.: STATE: 2351 PHRI: W-12 BPBM: — **DESCRIPTION:** Square enclosure with core-filled walls. FORMAL TYPE: Terraces The southwest wall consists of a ridge of bedrock. The wails TOPOGRAPHY: Dissected alluvial slope average 40 cm in height. The wall faces are comprised of VEGETATION: Panini, lantana and 'ilima stacked basalt cobbles and boulders. The core-fill is comprised CONDITION: Fair of cobbles. INTEGRITY: Unaltered DIMENSIONS: 7.0 m long by 13.2 m wide; c. 92 sq m SITE NOS.: STATE: 2353 PHRI: W-14 BPBM: — PROBABLE AGE: Prehistoric FORMAL TYPE: Complex FUNCTIONAL INTERPRETATION: Agriculture TOPOGRAPHY: Dissected alluvial slope DESCRIPTION: Three rock-retained terraces arranged in VEGETATION: Lantana, panini, 'ilima, and grasses a stepped series. The terraces average 0.4 m in height, 7.0 **CONDITION:** Fair m long by and 4.6 m wide. Terrace walls incorporate **INTEGRITY:** Unaltered bedrock outcrops. Additional agricultural features, mostly DIMENSIONS: 42.0 m long by 28.0 m wide; c. 1176 sq m mounds and modified outcrops are present to the southeast. PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ SITE NOS.: STATE: 2352 PHRI: W-13 BPBM: — (Figure D-1) DESCRIPTION: This site includes two enclosures, an L-FORMAL TYPE: Complex shaped wall, and associated agricultural features. TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wiliwili, 'ilima, kiawe and grasses FEATURE: A CONDITION: Good FORMAL TYPE: Enclosure

DIMENSIONS: 25.0 m long by 20.0 m wide; c. 500 sq m VEGETATION: Lantana, panini, 'ilima, and grasses

TOPOGRAPHY: Dissected alluvial slope

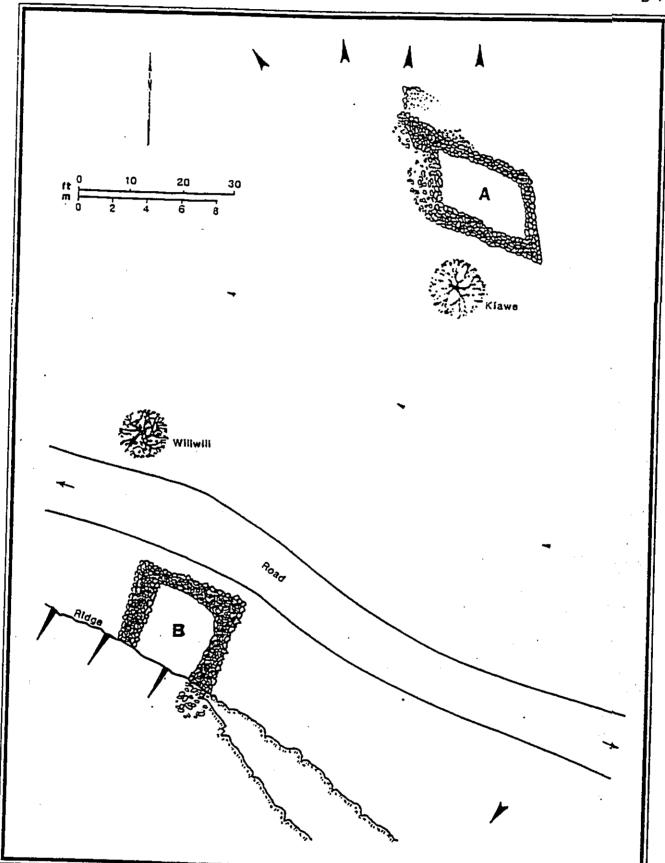


Figure D-1. SITE W-13, FEATURES A AND B.

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 8.1 m long by 6.0 m wide; c. 49 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with internal facing on the NE corner. Two large flat slabs located atop walls of structure. Internal wall extends off south wall. The walls range from 20 to 60 cm in height and are comprised of stacked basalt boulders and cobbles.

FEATURE: B

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 3.0 m long by 2.5 m wide; c. 8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped; very crude. One end of the structure sits on bedrock. Feature is open to the south. It is comprised of basalt boulders and cobbles stacked/piled up to 50 cm in height. Feature probably is agricultural in function.

FEATURE: C FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION: Fair** INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 9.0 m wide; c. 90 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: L-shaped; west portion of feature consists of an alignment of boulders and cobbles; south wall consists of stacked boulders and cobbies. The walls border a roughly rectangular area of level soil.

SITE NOS.: STATE: 2354 PHRI: W-15 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION: Poor** INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.8 m wide; c. 24 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This is an oval enclosure constructed of large stones (averaging 60 cm in diameter). The inside of the NE wall is faced. Agricultural features, mounds and modified outcrops, are present to the southeast.

SITE NOS.: STATE: 2355 PHRI: W-17 BPBM: —

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 9.0 m wide; c. 117 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Consists of a two-chambered enclosure and an oval enclosure; both are small and incorporate bedrock in their construction. Scattered agricultural features

surround the site.

FEATURE: A

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two chambered enclosure; incorporates bedrock on south side. The north wall is faced on both the inside and the outside up to 60 cm in height. Walls are comprised of stacked boulders and cobbles. A cowrie shell fragment is present on the surface inside the feature.

FEATURE: B

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.2 m long by 4.2 m wide; c. 18 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure with the walls well faced on the inside. The southern wall is 1.0 m high and the north wall is 0.7 m high. The walls are comprised of stacked

basait boulders and cobbles.

SITE NOS.: STATE: 2356 PHRI: W-18 BPBM: —

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 100.0 m long by 80.0 m wide;

c. 8,000 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Red

Agriculture

**DESCRIPTION:** This site includes one rectangular enclosure, one irregular enclosure, and numerous agricultural terraces and mounds.

FEATURE: A

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, wattle, kiawe, and grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 6.3 m long by 5.4 m wide; c. 34 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Medium-sized rectangular enclosure which appears to have a doorway on the northwest corner. The walls are comprised of stacked basalt boulders and cobbles and range from 15 to 50 cm in height.

FEATURE: B

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 11.0 m wide; c. 132 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Complex irregular enclosure. The larger (southern) enclosed area is large (9 x 7.5 cm) and U-shaped. The northern enclosed area consists of an attached C-shape. The larger enclosed area opens to the west portion of the U-shaped area. The walls are comprised of stacked basalt boulders and cobbles. The walls range in height from 30 to 40 cm.

SITE NOS.: STATE: 2357 PHRI: W-20 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.1 m long by 6.9 m wide; c. 49 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure; upslope walls retain a terrace. The west wall consists of an alignment on an outcrop. The walls are comprised of basalt boulders and cobbles stacked up to 70 cm in height. A probable hammerstone is present on the surface. Scattered agricultural features surround the site.

SITE NOS.: STATE: 2358 PHRI: W-21 BPBM: — (Figure D-2)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 9.9 m long by 9.2 m wide; c. 91 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This is a rectangular enclosure open to the NW which is situated on a partially paved terrace. The walls of the enclosure are faced on both sides. The enclosure is 5 m long by 4.5 wide by 1.2 m high. Both the terrace and enclosure are comprised of stacked basalt cobble and boulders. Scattered agricultural features surround the site.

SITE NOS.: STATE: 2041 PHRI: W-27 BPBM: T-36 (Figures D-3, D-4)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 22.0 m long by 12.5 m wide; c. 275 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious/

Habitation

DESCRIPTION: May be Kaumeheiwa Heiau. L-shaped enclosure; includes an internal platform or wall segment, paving, and cupboard and step along the inner north wall. The northeast corner is notched. The south wall is paved with flat well-rounded boulders. The walls are well-faced and average 1.2 to 2 m in thickness and 90 cm in height. A test unit excavated in the interior of the enclosure revealed a subsurface cultural deposit containing charcoal, basalt and volcanic glass flakes, coral, marine shell and bone. A radiocarbon sample from the deposit yielded three possible age ranges between AD 1305 and 1617.

SITE NOS.: STATE: 2042 PHRI: W-28 BPBM: —
(Figure D-5)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.1 m long by 11.1 m wide; c. 134 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*

/Habitation

DESCRIPTION: This is a notched, paved enclosure. The paving lies over a rich cultural (habitation) layer. This feature may be a heiau or high status residence. Formally it resembles site 27. The walls average 2m in thickness and are up to 90 cm in height. The walls are faced on the interior and exterior. The walls are constructed of stacked boulders

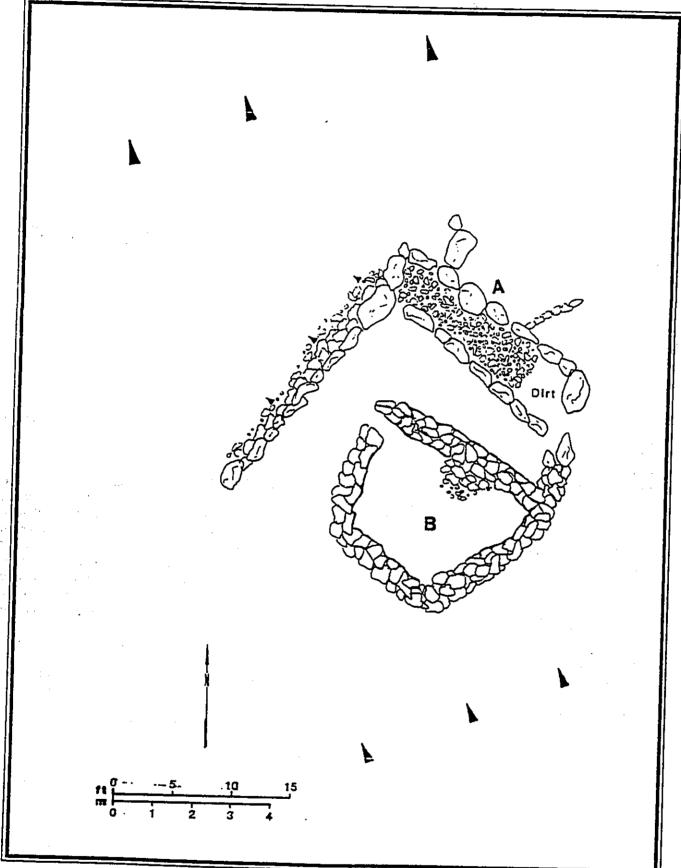


Figure D-2. SITE W-21

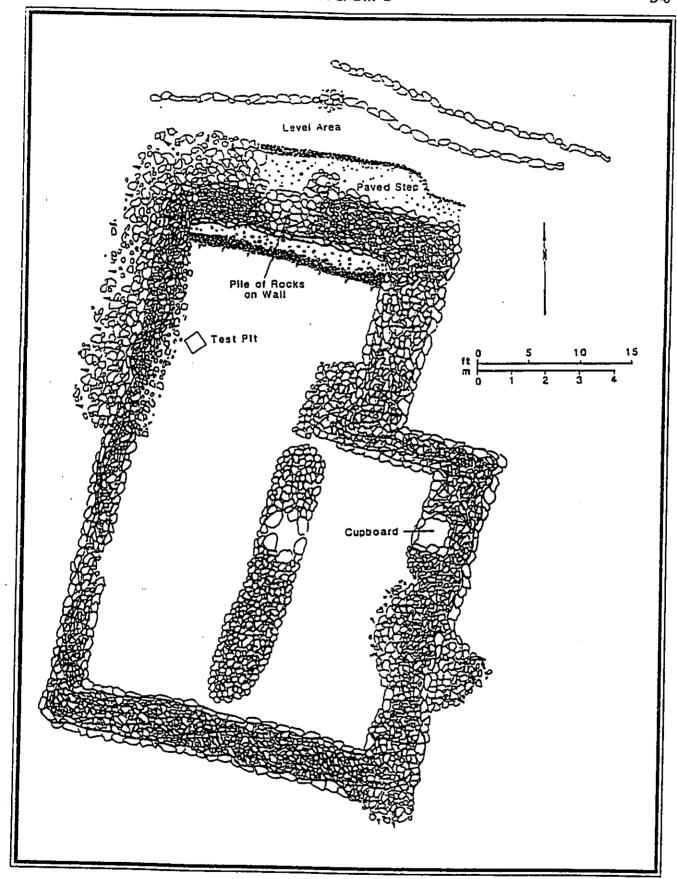


Figure D-3. SITE W-27

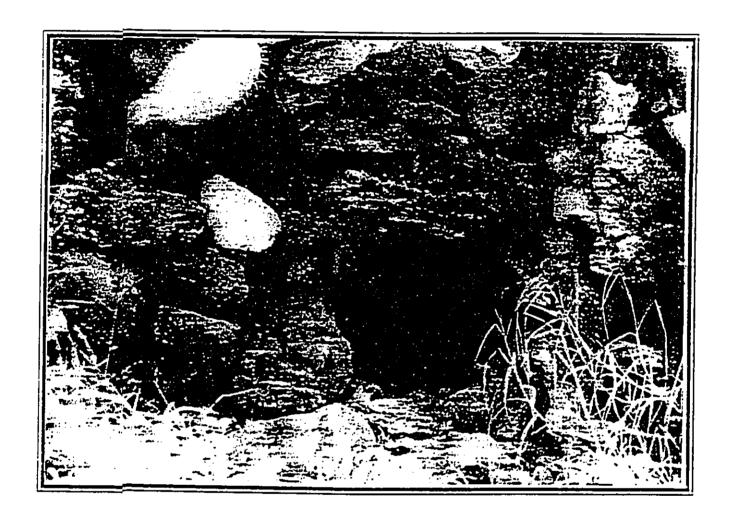


Figure D-4. SITE W-27, CUPBOARD.
VIEW TO EAST-SOUTHEAST
(PHRI Neg. 1143-3)

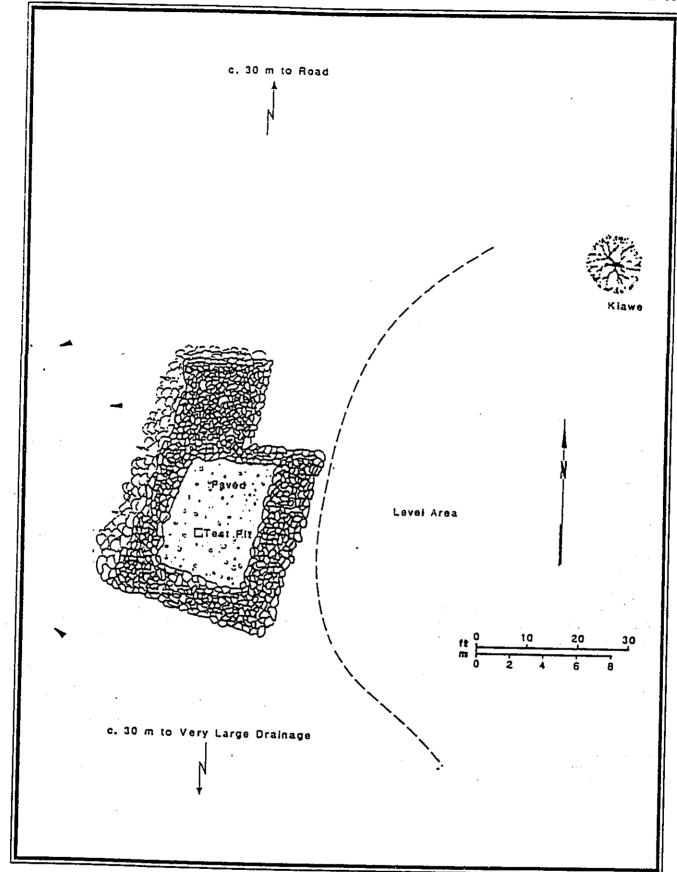


Figure D-5. SITE W-28

and cobbles. A test unit in the interior of the enclosure revealed a subsurface cultural deposit containing coral. basalt and volcanic glass flakes, bone and charcoal. The deposit was capped by a pavement of basalt pebbles and cobbles. A radiocarbon sample obtained from the deposit yielded a age range of AD 1290- 1640.

SITE NOS.: STATE: 2359 PHRI: W-30 BPBM: T-110

FORMAL TYPE: Alignment

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 23.0 m long by 1.0 m wide; c. 23 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*

DESCRIPTION: Alignment of uprights and boulders situated on the edge of a basalt outcrop overlooking a guich and another possible ceremonial site (W-32). Site W-27 lies c. 75.0 m to the southwest. The site's proximity to at least one religious/ceremonial site and its form suggest a possible religious function.

SITE NOS.: STATE: 2360 PHRI: W-31 BPBM: —

FORMAL TYPE: Overhangs

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 13.0 m long by 3.0 m wide; c. 39 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Two overhangs; includes a bedrock outcrop and a free standing wall. The wall connects with the outcrop c. 5.5 m east of the easternmost overhang and extends west for about 7.0 m. The overhangs are each c. 1.0 m deep by 3.0 m wide by 2.0 m high. Agricultural features surround the site.

SITE NOS.: STATE: 2361 PHRI: W-32 BPBM: — (Figure D-6)

FORMAL TYPE: Upright

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair

INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 6.0 m wide; c. 55 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\* DESCRIPTION: Natural upright with oritice. The upright is part of an outcrop. The upright projects well above the outcrop and is 2m high measured from the surface of the

rough terrace. The orifice is .15 m in diameter and .55 m deep. Beneath the boulder wall is a crude terrace retained by a single-course of rocks. This unusual, and apparently modified natural upright is interpreted as a possible shrine: however, excavation of the terrace would be necessary to confirm this interpretation.

SITE NOS.: STATE: 2362 PHRI: W-35 BPBM: T-105\*

FORMAL TYPE: Human bone

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, lantana, and 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.8 m long by 4.5 m wide; c. 22 sq m

PROBABLE AGE: Unknown

FUNCTIONAL INTERPRETATION: Burial

DESCRIPTION: A slightly waterworn human skull fragment was discovered in the bottom of a guich. Anterior portions of the occipital and both parietals were still articulated. The isolated fragment probably originated from an eroded burial situated somewhere upslope.

SITE NOS.: STATE: 2043 PHRI: W-36 BPBM: -(Figure D-7)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 15.6 m long by 7.6 m wide; c. 119 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*

/Habitation

DESCRIPTION: A complex, paved rectangular enclosure with internal features. In the northeast corner is a slightly elevated paved platform. A fallen upright is present at the interior edge of the platform. One decomposing piece of coral is present near the platform. Overall the feature appears to be divided longitudinally into an upper paved half which has the platform and a lower half which has a soil covered surface. The walls of the feature are well-faced along much of their extent. The walls are comprised of basalt cobbles and boulders stacked up to 1.0 cm in height. The walls average 2 m in thickness. A test unit excavated in the lower soil-covered half of the feature revealed a pavement of large flat stones beneath which is a subsurface cultural deposit containing charcoal, coral, basalt flakes and numberous pebbles and cobbles, many of which are waterwon. A radiocarbon sample from the deposit yielded a calendric age range from AD 1397-1482.

SITE NOS.: STATE: 2363 PHRI: W-37 BPBM: T-104\* FORMAL TYPE: Complex

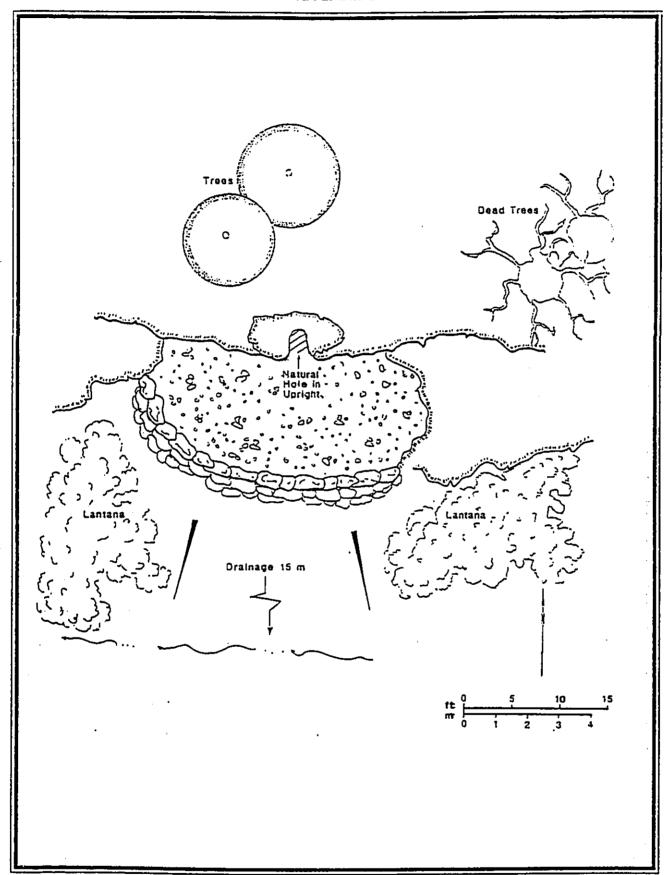


Figure D-6. SITE W-32

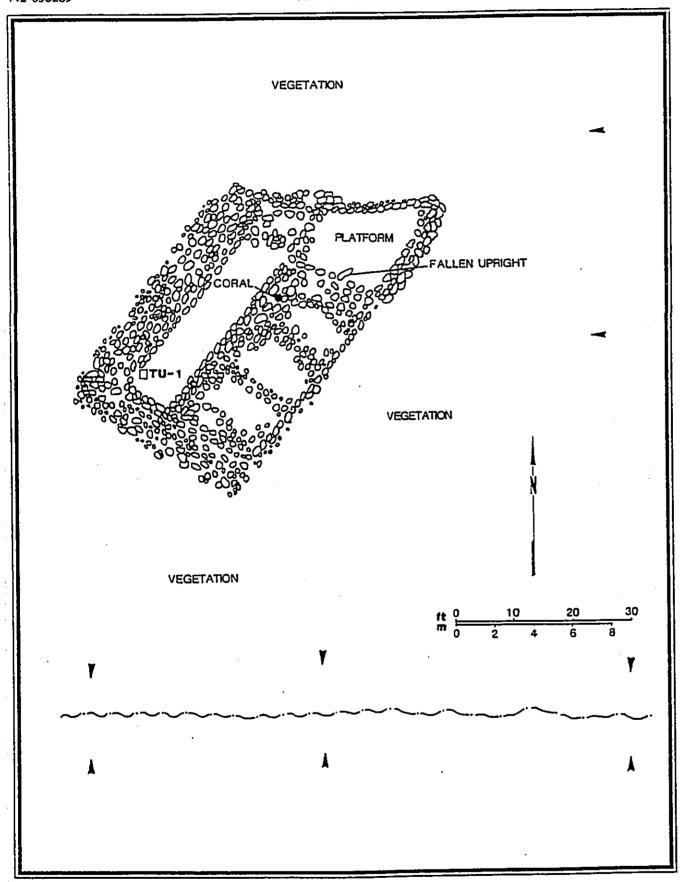


Figure D-7. SITE W-36

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.0 m wide; c. 20 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Circular enclosure with some facing on inside of NE wall, and a U-shaped enclosure. Agricultural features surround this site for distances exceeding 100.0 m.

FEATURE: A

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, and 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.0 m wide; c. 20 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure c. 25 m north of Waiohuli Gulch. Enclosure is thoroughly obscured by lantana and panini. No signs of paving within enclosure. Walls average 75 cm in thickness and 30 cm in height. They are comprised of stacked basalt boulders and cobbles.

FEATURE: B

FORMAL TYPE: U-shaped wall

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle Forest

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 20.0 m long by 17.0 m wide; c. 340 sq m

PROBABLE AGE: Unknown

DESCRIPTION: Discontinuous U-shaped wall faces the south, perpendicular to the slope. The wall consists of one to two courses of large stacked cobbles and boulders.

SITE NOS.: STATE: 2364 PHRI: W-42 BPBM: T-75\*

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, grasses, 'ilima CONDITION: Poor

INTEGRITY: Unaltered

DIMENSIONS: 5.5 m long by 5.2 m wide; c. 29 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

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DESCRIPTION: Oval enclosure and surrounding agricultural terraces. The highest density of terraces is to the east and the south of the enclosure. The enclosure is either poorly constructed or in poor condition. The walls are comprised of stacked basalt cobbles and boulders. Walls average 90 cm in thickness and 20-40 cm in height.

SITE NOS.: STATE: 2044 PHRI: W-45 BPBM: T-72 (Figure D-8)

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 90.0 m long by 65.0 m wide;

c. 5,850 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This complex includes a rectangular enclosure and an oval enclosure amidst extensive agricultural terraces and mounds.

FEATURE: A

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Panini, Lantana, 'ilima, and grasses

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 12.0 m long by 12.0 m wide; c. 144 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with an adjoining western terrace. The western edge of the enclosure is defined by a large bedrock outcrop. Walls are comprised of basalt boulders and cobbles stacked to a maximum height of 40 cm.

FEATURE: B

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses.

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 8.0 m long by 7.0 m wide; c. 56 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with high, wide, faced walls. On the inside of the northwest wall there is a step-like feature which averages 1 m in width and is c. 30 cm above the interior surface. The walls of the structure range between 1 and 2 m in thickness and .50 to 1.40 in height. The walls are comprised of stacked boulders and cobbles. A test unit excavated in the interior of the feature revealed a subsurface cultural deposit containing charcoal, marine shell, basalt and volcanic glass flakes an kukui nut shell. A radiocarbon sample from the deposit yielded a calendric age range of AD 1450-1660.

SITE NOS.: STATE: 2365 PHRI: W-46 BPBM: T-71

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, wantle, 'ilima, and grasses

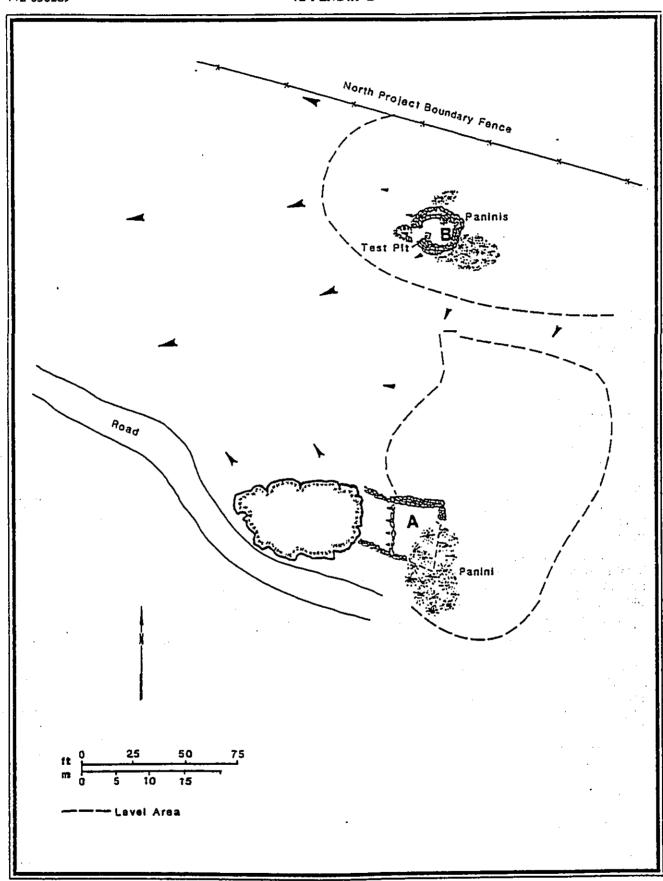


Figure D-8. SITE W-45

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 14.5 m long by 9.5 m wide; c. 138 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Trapezoidal enclosure surrounded by agricultural features. There is an opening in the northwest comer of the structure. The walls, comprised of stacked basalt boulders and cobble, average 1.0 m in thickness and 50 cm in height.

SITE NOS.: STATE: 2366 PHRI: W-47 BPBM: T-107

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima and grasses

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 39.0 m long by 25.0 m wide; c.975 sq m

PROBABLE AGE: Historic\*

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Large rectangular enclosure. Wing walls extend off NE and NW corners. Some facing on the south and north sides and on the east wing wall. Walls are comprised of stacked boulders and cobbles. The walls average 80 cm in thickness and 1.0 m in height.

SITE NOS.: STATE: 2367 PHRI: W-48 BPBM: T-108

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 20.0 m long by 38.0 m wide; c. 760 sq m

PROBABLE AGE: Prehistoric\*

FUNCTIONAL INTERPRETATION: Agriculture DESCRIPTION: Large U-shaped wall; western wall retains a terrace. Wall is comprised of stacked basalt boulders and cobbles. Wall ranges in height from 40 to 100 cm.

SITE NOS.: STATE: 2368 PHRI: W-49 BPBM: —

FORMAL TYPE: Terraces

TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 12.0 m wide; c. 156 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: Alignment connecting two parallel agricultural terraces. Agricultural terraces are extensive in this area, extending c. 150.0 m east to the edge of the project

area.

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SITE NOS.: STATE: 2369 PHRI: W-55 BPBM: --

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle, grasses, lantana, and Silky Oak

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 4.0 m long by 3.5 m wide; c. 14 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Temporary

Habitation\*

DESCRIPTION: Site is an overhang with a wall in front partially blocking the entrance. The enclosed area measures 4.0 m wide by 3.5 m deep 2.0 m high. The wall covers 1.4 m of the entrance. The overhang is filled with historic trash. The wall is composed of stacked basalt boulders.

SITE NOS.: STATE: 2370 PHRI: W-57 BPBM: —

FORMAL TYPE: Upright slab

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, lantana, and grasses.

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 0.03 m long by 0.10 m wide; c. 300 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: Single upright slab with a few possibly associated boulders. Possible remnant of a wall or terrace because evidence of bulldozer disturbance surrounds.

SITE NOS.: STATE: 2371 PHRI: W-58 BPBM: -

FORMAL TYPE: Walls

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima, and grasses

**CONDITION:** Fair INTEGRITY: Altered

DIMENSIONS: 30.0 m long by 1.0 m wide; c. 30 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Two wall segments which were probably connected before bulldozing of area. Walls run perpendicular to slope segments comprised of stacked basalt boulders and cobbles averaging 60 cm high. Probable remnant of cattle wall...

SITE NOS.: STATE: 2372 PHRI: W-59 BPBM: T-81

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, 'ilima, grasses

CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 24.0 m long by 1.0 m wide; c. 24 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Transportation

DESCRIPTION: Historic road retaining wall. The wall is FEATURE: A in good condition and well-faced. It retains an abandoned road overlooking a drainage.

SITE NOS.: STATE: 2373 PHRI: W-60 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope **VEGETATION:** Wattle and grasses

CONDITION: Poor INTEGRITY: Altered

DIMENSIONS: 25.0 m long by 0.4 m wide; c. 10 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Intermittent wall with some facing on the south side of the east end. The wall runs mauka-makai perpendicular to slope. Wall id 25 m long, 40 cm thick, and 1.0 m high. It is constructed of stacked basalt boulders and cobbles. Probably part of some wall represented at site 58.

SITE NOS.: STATE: 2374 PHRI: W-65 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Silky Oak, wattle, lantana, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 26.0 m long by 12.0 m wide; c. 312 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Semi-rectangular enclosure and terraces. The NE and NW walls of this enclosure consist of modified bedrock. Facing is in the SE interior corner. A 10.0 m long terrace alignment situated just upslope from the structure. Enclosed walls average 75 cm in thickness and 40 cm in height. The enclosure is 8.4. m long and 5.6 m wide.

SITE NOS.: STATE: 2375 PHRI: W-67 BPBM: — (Figure D-9)

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, panini, 'ilima

**CONDITION:** Good INTEGRITY: Altered

DIMENSIONS: 18.0 m long by 12.0 m wide; c. 216 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Consists of one trapezoidal enclosure and two close parallel waiis. Walls may represent a collapsed structure or two adjacent terraces. Several agricultural mounds noted in the vicinity.

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, panini, 'ilima

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 12.0 m long by 11.0 m wide; c. 132 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Trapezoidal enclosure. The east wall has been built around bedrock. The south wall is faced with eight upright slabs. There are also upright slabs in the NE and NW corners. A wing wall extends off the southwest corner. The wall averages 40 cm in height and is composed of stacked basait boulders and cobbles.

FEATURE: B

FORMAL TYPE: Enclosure (?)

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, panini, 'ilima

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 9.0 m long by 4.0 m wide; c. 36 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two parallel walls two meters apart extending for c. 7.8 m. Walls are joined at NW end by relatively large rocks. The other end is partially enclosed by larger rocks but they do not completely close off the structure. Formally the walls resemble terraces; however' it is likely they represent the disturbed remnants of a smaller enclosed rectangular terrace.

SITE NOS.: STATE: 2376 PHRI: W-71 BPBM: T-101

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, panini, wattle, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 22.0 m long by 18.0 m wide; c. 396 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: Triangular enclosure with associated agricultural features. The structure has a small wall in the eastern end. Agricultural features extend west for c. 120.0 m along the side of a hill. Enclosure walls average 25 cm in height and are comprised of stacked boulders and cobbles.

SITE NOS.: STATE: 2377 PHRI: W-73 BPBM: —

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FORMAL TYPE: Walls

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle and grasses

CONDITION: Fair INTEGRITY: Altered

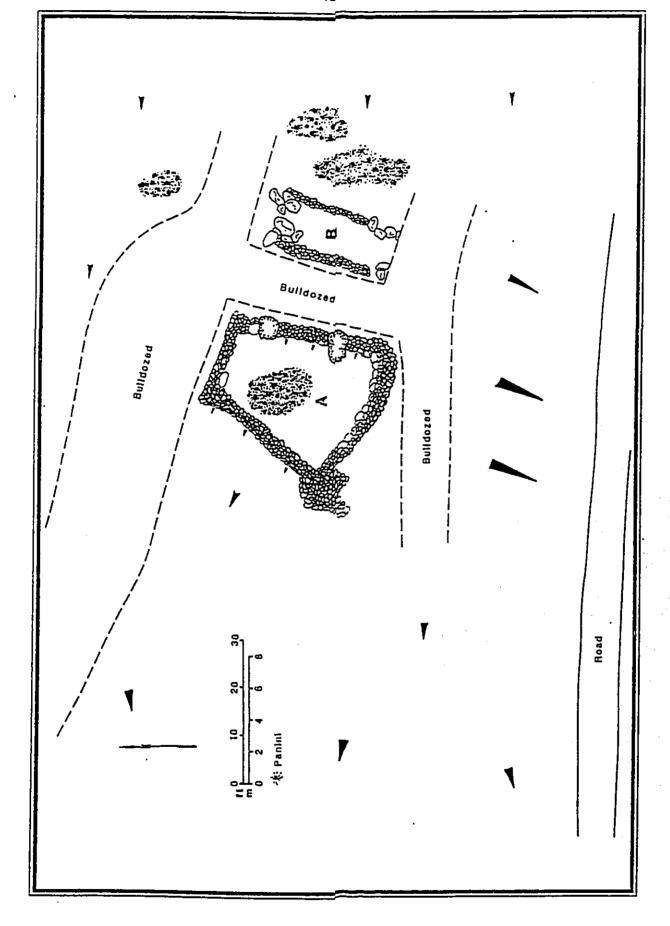


Figure D-9. SITE W-67

DIMENSIONS: 170.0 m long by 75.0 m wide;

c. 12,750 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: Terraces and walls. In this area there are two larger terraces and numerous smaller ones. The wall runs perpendicular to the slope. Terraces are retained by either short retaining walls or alignments.

**SITE NOS.: STATE: 2378 PHRI: W-75 BPBM: T-87-86** 

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle and grasses

CCNDITION: Good INTEGRITY: Altered

DIMENSIONS: 100:0 m long by 0.5 m wide; c. 50 sq m

PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Habitation/Agriculture

DESCRIPTION: L-shaped wall, the north-south wall of which retains a terrace. The east-west wall is short and free standing. There are terraces in the area. There is also a water trough made from a cut half-boiler. The L-shaped wall appears to be the disturbed remnant of a rectangular enclosure. The wall has a maximum height of 50 cm and is composed of stacked basalt boulders and cobbles.

SITE NOS.: STATE: 2379 PHRI: W-77 BPBM: — (Figures D-10, D-11)

FORMAL TYPE: Enciosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle, lantana, koa haole, 'ilima, and

grasses

CONDITION: Good
INTEGRITY: Altered

DIMENSIONS: 30.0 m long by 20.0 m wide; c. 600 sq m

PROBABLE AGE: Prehistoric\*

FUNCTIONAL INTERPRETATION: Agriculture DESCRIPTION: Irregular-shaped enclosure; uses a bedrock outcrop. Very low wall on NW side. The enclosure is situated in a swale. Wall is poorly preserved composed of stacked basalt boulders and cobbles. A test unit of this feature did not reveal any cultural remains.

SITE NOS.: STATE: 2380 PHRI: W-80 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle, Silky Oak, lantana, 'ilima, panini,

grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 400.0 m long by 1.0 m wide; c. 400 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Long wail runs perpendicular to the slope. The wall runs parallel to and close to the south side of a deep ravine and as such may be part of the system of walls at Site W-4. Some segments of the wall are collapsed or have been destroyed by cows and bulldozers.

SITE NOS.: STATE: 2381 PHRI: W-82 BPBM: —

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair

INTEGRITY: Altered

DIMENSIONS: 9.3 m long by 5.5 m wide: c. 51 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Possible rectangle habitation terrace in a large area of many scattered agricultural terraces. Consists of a U-shaped alignment of boulders and cobbles, the interior of which is relatively level compared to the adjacent slope.

SITE NOS.: STATE: 2382 PHRI: W-83 BPBM: ---

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 5.0 m long by 3.5 m wide; c. 18 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Small rectangular enclosure; NW corner faced on interior and exterior; also facing on the interior of the SW corner. Walls have a maximum height of 30 cm and are composed of stacked cobbles and boulders. Agricultural features are present in the vicinity.

SITE NOS.: STATE: 2383 PHRI: W-88 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle and grasses

CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 15.0 m long by 1.1 m wide; c. 17 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Transportation DESCRIPTION: Road retaining wall. This wall is in good condition and is faced. The wall holds up a bend in an old road situated on the edge of a drainage. The road is almost certainly the same road that crosses the bridge (Site

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W-101) just up stream.

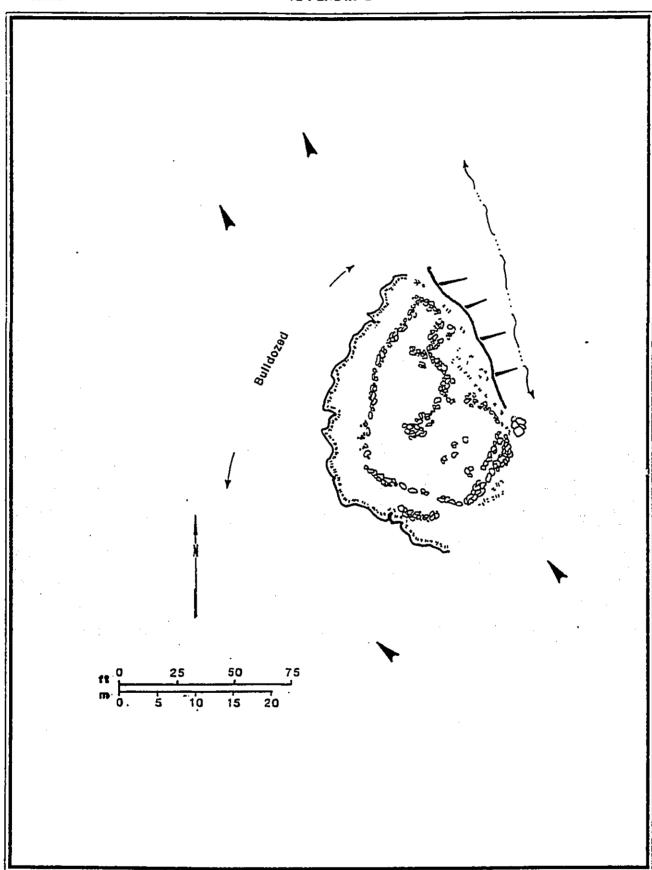


Figure D-10. SITE W-77

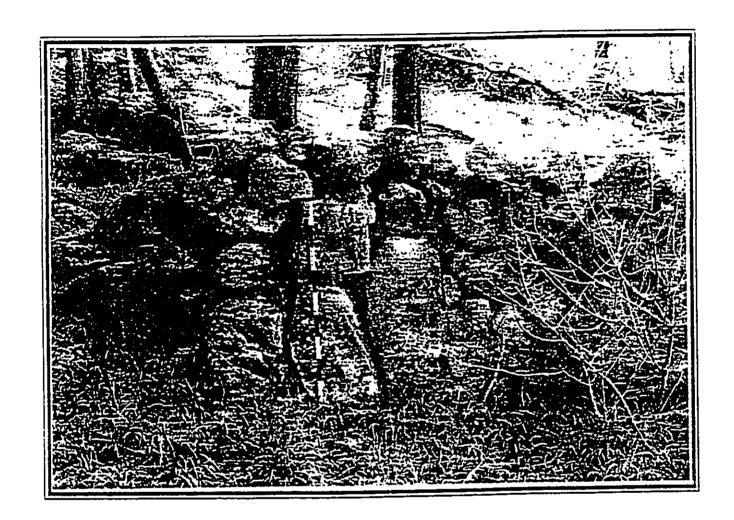


Figure D-11. SITE W-77, WALL WITH UPRIGHTS. View to South. (PHRI Neg.1143-36)

SITE NOS.: STATE: 2384 PHRI: W-90 BPBM: — (Figure D-12)

FORMAL TYPE: Cave

TOPOGRAPHY: Stream-cut basalt cliff

VEGETATION: Wattle, lantana, 'ilima, and grasses

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 8.0 m long by 0.8 m wide; c. 6 sq m

PROBABLE AGE: Historic

**FUNCTIONAL INTERPRETATION: Burial** 

DESCRIPTION: Small lava tube which extends into the face of a tall cliff face; at least two burials present in tube. The tube extends inward for more than 8.0 m; bends slightly to left. Bones are scattered throughout the tube; a concentration of bones is situated c. 6.0 m from the opening. Entrance to tube is partially walled. Elements present include rib, long bones, possible skull fragment and other post-cranial remains. A glass bead and shell button noted among the bones.

SITE NOS.: STATE: 2385 PHRI: W-96 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 9.2 m wide; c. 92 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: U-shaped wall with an internal mound. Site is situated in a large agricultural area. The mound is c. 1.5 m in diameter and 0.5 m high. U-shape opens to the NW. Wall ranges from 35 to 60 cm in height and is comprised of stacked cobbles and boulders. Sub-surface probes indicate that no cultural remains are present in fill, thus probably the feature is agricultural in nature.

SITE NOS.: STATE: 2386 PHRI: W-97 BPBM: ---

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

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DIMENSIONS: 12.0 m long by 10.0 m wide; c. 120 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure with short internal wall parallel to the east wall. The walls are very thick (c. 2 m). All walls have large flat boulders on top. There is a 15.0 m long wall extending northeast to the gulch. The 70 cm high enclosed wall is comprised of stacked basalt boulders and cobbles. Agricultural features are present in the vicinity.

SITE NOS.: STATE: 2387 PHRI: W-98

BPBM: T-69-70\*

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 7.7 m long by 5.0 m wide; c. 39 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure with associated agricultural features. The enclosure is higher on the west side to accommodate the slope. Walls are 1-2 m thick and range from 30-60 cm in height. Walls are composed of stacked basalt boulders and cobbles.

SITE NOS.: STATE: 2388 PHRI: W-101 BPBM: —

FORMAL TYPE: Bridge

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle CONDITION: Poor INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 4.0 m wide; c. 36 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Transportation DESCRIPTION: Historic wooden bridge. The bridge is collapsed. The south side still has some of the lower supports in place; "X" braces nailed to supports. Most of the cross members are missing. Supports consist of chemically treated piles.



Figure D-12. SITE W-90, ENTRANCE TO HISTORIC BURIAL.
VIEW TO SOUTHEAST. (PHRI Neg.1145-3)

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# APPENDIX E

# KEOKEA SITE AND FEATURE DESCRIPTIONS

SITE NOS.: State: 2046 PHRI: K-1 BPBM: T-15

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

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VEGETATION: Grasses, lantana, wante, panini, and 'ilima

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 80.0 m long by 40.0 m wide;

c. 3,200.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Platform (Fea. A), terrace (Fea. B), mounds, paved areas, walls, and possible trails. There are a large number of agricultural features in this area including terraces, mounds, and modified outcrops.

FEATURE A: Platform

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, morning glory, 'ilima,

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 7.0 m wide; c. 49.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: An irregular paved platform with two possible bedrock cupboards on the north side. Feature is constructed aganist a bedrock outcropp. It is constructed of stacked cobbles and boulders. The upper surfeace is irregularly paved with cobbles. The north half of the feature is partially collapsed.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

DIMENSIONS: 5.8 m long by 6.4 m wide; c. 37 sq m VEGETATION: Lantana, grasses, moming glory, 'ilima,

panini

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CONDITION: Fair INTEGRITY: Unaltered PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular terrace. The tops of the south and west walls are even with the inside ground surface. The east wall consists of modified bedrock. The terrace wall has a maximum height of 50 cm and is composed of stacked basalt boulders and cobbles.

SITE NOS.: State: 2047 PHRI: K-2 BPBM: T-16

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

\* Tentative, temporary, or provisional

VEGETATION: 'Ilima, lantana, and grass

CONDITION: Fair to Good INTEGRITY: Altered\*
PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Site consists of two adjacents enclosures. There are a large number of agricultural features in this area including terraces, mounds, and modified outcrops.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Lantana and grass

CONDITION: Fair INTEGRITY: Altered\*

DIMENSIONS: 12.0 m long by 10.0 m wide;

c. 120.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a 5.0m by 6.0 m paved platform in the southeast corner and a possible firepit inside. The northwest wall sits on the edge of a drop and consists of an alignment. The walls range from 1.0 to 2.0 m in thickness and average 50 cm in height. The walls are constructed of stacked cobbles and boulders. The south corner of Fea. B abuts the north corner of Fea. A.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: lantana, grass, and 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 7.0 m wide; c. 70.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Irregular enclosure, the east wall of which consists of a bedrock outcrop. Facing present on both sides of the north and east walls. The south corner abuts the north corner of Fea. A. Walls are comprised of stacked basalt boulders and cobbles.

and coulders and coopies.

SITE NOS.: State: 2028 PHRI: K-3 BPBM: T-14

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 120.0 m long by 100.0 m wide;

c. 12,000.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial\*/

Habitation/Agriculture

DESCRIPTION: Two rectangular enclosures with wide walls, one with an internal L-shaped wall. Agricultural terraces and mounds surround the enclosure.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: 'Ilima, lantana, grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 14.0 m long by 14.0 m wide;

c. 196.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with wide walls. especially in the northwest corner. The west and south walls are faced externally and the east wall is faced internally. The walls average 80 cm in height and are copmrised of stacked boulders and cobbles. A curved, rock-retained terrace curves southward and then west away from the southeast corner of the enclosure. A test unit excavated in the interior of this feature revealed the presence of a subsurface deposit containing charcoal, marine shell, bone, and basalt flakes. The bone includes two phalanges from a child, potentially indicating and infant burial beneath the floor of the structure. A radiocarbon sample from the deposit yielded a calendric age range of AD 1640-1890.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

**CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 9.0 m long by 8.5 m wide; c. 76.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with internal dividing wall. The internal wall forms a small room in the northwest corner of the enclosure. There is some interior and exterior facing on the south wall. The walls range between 40 and 60 cm in height and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2049 PHRI: K-4 BPBM: FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, and 'ilima

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 27.0 m long by 10.0 m wide;

c. 270.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of an irregular enclosure and a rectangular enclosure. Possible firepit size and shape (triangular), the platform may have served an

present in Fea. A. Features fit pattern of typical residences situated along the edge of a terraced slope. Numerous agriculture terraces surround the site.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, and 'ilima

**CONDITION: Good** INTEGRITY: Unaltered

DIMENSIONS: 7.2 m long by 6.0 m wide; c. 43.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Irregular nearly C-shaped enclosure. Possible terrace in the north half; possible firepit in the center. Walls range from 100 cm to 10 cm in height and are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, kiawe, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 8.5 m long by 7.5 m wide; c. 63.8 sq m

PROBABLE AGE: Prehistoric

**DESCRIPTION:** Rectangular enclosure with small room in the southeast corner. A c. 20.0 m long terrace wall extends off the southeast corner of the enclosure. A two track road runs through this terrace. Walls average 30 cm in height and are comprised of stacked boulders and cobbles.

SITE NOS.: State: 2048 PHRI: K-5 BPBM: T-19

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 75.0 m long by 18.5 m wide;

c. 1,387.5 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Temporary

Habitation/Agriculture

DESCRIPTION: Site consists of a C-shape, a platform, a modified outcrop wall, and surrounding terraces. The wall may have diverted water to a large earthen terrace system.

FEATURE A: Platform

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle.

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS:5.0 m long by 3.0 m wide; c. 15.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Paved collapsed platform. Given its

agricultural function; however, testing is necessary to verify function. Feature is c. 30 cm high and is comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 7.0 m long by 6.8 m wide; c. 47.6 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the southwest. Possible midden within enclosure, as the soil inside is darker and finer than the surrounding soil. Position of surrounding features indicates the enclosure may be agricultural.

SITE NOS.: State: 2029 PHRI: K-6 BPBM: FORMAL TYPE: Complex (4 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 75.0 m long by 60.0 m wide:

c. 4,500.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial/Habitation

/Agriculture

**DESCRIPTION:** Complex consists of three enclosures, a mound, and agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, and wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 11.8 m wide;

c. 153.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Notched rectangular enclosure with two internal platforms, an internal room, and an external platform. Internal platforms are in the northeast half of the enclosure and are connected by a step. The internal room is in the southwest portion of the enclosure near the notch. A test unit excavated in side the internal room revealed a subsurface cultural deposit containing volcanic glass and basalt flakes, sea urchin remains, coral fragments, marine shell, mammal and fish bone, charcoal, and kukui nut shell. A radiocarbon sample from the deposit yielded two possible calendric age ranges of AD 1470-1680 and AD 1739-1805.

FEATURE B: Mound

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 2.0 m long by 1.0 m wide; c. 2.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular mound surrounded by bedrock outcrops. Facing on southwest side of this feature indicates that it may be a partially collapsed burial platform. The mound has a maximum height of 30 cm and is comprised of steeled best the budget and so below.

of stacked basait boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 7.0 m wide; c. 49.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with high well-faced walls, except for the east wall which is mostly collapsed. The enclosure is adjacent to a collapsed lava tube. The enclosure's external wall faces are higher than the internal ones (avr. 85 cm versus avr. 60 cm). Terraced level areas are adjacent to the north and south sides of the enclosure.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Fair/Poor INTEGRITY: Unaltered

DIMENSIONS: 5.8 m long by 5.6 m wide; c. 32.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the west. The walls look very deflated, though there is no evidence of collapse. Rocks from the wall may have been removed and utilized for the construction of Fea. C.

SITE NOS.: State: 2030 PHRI: K-7 BPBM: T-22 (Figure E-1)

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wiliwili, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 110.0 m long by 70.0 m wide;

c. 7,700.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

**DESCRIPTION:** Complex consists of two enclosures, one rectangular and one oval. Surrounding the enclosures are numerous agriculture features.

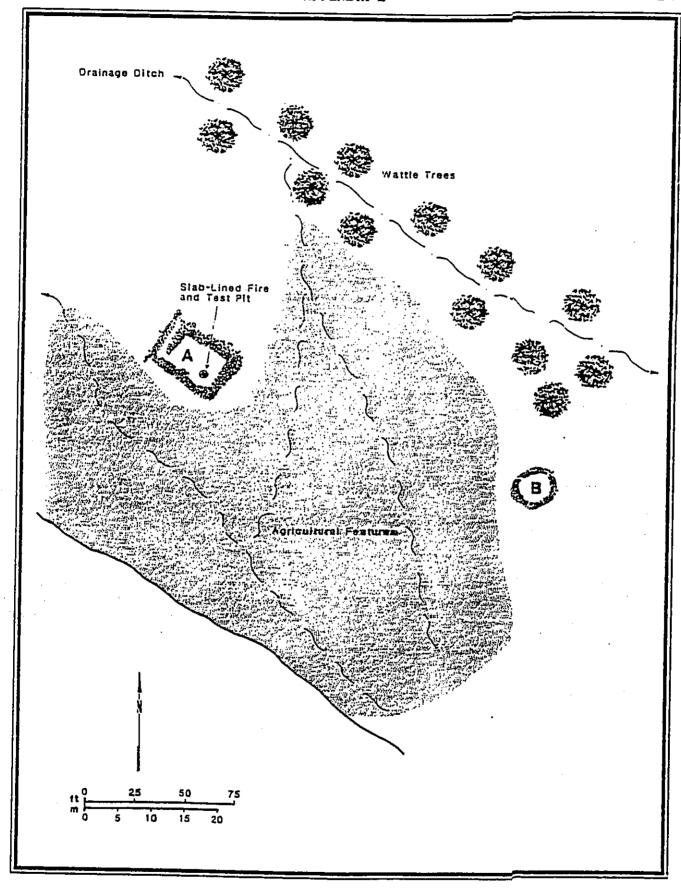


Figure E-1. SITE K-7, FEATURES A AND B.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wiliwili

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 10.0 m wide:

c. 130.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a terrace attached to the northwest wall. A probable entryway opens onto the terrace near the west corner of the northwest wall. Facing is intermittent along the walls which are 65 cm to 75 cm high and comprised of stacked basalt boulders and cobbles. A slab-lined firepit is centrally located in the eastern half of the structure.

A test unit was excavated which half-sectioned the firepit. The test unit revealed a subsurface cultural deposit containing marine shell, mammal bone, volcanic glass flakes, and charcoal. A radiocarbon sample collected from the deposit yielded three possible calendric age ranges: AD 680-1060, AD 1077-1125, and AD 1135-1157.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.5 m long by 5.0 m wide; c. 27.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure; walls mostly faced, some collapsed. The south part of the structure lies even with the ground surface. The walls average 80 cm in height and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2050 PHRI: K-8 BPBM: — FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 50.0 m long by 45.0 m wide;

c. 2,250.00sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

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DESCRIPTION: Complex consists of three rectangular enclosures, two rectangular and one irregular. Many agriculture features are present in the general area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima

CONDITION: Good

INTEGRITY: Unaitered

DIMENSIONS: 20.0 m long by 15.0 m wide;

c. 300.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Irregular in plan. South wall extends c. 4.0 m beyond the east wall. The southwest portion of the structure has wider walls and the exterior of these walls are collapsed. A short section of the south wall is faced. Maximum wall height is 1.0 m. Walls are comprised of stacked cobbles and boulders. A possible firepit is present in the north central portion of the enclosure.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima

CONDITION: Fair/Poor INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 6.0 m wide; c. 78.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure partially faced on the interior of the northeast corner. The outside of the east wall is partially covered by alluvium. The walls range in height from 30 cm to 40 cm and are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 8.0 m wide; c. 96.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with partial facing on the southeast exterior wall. The feature has been damaged by cattle to the extent that details of construction are difficult to ascertain. Maximum height of walls is 1.0 m and they average 1.5 m in width.

SITE NOS.: State: 2051 PHRI: K-9 BPBM: --- T-38

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 95.0 m long by 90.0 m wide;

c. 8,550.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two overhangs with associated walls, a rectangular enclosure, and a large irregular enclosure. The irregular enclosure surrounds an area of agricultural features. Both enclosures are attached to the wall of Site K-12.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, honey suckie.

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 10.0 m long by 5.0 m wide; c. 50.00 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of two adjacent overhangs with associated walls on top of an outcrop. The south edge of the outcrop abuts the rock wall of Site K-12. The northern overhang is 3.0 m long, 2.5 m deep, and 1.5 m high. The southern overhang is 1.3 m long, 1.2 m deep, and 1.5 m high. Although no cultural remains noted on the surface of the overhangs their association with Feature B and size indicate possible use as shelters. Testing would be necessary to verify prehistoric use.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 10.0 m long by 8.0 m wide; c. 80.0 sq m

PROBABLE AGE: Prehistoric/Historic

DESCRIPTION: Rectangular enclosure; paved area adjacent to east wall. The paved area measures c. 8.0 by 4.0 m; its exact dimensions are difficult to determine because dense vegetation covers the feature. The walls have an average width of 80 cm and a maximum height of 80 cm. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, Christmas-berry

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 45.0 m long by 15.0 m wide;

c. 675.0 sq m

PROBABLE AGE: Historic/Prehistoric\*

DESCRIPTION: Very large irregular-shaped enclosure surrounding an area of agricultural features. Feature forms part of the walls of Site K-12 a complex of of historic cattle control walls; however, the presence of a series of terraces and numerous mounds in the interior suggest the enclosure also functioned, potentailly prehistorically, as a garden enclosure. The walls range from 1.0 to 1.8 m in height and average 80 cm in thickness, they are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2052 PHRI: K-10 BPBM: — FORMAL TYPE: Complex (7 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, grasses, panini, wattle

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 80.0 m long by 60.0 m wide;

c. 4,800.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two square enclosures, two oval enclosures, one circular enclosure, one U-shaped enclosure, a platform, and many surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, panini

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 3.6 m long by 3.5 m wide; c. 12.6 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small square enclosure; most of the walls are faced internally and externally. A probable entryway is present in the western portion of the northeast wall. The walls have a maximum thickness of 70 cm and a maximum height of 1.3 m. Walls are comprised of stacked

basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.7 m long by 3.8 m wide; c. 21.7 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with high walls. The structure is built into a slope so that the northeast wall is almost at ground level; the wall opposite the northeast wall is very high, 1.5 m. The interior walls of the enclosure are faced, and most of the exterior walls are faced. Walls have a maximum thickness of 1.0 m and are comprised of stacked

basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, wattle

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 6.5 m long by 5.0 m wide; c. 32.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure; two internal cupboards present in east and south walls. The north wall is the highest and is built into the slope. Internal facing on the southeast and southwest corners. The walls have a maximum thickness of 1.0 m and range from 10 to 30 cm in height. Walls are

occasionally incorporate bedrock outcrops.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, wattle

**CONDITION: Poor** INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 4.0 m wide; c. 16.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small circular enclosure; some interior facing on the southwest side. Just south of the enclosure, at the foot of Site K-12, is a small natural cupboard in bedrock. Walls average 20 cm in height and 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.3 m long by 5.3 m wide; c. 22.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure; exteriors of the southwest and northeast walls and interiors of northeast, southeast, and northwest walls are faced. Possible cupboard present in north corner. The walls have a maximum thickness of 1.3 m and a maximum height of 80 cm. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE F: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaltered

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DIMENSIONS: 4.5 m long by 7.6 m wide; c. 34.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: U-shaped enclosure open to the northeast. Both sides of southeast and southwest walls are faced. The northwest wall is mostly collapsed. Walls average 20 cm in height and 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE G: Platform/pavement TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 5.0 m wide; c. 25.0 sq m

PROBABLE AGE: Prehistoric

comprised of stacked basalt cobbles and boulders and DESCRIPTION: Platform or partially elevated pavement built on and around bedrock. One meter north of the platform is a faced wall which extends north for 4.0 m. The feature has a maximum height of 50 cm and is comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2053 PHRI: K-11 BPBM: -- T-39

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini, wattle,

**CONDITION: Good** INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular terrace; the east side and part of the west wall of the terrace consist of bedrock outcrops. Most of the west and north walls retain and rise slightly above a level area. Walls are unfaced. Many agricultural features in the general area.

SITE NOS.: State: 2054 PHRI: K-12 BPBM: -

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, 'ilima, wiliwili

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 700.0 m long by 333.0 m wide;

c. 23,3100.0 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Site consists of a complex of variable length cattle walls some of which form large enclosures in a collapsed lava tube. The walls extend beyond the project area's southwestern corner. The most prominent wall extends the distance and loops around to return to the project area's west boundary.

SITE NOS.: State: 2055 PHRI: K-13 BPBM: --FORMAL TYPE: Complex (6 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, cilantro (Coriandrum

sativum L., 'ilima, wattle, panini

**CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 100.0 m long by 45.0 m wide;

c. 4.500.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

**DESCRIPTION:** Four rectangular enclosures, one D-shaped enclosure, and one oval enclosure. Agriculture features, mounds and terraces, present in the area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 3.5 m long by 3.0 m wide; c. 10.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; internal cupboard present on east wall; north-south wall extension off the east wall. Some of the inside of the north wall is faced; however, most walls are collapsed. Walls range from 30 cm to 60 cm in height and average 50 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, cilantro

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 5.8 m wide; c. 36.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Sub-rectangular enclosure with collapsed walls; no facing or internal features present. Faced terrace nearby. Walls average 60 cm in height and 1.4 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, and 'ilima

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.7 m long by 5.3 m wide; c. 30.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; north and northeast sides of the feature are built on bedrock. The walls are collapsed and the interior is filled with rubble. Walls average 60 cm in height and 1.4 m in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, wattle, forbs

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 5.0 m wide; c. 25.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with unfaced walls

Walls average 40 cm in height and 1.2 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

E-8

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, morning glory, grasses, panini,

'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.6 m long by 4.5 m wide; c. 25.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: D-shaped enclosure. North wall formed by an overhang and the remaining walls are comprised of stacked rock. The east wall and portions of the west wall are faced. Walls average 40 cm in height and 80 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE F: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.5 m long by 5.5 m wide; c. 35.8 sq m

PROBABLE AGE: Prehistoric

**DESCRIPTION:** Sub-rectangular structure with no facing. Walls average 40 cm in height and 1.2 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2056 PHRI: K-14 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, panini, grasses, forbs

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 50.0 m long by 35.0 m wide;

c. 1,750.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Complex consists of a U-shaped structure and associated agriculture features. The U-shape opens to southwest. The feature is 6.0 m long, 5.5 m wide, and has a maximum height of 70 cm. The walls average 2.0 m in thickness and appear mostly collapsed. A cattle wall (Site K-12) runs through the site.

SITE NOS.: State: 2057 PHRI: K-16 BPBM: —

FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, honey suckle, wattle,

panini

CONDITION: Fair INTEGRITY: Unaltered **DIMENSIONS:** 85.0 m long by 55.0 m wide; c. 4,675.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION — Habitation DESCRIPTION: Complex consists of four habitation enclosures. A cattle wall, which is part of Site K-12, runs

through the site. Minor agricultural features surround complex.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, Christmas-berry

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.7 m wide; c. 14.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure. The eastern enclosure is circular, the walls are collapsed and they incorporate bedrock. The western enclosure is square, and the walls are collapsed. Walls average 80 to 100 cm in height and 100 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, Christmas-berry,

panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.5 m long by 5.5 m wide; c. 35.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; facing present on all of the exterior walls and on the interiors of the south and west walls. The stones used in construction are quite irregular so that the facing is not obvious. A break in the west wall is probably due to cattle, but may represent an entryway. Walls have a maximum height of 85 cm and and a maximum thickness of 80 cm.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini

CONDITION: Poor INTEGRITY: Unaltered

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DIMENSIONS: 8.5 m long by 7.5 m wide; c. 63.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with collapsed walls. Walls average 10 cm in height and 60 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2058 PHRI: K-19 BPBM: — FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 60.0 m long by 45.0 m wide;

c. 2,700.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex of three habitation structures and numerous agriculture features. Many of the agriculture features are well-defined, are well-constructed, and incorporate bedrock.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.2 m wide; c. 21.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small circular structure with some internal facing. Walls average 50 cm in height and 65 cm in thickness. Walls are comprised of stacked basalt pebbles, cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle, panini

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 4.2 m long by 3.5 m wide; c. 14.7 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small C-shaped enclosure. No facing observed. Walls average 55 cm in height and 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good
INTEGRITY: Unaitered

DIMENSIONS: 8.5 m long by 8.0 m wide; c. 68.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with some facing in the northeast corner. North wall is the highest. Walls average 80 cm in height and 60 cm in thickness. Walls are comprised

of stacked basalt cobbles and boulders.

SITE NOS.: State: 2059 PHRI: K-20 BPBM: — FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wattle, Christmas-berry CONDITION: Good INTEGRITY: Unaltered DIMENSIONS: 50.0 m long by 35.0 m wide: c. 1,750.0 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two enclosures, one residential terrace, and many surrounding agriculture terraces.

FEATURE A: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grass, 'ilima, wattle,

Christmas-berry CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 6.3 m long by 0.0 m wide; c. 0.00 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square unfaced enclosure; possible step on the interior of the east wall at a possible entryway. Walls have a maximum height of 50 cm. and are comprised of stacked basait pebbles, cobbles and boulders.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 5.0 m wide; c. 30.0 sq m

PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Rectangular level area with walls on three sides. A wall, or what may be a wall, extends off the northwest corner of the terrace. Walls average 80 cm in height and 80 m in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 2.0 m long by 2.0 m wide; c. 4.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: This is a small circular enclosure. There is some facing on the walls. A possible entry way is present in the sutheast side. Walls average 70 cm in height and 50 m in thickness. Walls are comprised of stacked basalt INTEGRITY: Altered cobbles and boulders.

SITE NOS.: State: 2060 PHRI: K-21 BPBM: — FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, wattle, panini

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 55.0 m long by 25.0 m wide;

c. 1.375.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a notched enclosure and a badly collapsed circular enclosure. Within the notched enclosure is a small room. Agriculture features present in general area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wattle, panini

CONDITION: Fair **INTEGRITY:** Unaltered

DIMENSIONS: 5.5 m long by 5.5 m wide; c. 30.3 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure bisected by a modified bedrock wall. The walls are severely collapsed. Walls average 60 cm in height and 35 m in thickness. Walls are comprised of stacked basalt cobbles and boulders and occasionally incorporate bedrock outcrops.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, Christmas-berry,

panini

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 11.0 m long by 10.5 m wide;

c. 115.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Notched structure with thick, 2.0+ m wide walls in the northeast corner and north end of the east wall. A small internal room, c. 2.5 m by 1.5 m in size, extends from the north wall. Some facing is evident around the structure, as well as on the internal room. Walls average 80 cm in height and 1.15 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2061 PHRI: K-25 BPBM: — FORMAL TYPE: Complex (6 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, wattle, panini

CONDITION: Good

DIMENSIONS: 120.0 m long by 90.0 m wide;

c. 10,800.0 sq m

PROBABLE AGE: Historic/Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture/Animal Control

DESCRIPTION: Complex consists of a circular enclosure, one irregular enclosure, two sub-rectangular enclosures, an L-shaped enclosure, one upslope-downslope wall, and many agriculture features. A series of well-faced, relatively high scallop-shaped terraces which frequently incorporate bedrock outcrops are present on the steeper slopes in the southeast portion of the site.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.5 m wide; c. 14.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure with partially collapsed unfaced walls. Structure opens to the southwest. Walls average 30 cm in height and 60 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE B: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 9.4 m long by 5.3 m wide; c. 49.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: L-shaped enclosure with some facing on the interior and exterior of the south wall. Feature is open to the southeast. The west wall is entirely collapsed. An area of rubble indicates feature may have once had a north wall. Walls have a maximum height of 1.2 m and average 90 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders. There is a mound very close to the feature and a small C-shaped mound 2.0 m from the northwest corner.

FEATURE C: Enclosure

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TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good/Fair INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 9.0 m wide; c. 108.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Enclosure is irregular in plan view. The southwest wall runs upslope-downslope into Site K-36. Enclosure contains an internal terrace wall in poor condition. Facing is present on the interior of the northeast corner and

parts of the south wall. Walls average 45 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, 'ilima, lantana, wattle, panini

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 20.5 m long by 15.0 m wide;

c. 307.5 sq m

PROBABLE AGE: Prehistoric/Historic

DESCRIPTION: Large rectangular enclosure; the east and west walls form terraces. The north and south walls are free standing. A wing wall extends off the southeast corner for c. 15 m. A long upslope-downslope probable ranch wall extends off the northeast corner, and a terrace extends off the east wall.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.5 m long by 4.0 m wide; c. 18.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with some facing present on the exterior of the northeast corner. Walls average 60 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE F: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 32.0 m long by 0.8 m wide; c. 25.6 sq m

PROBABLE AGE: Historic

DESCRIPTION: Upsole-downslope wall segment. West end of wall falls about 2.0 meters short of connecting with Fea. D. The east end of the wall is broken up into several walls and extends almost to a drainage. Walls average 60 cm in height and are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2062 PHRI: K-26 BPBM: — T-64

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 40.0 m long by 20.0 m wide;

c. 800.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Feature A is comprised of two rectangular rooms and a semicircular room. Feature B is a triangular planform. There are agricultural terraces throughout the general area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 7.0 m wide; c. 70.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Three-roomed enclosure consisting of two rectangular enclosures which share a wall with a semicircular enclosure. Rectangular enclosures are simuted just uphill from the semicircular enclosure. Wall of the semicircular enclosure is faced. Walls average 30 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Platform

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wiliwili

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 3.5 m long by 5.0 m wide; c. 17.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Triangular platform extends out from a gentle slope. The northwest wall is faced. The platform is 30 cm high and comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2063 PHRI: K-27 BPBM: — T-62 (Figure E-2)

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 30.0 m wide;

c. 900.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a rock shelter with a curved wall in front of it, and a rectangular enclosure which makes extensive use of bedrock. Agriculture features surround the complex.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, wattle

CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two small chambers are present within the 50 cm high overhang. A wall fronting the overhang forms a semicircular enclosure with the overhang. The wall averages 60 cm in height and is comprised of stacked basalt cobbles and boulders. Off the east wall of the enclosure there is a level area consisting of rubble (possible pavement).

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 10.0 m long by 5.8 m wide; c. 58.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A rectangular enclosure. The north wall consists of the outcrop Feature A cuts into. There is some facing on the south and east walls. A 50 cm high step or bench runs the length of the interior of the east wall and possibly extends a little on the north and south walls. Walls average 60 cm in height and are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2064 PHRI: K-29 BPBM: — T-63

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvíal slope VEGETATION: Lantana, grasses, 'ilima CONDITION: Good/Fair

INTEGRITY: Unaltered

DIMENSIONS: 50.0 m long by 50.0 m wide;

c. 2,500.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Feature A has walls extending from the northwest and southwest corners. Feature B has a possible platform in the southeast corner and a paved trail in the southwest corner. Agriculture features surround the complex. Some distance from the complex an isolated piece of coral was found. The substantial nature of Feature B and its close proximity to the heiau, Site K-30 suggest it may have functioned as a high status and/or priestly residence.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered



Figure E-2. SITE K-27, OVERHANG. VIEW TO WEST-NORTHWEST. (PHRI Neg. 1143-10a)

DIMENSIONS: 12.0 m long by 10.0 m wide;

c. 120.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with modified bedrock walls extending off the northeast and southeast corners. These walls run upslope, the longest for 15.0 m, the other for 5.0 m. The north wall and the interior of the east wall are faced. Maximum wall height is 1.5 m. Walls are comprised of stacked cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 18.0 m long by 13.0 m wide;

c. 234.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a possible collapsed platform in the southeast corner. Portions of the north wall are paved with pebbles, especially the eastern half of the north wall. The upper surface of the west wall is nearly flush with the interior of the structure and thus, may have served as a porch. The walls are very substantially constructed being nearly 2.0 m thick and up to 1.2 m high. Intact facing is present along most of the interior and exterior of the structure's walls. A paved walkway is present 0.5 m from the southwest corner of the enclosure; this walkway extends for 5.0 m to the west.

SITE NOS.: State: 2031 PHRI: K-30 BPBM: -

(Figure E-3)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, morning glory,

castor bean
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 25.0 m long by 24.0 m wide;

c. 600.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious

DESCRIPTION: Molohai Heiau; a large and notched enclosure. Internal features include a long low wall, two mounds (one of which is faced), a triangular platform faced on one side, a square platform in the north corner, a step or bench around most of the inside wall, and a step or bench along outside of the north and west walls. A fragment of coral is present on the step on the inside of the south wall.

A test unit was excavated near the triangular platform which revealed a subsurface cultural deposit containing volcanic glass and basalt flakes, marine shell, mammal bone, and charcoal.

SITE NOS.: State: 2065 PHRI: K-31 BPBM: --T-13

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 9.0 m wide; c. 90.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Sub-rectangular enclosure with very collapsed walls. Agricultural features surround this site. Some facing is present on the inside of the east wall. Possible platform present in the northeast corner. The wall ranges from 20 cm to 55 cm in height and averages 2.5 m in width. The wall is comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2066 PHRI: K-32 BPBM: —

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 5.5 m wide; c. 33.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Sub-rectangular terrace with walls on the north, south, and west sides. The walls range from 50 cm to 60 cm in height and average 1.3 m in thickness. Walls are comprised of stacked basalt cobbles and boulders. The east side is defined by a bedrock alignment. A short wall extends off the south corner.

SITE NOS.: State: 2067 PHRI: K-35 BPBM: — FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 80.0 m long by 65.0 m wide;

c. 5,200.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists primarily of a interconnected complex of agricultural terraces with an associated small enclosure and a small overhang.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, grasses

CONDITION: Fair

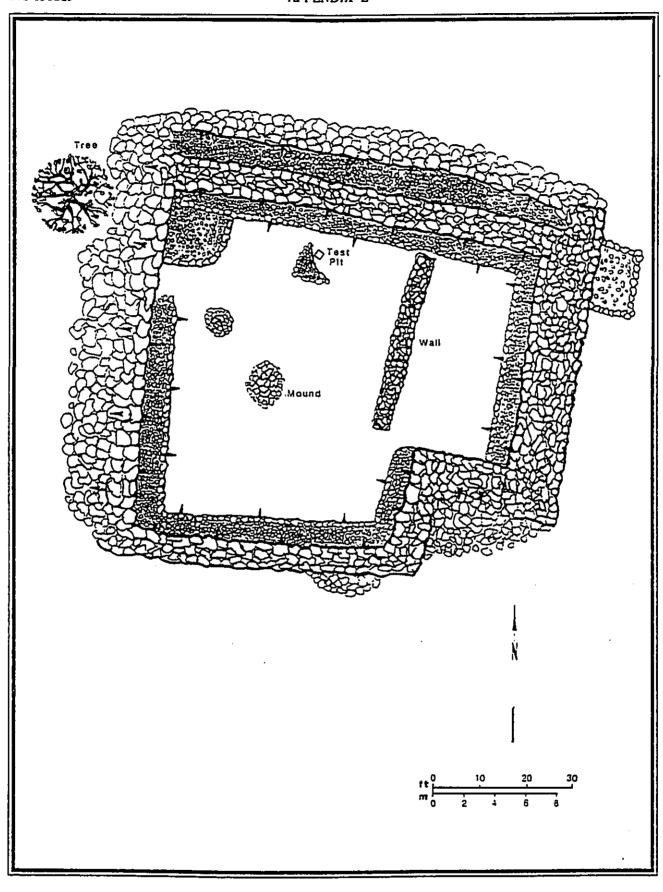


Figure E-3. SITE K-30.

INTEGRITY: Unaltered

DIMENSIONS: 6.5 m long by 5.6 m wide; c. 36.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: D-shaped enclosure with two terrace walls curving off the northwest and southeast sides. The walls connect with a larger terrace 5.0 m to the south. Another wall may have once been connected to the east side of the enclosure; this wall is now separated from the enclosure by a cattle trail.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wantle, 'ilima, grasses, vines

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 4.7 m long by 3.1 m wide; c. 14.6 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Natural partially collapsed lava blister. The 50 cm high blister opening is partially blocked with a cobble wall. The wall is faced on the inside of its northwest end.

SITE NOS.: State: 3032 PHRI: K-36 BPBM: — FORMAL TYPE: Complex (5 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, grasses, wattle

CONDITION: Excellent INTEGRITY: Unaitered

DIMENSIONS: 100.0 m long by 90.0 m wide;

c. 9,000.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two rectangular enclosures, one trapezoidal enclosure, two attached circular enclosures, one very large rectangular enclosure, and numerous associated agriculture features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wante, Christmas-berry,

ʻilima

CONDITION: Very Good INTEGRITY: Unaltered

DIMENSIONS: 4.8 m long by 3.3 m wide; c. 15.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a cupboard and intact facing on interior of the southwest wall. The feature has very high walls, up to 2.0 m (exterior measurement). The walls average 1.0 m in thickness and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, grasses, morning glory

CONDITION: Excellent INTEGRITY: Unaltered

DIMENSIONS: 5.9 m long by 5.4 m wide; c. 31.9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: All walls are faced on both sides. A few small areas of the wall are collapsed. The walls average 80 cm in height and average 1.0 m in thickness. Walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 9.0 m long by 7.5 m wide; c. 67.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Sub-trapezoidal enclosure. Inside of west wall is faced. Present on exterior of north wall is a bedrock overhang (3.3 m long by 60 cm deep by 60 cm high). All wails are partially collapsed. The walls have a maximum height of 1.0 m and average 70 cm in thickness. Walls are comprised of stacked basalt cobbles and boulders.

Feature is within and attached to Feature E.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 65.0 m long by 37.0 m wide:

c. 2,405.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature C is within this very large enclosure; a Feature E is attached to the outside of the enclosure. Terraces are present throughout the enclosure's interior. The enclosure average 75 cm in height ane are comprised of stacked basalt cobbles and boulders.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 5.0 m wide; c. 50.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure consisting of two attached, roughly circular enclosures. The walls are very collapsed. North wall is formed by Feature D. Much of the east wall is formed by an outcrop. The walls have a maximum height of 90 cm and average 60 cm in thickness.

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SITE NOS.: State: 2068 PHRI: K-39 BPBM: —

FORMAL TYPE: Overhangs

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, Christmas-berry,

grasses

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 28.0 m long by 10.0 m wide;

c. 280.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Consists of two shelters situated on the same side of a collapsed lava tube. The northern shelter is smaller than the southern one. The northern shelter is approximately 11 m long, 1.0m to 1.6 m deep, and 40 cm to 60 cm high. The southern shelter is approximately 8 m long, 1.6 m to 4.6 m deep, and 40 cm to 90 cm high. A terrace is fronts the southern shelter extending 5.0 m outside the shelter opening. The terrace has a maximum height of

SITE NOS.: State: 2069 PHRI: K-40 BPBM: --

(Figure E-4)

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, grasses, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 8.0 m wide; c. 96.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Complex consists of a rockshelter situated directly beneath a rectangular enclosure.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, grasses

**CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 11.0 m long by 8.4 m wide; c. 92.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with a c. 1.0 mwide bench or step along the east wall. The northwest corner is comprised of bedrock, which extends over the top of Feature B. The west and north walls, and the southeast corner of the enclosure are partially faced. The walls range from 30 to 70 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Overhang

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TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses **CONDITION:** Good

INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.6 m wide; c. 14.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Natural rock shelter in partially collarsed blister. The shelter is 90 cm high. Two basait flakes noted

at the north end of the shelter.

SITE NOS.: State: 2070 PHRI: K-41 BPBM: -

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, grasses, Christmas-berry

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 1.2 m long by 1.0 m wide; c. 1.20 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Temporary

Habitation

DESCRIPTION: Very small rock shelter. Shelter is 60

cm high. Kukui nut fragment found inside.

SITE NOS.: State: 2071 PHRI: K-42 BPBM: — (Figure E-5)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Very Good INTEGRITY: Unaltered

DIMENSIONS: 50.0 m long by 18.0 m wide;

c. 900.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Rectangular enclosure with core-fill walls. Walls average 90 cm in height. A piece of columnar basalt is present in the east wall. Sixteen meters away from the enclosure is a 26.0 m long wall.

SITE NOS.: State: 2072 PHRI: K-44 BPBM: — FORMAL TYPE: Complex (4 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 55.0 m long by 45.0 m wide:

c. 2,475.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a rectangular structure, an irregular enclosure, two C-shape enclosures, and surrounding agriculture features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope



Figure E-4. SITE K-40, OVERHANG. VIEW TO SOUTHEAST. (PHRI Neg. 1157-10)

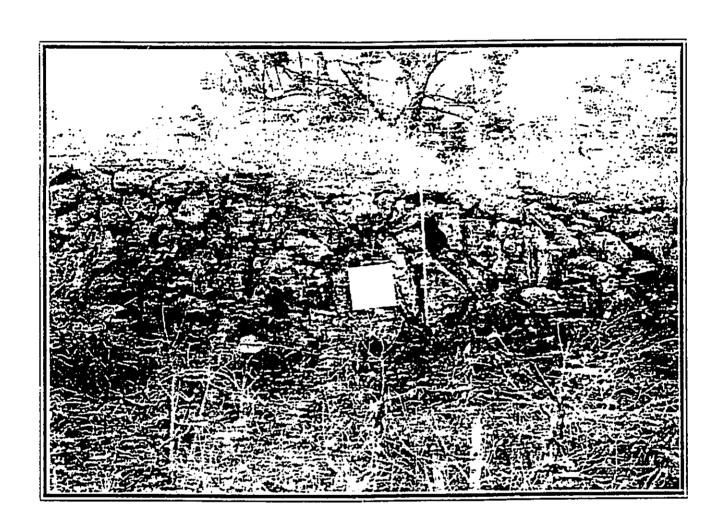


Figure E-5. SITE K-42, NE WALL OF FEATURE A. VIEW TO SOUTHWEST.
(PHRI Neg.1151-1)

VEGETATION: Lantana, 'ilima, wattle, grasses

**CONDITION: Good** INTEGRITY: Unaltered

DIMENSIONS: 7.5 m long by 6.0 m wide; c. 45.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular structure with very thick (2-3.0 m) walls. Interior of the east and west walls are faced. North and west walls are somewhat collapsed. The walls range from 50 (interior) to 1.1 m (exterior) in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 17.0 m long by 13.0 m wide;

c. 221.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure consisting of a roughly square and a roughly rectangular enclosure. The walls of the enclosure are very thick, up to 4.0 m thick on the southeast side. The south corner of the enclosure is faced. Near the south corner, on the southwest wall, is an opening. The walls range from 60 cm (interior) to 80 cm (exterior) in height and are comprised of stacked basalt cobbles and boulders occasionally incorporating bedrock outcrops.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 8.5 m wide; c. 76.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large C-shaped enclosure with walls faced on both sides. A short wall extends off the west corner of the enclosure. The southeast wall of the enclosure is collapsed. The walls average 55 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wante, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.0 m long by 3.0 m wide; c. 9.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small C-shaped enclosure open to the north. The back wall of the enclosure is built into an outcrop. On this same outcrop are several small terraces.

SITE NOS.: State: 2073 PHRI: K-45 BPBM: --- T-60

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, panini, wante, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.8 m long by 6.5 m wide; c. 50.7 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure with most of each wall faced. The northeast wall is built partially on bedrock. North of the feature is a long terrace which forms an arc; level areas are present above and below the terrace. The walls average 50 cm in height and are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2074 PHRI: K-46 BPBM: — T-60

FORMAL TYPE: Complex (4 Features)

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, panini, wante, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 74.0 m long by 35.0 m wide;

c. 2590.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of two rectangular enclosures, one C-shaped enclosure, one D-shaped enclosure, and numerous surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, 'ilima grasses CONDITION: Fair

INTEGRITY: Unaltered

DIMENSIONS: 6.5 m long by 6.0 m wide; c. 39.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: The northwest side of this rectangularshaped feature is very collapsed. The northwest side incorporates a bedrock outcrop. Small portions of both sides of the walls are faced. The walls average 50 cm in height and are comprised of stacked basalt cobbles and boulders.

FEATURE B: Enclosure TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wantle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 5.5 m wide; c. 38.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the southwest. The back of the C-shape is comprised of an outcrop. The outside of north wall is faced. A rock alignment runs across the front of the enclosure. The walls are comprised of stacked basalt cobbles and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.5 m long by 5.5 m wide; c. 41.3 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure. Exteriors of all walls except east wall are faced. East wall is totally collapsed. The west wall incorporates some bedrock. The walls are comprised of stacked basalt cobbles and boulders.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 5.0 m wide; c. 35.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: D-shaped enclosure comprised of a bedrock outcrop and a wall. The outcrop forms the straight wall and part of the western portion of the D-shape. The walls are comprised of stacked basalt cobbles and boulders.

SITE NOS.: State: 2033 PHRI: K-48 BPBM: T-61-17-58 (Figure E-6)

FORMAL TYPE: Complex (4 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, 'ilima, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 145.0 m long by 75.0 m wide;

c. 10,875.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Very large complex consisting of a very large enclosure, a double enclosure, a small square enclosure, and an irregular enclosure. An extensive series of large contour terraces is situated along a broad ridge which extends through the central portion of the site.

FEATURE A: Enclosure

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TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 67.0 m long by 67.0 m wide:

c. 4,489.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large irregular-shaped enclosure with substantial walls, several of which incorporate large upright slabs as facing stones. Some of the walls are faced. Walls have a maximum thickness of 2.0 m and are up to 1.5 m in height. Walls are comprised of stacked basalt boulders and

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wattle, vines, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 10.5 m wide:

c. 126.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Double enclosure in good condition. Lanai of porch present outside of the west wall. Situated just above the northeast corner of the enclosure is a curved paved terrace. Much facing present on interior walls. The walls have a maximum height of 1.1 m and maximum thickness of 2.0 m.

Two test units were excavated in the feature, one in each room. The units revealed a subsurface cultural deposit containing sea urchin remains, mammal and fish bone, a shark tooth, basalt and volcanic glass flakes, and charcoal. A radiocarbon sample collected from the deposit yielded a calendric age range of AD 1518-1591.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 17.0 m long by 17.0 m wide;

c. 289.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Generally rectangular in plan view. The north and east walls are very thick, the west wall is thin, and the south wall is single-stacked, single-coursed. Present in the northeast corner is a platform.

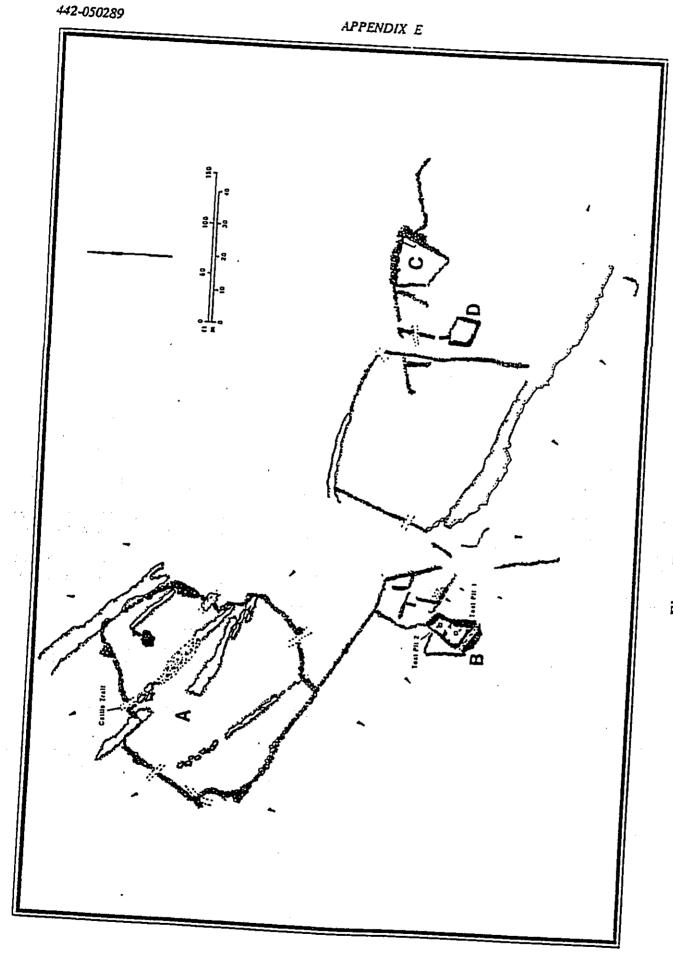
FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, grasses, Christmas-berry

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 9.0 m wide; c. 81.0 sq m



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PROBABLE AGE: Prehistoric

DESCRIPTION: Feature has very low intact walls. Walls have a maximum thickness of 1.5 m and are up to 30 cm in height. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2075 PHRI: K-50 BPBM: —

(Figure E-7)

FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Steep dissected alluvial slope

VEGETATION: Lantana, wattle, 'ilima, Christmas-berry,

grasses CONDITION: Good

INTEGRITY: Altered

DIMENSIONS: 40.0 m long by 35.0 m wide;

c. 1,400.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex features are spread along a steep slope. At the top of the slope is a rectangular enclosure; further down the slope is an oval enclosure, and further down from the oval enclosure is a double enclosure. Numerous agricultural features, primarily terraces, are present in the area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, Christmas-berry, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 7.8 m wide; c. 70.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; parts of the northwest corner and south wall are missing. The north and east walls are mostly bedrock. Walls have a maximum height of 80 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

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DIMENSIONS: 7.2 m long by 7.0 m wide; c. 50.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Oval enclosure with well built and preserved walls. Internal walls are mostly faced. Opening present on northwest side. Walls have a maximum height of 90 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, Christmas-berry, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.8 m long by 8.0 m wide; c. 102.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two circular enclosures connected by a short wail. The southern enclosure is built almost entirely within a natural circle of bedrock. The northern enclosure is built on a flat area of bedrock; the southwest wall of the enclosure consists of modified bedrock. Walls have a maximum height of 70 cm. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2076 PHRI: K-51 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, wattle, morning glory, panini

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 5.5 m wide; c. 66.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Sub-rectangular enclosure with an attached terrace. East wall has some internal facing; the rest of the walls are mostly collapsed. The northwest wall is totally collapsed. Maximum wall height is 42 cm. Walls average 75 cm in thickness and are copmrised of stacked basalt cobbles and boulders. Agricultural features surround the feature.

SITE NOS.: State: 2077 PHRI: K-52 BPBM: T-31

FORMAL TYPE: Complex (2 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry,

panini

CONDITION: Fair/Good INTEGRITY: Unaltered

DIMENSIONS: 42.0 m long by 35.0 m wide;

c. 1,470.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of an irregular ovoid enclosure with an adjacent area of possible paving. Agricultural features surround the enclosure.

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Figure E-7. SITE K-50, FEATURE B. VIEW TO SOUTHEAST. (PHRI Neg. 1155-6)

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, lantana, 'ilima, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 24.0 m long by 18.0 m wide:

c. 432.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Western part of feature is built into a bedrock outcrop. There are two cupboards at the southwest end of the enclosure and a paved area at the south end. The wails of the enclosure have some facing. The walls include sections of multiple stacked and core-fill construction. Maximum wall height is 1.5 m.

FEATURE B: Paved Area

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, wattle, grasses, honey suckle,

panini

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 15.0 m long by 15.0 m wide;

c. 225.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of an irregularly-shaped area of paving adjacent to the west wall of the structure.

SITE NOS.: State: 2078 PHRI: K-53 BPBM: --FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wattle, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 42.0 m long by 40.0 m wide;

c. 1,680.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a group of connected agricultural and habitation features surrounded by a larger area of agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, wattle, panini

CONDITION: Good INTEGRITY: Unaitered

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DIMENSIONS: 3.0 m long by 1.7 m wide; c. 5.1 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure attached to Feature B. Feature opens to the south. Wall averages 30 cm in height and averages 75 cm in thickness. Wall is constructed of stacked basalt boulders and cobbles. Feature is either a planting windbreak or a temporary habitation structure.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 20.0 m long by 15.0 m wide:

c. 300.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Raised terrace with three small planting features adjacent to the main wall. Wall averages 1.05 m in height and averages 40 cm in thickness. Wall is constructed of stacked basalt boulders and cobbles.

SITE NOS.: State: 2079 PHRI: K-54 BPBM: T-30

(Figure E-8)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, 'ilima, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 14.0 m long by 11.0 m wide;

c. 154.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: The feature is built on bedrock. It consists of an irregular-shaped enclosure with an internal rectangular terrace at the south end. The east wall is basically a terrace. Portions of the northeast wall are faced on the inside. Wall averages 30 m in height and averages 1.5 m in thickness. Wall is constructed of stacked basalt boulders and cobbles occaissionally incorporating bedrock outcrops.

SITE NOS.: State: 2080 PHRI: K-55 BPBM: — FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wattle, Christmas-berry,

grasses

**CONDITION: Fair** INTEGRITY: Unaltered

DIMENSIONS: 41.0 m long by 41.0 m wide;

c. 1,681.00 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Complex consists of two enclosures and an overhang. Numerous agricultural features surround the site.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses,

Christmas-berry

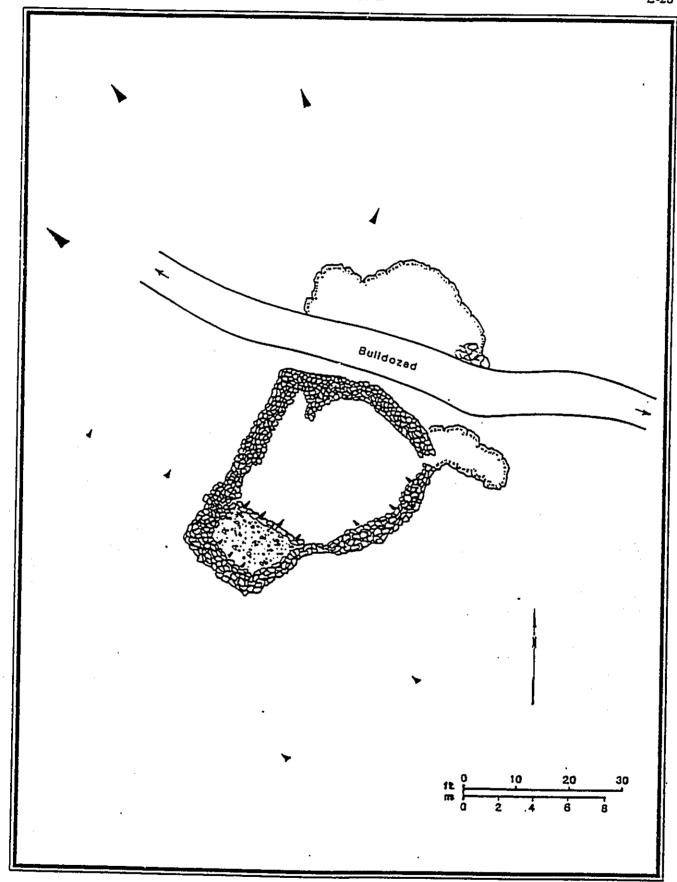


Figure E-8. SITE K-54.

E-27

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 5.0 m wide; c. 35.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with downslope wall also forming a terrace. A smaller enclosure or room is attached to the northeast side of the terrace. The terrace/ enclosure walls average 55 cm in height and are comprised of stackeed basalt boulders and cobbles.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 3.0 m wide; c. 15.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A low semicircular wall from the overhang. Ceiling of the shelter is 85 cm high.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, wante, grasses, Christmas-berry

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 16.0 m long by 7.5 m wide; c. 120.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of two small enclosures connected by a wail of bedrock; the bedrock forms the northeast wall of both rooms. The lower room is triangular in plan, and its northwest wall forms a terrace. The upper room is square in plan. An upright slab is present on the wall of bedrock between the two rooms. The walls range from 55 cm to 90 cm in height and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2081 PHRI: K-57 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, Christmas-berry, wattle, Silky Oak

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 24.0 m wide;

c. 720.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Sub-rectangular enclosure built against an outcrop. The south and southeast walls incorporate bedrock. There is some facing on the enclosure's north comer. The walls average 80 cm in height and are comprised

of stacked basait boulders and cobbles. Many terraces present upslope and downslope of feature.

SITE NOS .: State: 2082 PHRI: K-59 BPBM: -

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wattle, grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 36.0 m long by 28.0 m wide;

c. 1.008.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure with short walls extending from the southeast and northeast corners. Interior of southeast wall and the exterior of northwest wall are faced. Part of the southwest wall is collapsed. The wallis have a maximum thickness of 1.5 m and a maximum height of 1.1 m. Walls are comprised of stacked basalt boulders and cobbles. The enclosure, excluding the extending walls, measures 11.0 by 5.5 by 0.7 m. Numerous small terraces usualy incorporating bedrock outcrops are present to the east of the feature.

SITE NOS.: State: 2083 PHRI: K-60 BPBM: \_\_

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, wattle, 'ilima

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 5.5 m long by 1.1 m wide; c. 6.1 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Wall segment is bifaced and core-filled and runs upslope-downslope. Wall averages 50 cm in height and is composed of stacked basalt boulders and

SITE NOS.: 51ate: 2084 PHRI: K-62 BPBM: —

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 45.0 m long by 35.0 m wide;

c. 1,575.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious/Burial/

Habitation/Agriculture

DESCRIPTION: Complex consists of a rectangular enclosure with an internal probable burial platform, a trapezoidal enclosure with an associated probable shrine/

8

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of enclosures and agricultural features close to each other. Six of the enclosures are habitation features, one is probably a field boundary.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 8.2 m long by 6.2 m wide; c. 50.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure with some facing on the interior of the northwest wall. A small cupboard-like overhang is present west of the southwest corner of the enclosure. Walls have a maximum height of 1.1 m and a maximum thickness of 60 cm. Walls are comprised of stacked basalt boulders and cobbles. A bedrock outcrop is incorporated into the southwest corner.

FEATURE B: Walls

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest

CONDITION: Fair INTEGRITY: Unaitered

DIMENSIONS: 45.0 m long by 5.0 m wide; c. 225.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two parallel walls on either side of a collapsed lava tube. The walls begin at the bottom of a short steep slope and extend to top of the slope, where they are joined together by a bedrock outcrop. The northwest wall ends at this point. The southeast wall continues through the site. Walls have a maximum height of 1.5 m and a maximum thickness of 1.0 m. Walls are comprised of stacked basait boulders and cobbles occasionally incorporating bedrock outcrops.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wantle forest CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 6.5 m wide; c. 52.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure. The interior of the southwest wall is faced. The other walls are somewhat collapsed. Walls have a maximum height of 90 cm and a maximum thickness of 1.1 m. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE D: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 15.0 m long by 14.0 m wide;

c. 210.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large D-shaped enclosure; the east wall consists of a bedrock outcrop. A few terraces are present within the enclosure. A 3.0 m long wall extends from the northwest portion of the enclosure generally toward the northwest. The northeast side of this wall is faced. Walls have a maximum height of 75 cm and a maximum thickness of 85 cm. Walls are comprised of stacked basalt boulders and cobbles occasionally incorporating bedrock outcrops.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 3.7 m wide; c. 18.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Somewhat square in plan view. Part of the interior of the south wall is faced. Walls have a maximum height of 80 cm and a maximum thickness of 80 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE F: Enclosures

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wantle forest

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 7.5 m wide; c. 90.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large oval enclosure with a slightly smaller enclosure attached to its northeast side. Most of the walls of both enclosures are collapsed. Walls have a maximum height of 65 cm and a maximum thickness of 90 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE G: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 7.4 m wide; c. 59.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure; interior and exterior of north corner is faced. The west corner of the feature is collapsed. Walls have a maximum height of 60 cm and an

average thickness of 90 cm. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2087 PHRI: K-69 BPBM: T-37 (Figure E-9)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 8.0 m long by 8.0 m wide; c. 64.0 sq m

PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Water Tank DESCRIPTION: Square enclosure faced on the southwest, northwest, and part of the northeast sides. The southeast and part of the northeast walls, which are lower than the rest of the structure, are constructed of generally larger stones than those used in the other walls. Within the enclosure are the remains of a wooden platform for a water tank, and metal hoops used to bind boards of tank together.

SITE NOS.: State: 2088 PHRI: K-70 BPBM: T-27

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, wante, grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 35.0 m long by 12.0 m wide;

c. 420.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Terrace extends southward for 10.0 m from a upslope-downslope oriented wall. The junction of the wail and the terrace abuts a basalt outcrop. The south end of the wall curves to create a small terrace measuring 5.0 m in diameter.

SITE NOS.: State: 2089 PHRI: K-71 BPBM: — FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, wattle, Christmas-berry, grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 60.0 m long by 50.0 m wide;

c. 3,000.0 sq m

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PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial\*/Habitation DESCRIPTION: Complex consists of two enclosures with terraces between them, and connected to them. One enclosure has unusually thick walls and a small interior. Southwest of this feature is a large rubble area which may be natural. Feature C is a possible lava tube burial.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, panini, wattle, grasses

CONDITION: Fair INTEGRITY: Unaitered

DIMENSIONS: 9.0 m long by 8.5 m wide; c. 76.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large square enclosure with low, collapsed walls. The north corner of the enclosure rises 1.5 m above the slope the enclosure is on. A terrace wall extends 5.0 m southwest off the southwest corner of the enclosure. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lanuana, 'ilima, Christmas-berry, grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 7.0 m wide; c. 49.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Enclosure consists of a square area of paving with a small sunken area in the middle of it. A wall built on the paving forms the southwest and part of the northwest wall of the room. The interior of the sunken area and the wall are faced. Walls average 50 cm in height and are comprised of stacked basalt boulders and cobbles.

A terrace runs off the northeast wall.

FEATURE C: Paved Mound

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wattle

CONDITION: Fair INTEGRITY: Unaitered

DIMENSIONS: 10.0 m long by 5.0 m wide; c. 50.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of a level area of rubble fill with a wall on it. The feature is simated in front of collapsed lava tube. This tube may have an opening plugged up with rubble. Several aligned large upright slabs to the southeast and northwest appear to remnants of a terrace wall which would have retained the rubble fill.

SITE NOS.: State: 2090 PHRI: K-76 BPBM: — FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 55.0 m long by 18.0 m wide;

c. 990.0 sq m

PROBABLE AGE: Prehistoric

APPENDIX E E-32

FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

DESCRIPTION: Complex consists of a U-shaped terrace with some paving and a free standing upslope-downslope-oriented wall segment.

FEATURE A: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, 'ilima, wattle, lantana

CONDITION: Fair/Poor INTEGRITY: Altered

DIMENSIONS: 10.5 m long by 8.0 m wide; c. 84.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: U-shaped terrace with low walls. A small paved area is present in the southeast portion of the feature. Northwest of the terrace is a short terrace. Walls have a maximum height of 45 cm and an average thickness of 1.2 m. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, 'ilima, lantana, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 1.1 m wide; c. 8.8 sq m

PROBABLE AGE: Historic/Prehistoric\*

DESCRIPTION: Core-filled wall segment oriented upslope-downslope. The wall is faced on both sides and is collapsed in some areas. Wall has a maximum height of 1.1 m and an average thickness of 1.2 m. Wall is comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2091 PHRI: K-78 BPBM: — FORMAL TYPE: Complex (6 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima, wattle,

Christmas-berry
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 115.0 m long by 70.0 m wide;

c. 8,050.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*/

Habitation/Agricultural

DESCRIPTION: Complex consists of two habitation terrace complexes, one stepped and paved platform, one rectangular enclosure, and one area of modified bedrock. Agricultural terraces are present north of the main features.

FEATURE A: Terraces

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle,

Christmas-berry
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 25.0 m long by 10.0 m wide;

c. 250.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Three paved terraces oriented upslopedownslope and connected to each other. Northeast boundary of the terraces consists of a bedrock outcrop. The south and west sides of the terraces are raised above the adjacent slope. The northwest wall of the westernmost terrace is faced. The eastern terrace measures 10 m by 7 m by 20 cm high. The central terrace measures 8.9 m by 6.3 m by 40 cm high. The western terrace measures 8.5 m by 5.3 m by 75 cm high.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,

wattle

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 10.0 m long by 8.0 m wide; c. 80.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Probable residential terrace with a small notch in the northwest corner. The inside of the east wall and the outside of the south wall are faced. Interior of terrace has possible paving.

FEATURE C: Platform/terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wartle, 'ilima,

Christmas-berry
CONDITION: Fair
INTEGRITY: Unaltered

**DIMENSIONS: 12.5 m long by 10.5 m wide; c. 131.3 sq m** 

PROBABLE AGE: Prehistoric

DESCRIPTION: Consists of a smaller paved platform built on a larger one. The lower platform forms a paved area which extends out c. 0.8 m beyond the limits of smaller platform. Some facing is present on the west and south sides of the platform.

FEATURE D: Complex

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle,

Christmas-berry
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 32.5 m long by 25.0 m wide;

c. 812.5 sq m

PROBABLE AGE: Prehistoric

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DESCRIPTION: Complex is located on bedrock and is delineated by retaining walls. Modified bedrock outcrops and a possible walkway are present on the north wall. Within the walls are alignments/terraces and areas cleared of stones presumably for planting.

FEATURE E: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle,

Christmas-berry CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.4 m long by 8.0 m wide; c. 75.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure; the east and south walls are built into a slope and are higher than the north and west walls. The interior of the east and south walls are faced, as are both sides of the west wall. A possible cupboard is present in the west wall. A possible firepit is present in the interior of the structure. Walls average 1 m in height and 1.2 m in width. Walls are comprised of stacked basait boulders and cobbles.

FEATURE F: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wattle,

Christmas-berry **CONDITION:** Good INTEGRITY: Altered

DIMENSIONS: 22.5 m long by 22.5 m wide;

c. 506.3 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large irregular enclosure with the majority of its walls standing on the edge of a low cliff. The northwest wall consists of a single course of rocks. Wing walls extend off the southeast and southwest corners of the enclosure. Enclosure walls have a maximum height of 1.3 m and an average width of 60 cm. Walls are composed of stacked basalt boulders and cobbles occasionally incorporating bedrock outcrops. Feature appears to be either a agricultural enclosure or corral.

SITE NOS.: State: 2092 PHRI: K-79 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, wattle, lantana, panini. 'ilima

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 22.0 m long by 20.0 m wide;

c. 440.0 sq m

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PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Large enclosure irregular in plan view. The south wall is constructed on a collapsed lava tube. The interior of the north wall is faced. The northeast wall consists of a loose alignment of rocks. Walls have a maximum height of 1.0 m and an average thickness of 60 cm. Walls are comprised of stacked basalt boulders and cobbles. Within the enclosure are several terraces.

SITE NOS.: State: 2093 PHRI: K-80 BPBM: T-46

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wante forest

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 50.0 m long by 1.5 m wide; c. 75.0 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Upsiope-downslope oriented wall partly with a fence along it. The wall ranges in height from 30 cm to 90 cm and is comprised of stacked basalt boulders and cobbles. At the north end the wall curves slightly to the west and connects with an outcrop situated above a drainage. Near the upslope portion of the wall is a terrace.

SITE NOS.: State: 2094 PHRI: K-81 BPBM: T-1036

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest **CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 80.0 m long by 40.0 m wide:

c. 3,200.0 sq m

PROBABLE AGE: Historic/Prehistoric

FUNCTIONAL INTERPRETATION: Animal control/

Agriculmal

DESCRIPTION: Complex consists of a large rectangular enclosure, a small circular enclosure, and numerous agricultural terraces. A wall extends off the southeast corner of the large enclosure.

FEATURE A: Enclosure

TOPOGRAPHY: Steep dissected alluvial slope

**VEGETATION:** Wattle Forest

CONDITION: Fair INTEGRITY: Unaitered

DIMENSIONS: 36.0 m long by 50.0 m wide:

c. 1,800.0 sq m

PROBABLE AGE: Historic

DESCRIPTION: Large rectangular enclosure. The northern two-thirds of the west wall consists of a single course of rocks. Present in the southern half of the enclosure is an outcrop. A wall extends c. 25.0 m northeast off the southeast corner of the enclosure.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.5 m wide; c. 14.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Small circular enclosure built against a low outcrop. The walls of the enclosure are built with large rocks and are relatively high. The walls are not faced.

SITE NOS.: State: 2095 PHRI: K-84 BPBM: T-55

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest CONDITION: Good

INTEGRITY: Unaitered

DIMENSIONS: 4.5 m long by 3.5 m wide; c. 15.8 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: L-shaped wall open to the northeast. The northwest portion of the wall is collapsed. Wall has a maximum height of 1.2 m and is comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2096 PHRI: K-85 BPBM: —
FORMAL TYPE: Wall and terrace complex
TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 80.0 m long by 60.0 m wide;

c. 4,800.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Animal Control/ Agricultural

DESCRIPTION: Complex is largely built on and around bedrock. Site consists of an area of rough terroes and a long well-preserved wall segment. The long wall probably connects to a wall at Site K-101.

SITE NOS.: State: 2097 PHRI: K-87 BPBM: T-25

(Figure E-10)

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 28.0 m long by 8.0 m wide; c. 224.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial

DESCRIPTION: The complex consists of a faced mound and a faced platform. Both features are small. The platform

has a small wall around the top; the platform is probably a burial. The mound is a possible burial.

FEATURE A: Platform

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest CONDITION: Excellent INTEGRITY: Unaltered

DIMENSIONS: 3.8 m long by 2.1 m wide; c. 7.9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: The sides and top of this feature are faced. A wall c. 20 cm high outlines the level upper surface of the platform. Platform has a maximum height of 1.2 m and is comprised of stacked basalt boulders and cobbles.

FEATURE B: Mound/platform

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 2.0 m long by 2.0 m wide; c. 4.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: The east and west sides of the mound are faced; the north and south sides are somewhat collapsed. The feature is built on a L-shaped, rock-retained terrace. The feature has a maximum height of I m and is comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2098 PHRI: K-89 BPBM: --

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Wattle forest CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 150.0 m long by 125.0 m wide;

c. 18,750.0 sq m

PROBABLE AGE: Prehistoric/Historic\*

FUNCTIONAL INTERPRETATION: Agricultural/

Habitation/Animal control

DESCRIPTION: Long terrace with a paved area. The terrace connects sides of a collapsed lava tube. Walls are built along the sides of the tube and intersect with the terrace and another large terrace downslope. There are many other small terraces to the north. The terraces appear to be largely agricultural in function, excepting the paved portion which may be a remnant of a habitation feature. For the most part, the walls appear to be ranch-related features. The site roughly resembles the map of Papakea Heiau contained in the SIMP Site Form No. 50-50-10-1036; however, the described location and coral offerings in the form do not match.



Figure E-10. SITE K-87, BURIAL PLATFORM. VIEW TO NORTHWEST. (PHRI Neg#.1151-36)

SITE NOS.: State: 2099 PHRI: K-90 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wattle

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 17.0 m long by 10.0 m wide;

c. 170.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Possibly notched enclosure which has been heavily disturbed. The enclosure has no northwest wall. The notch is in the south corner. Adjacent to the northwest side are two paved terraces or lanai. An internal wall subdivides the enclosure interior into upper and lower portions. The walls have a maximum height of 60 cm and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2300 PHRI: K-95 BPBM: —
FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, wattle, lantana
CONDITION: Fair
INTEGRITY: Unaltered
DIMENSIONS: 50.0 m long by 30.0 m wide;
c. 1,500.0 sq m
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Habitation/
Agricultural

DESCRIPTION: Complex consists of an ovoid enclosure, a partially walled terrace, and a wall segment. There numerous agricultural terraces in the area.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: The west side and portions of the south wall of this enclosure are built into bedrock. The interiors of the east, west, and north walls, and the exterior of the west and north walls are faced. The top of the east wall is even with the ground surface on the exterior, uphill side. Walls have a maximum height of 60 cm. Wall are comprised of stacked basalt boulders and cobbles and incorporate bedrock outcrops.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana

INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 8.0 m wide; c. 72.0 sq m

E-36

PROBABLE AGE: Prehistoric

DESCRIPTION: Terrace has east and south walls only; built on bedrock. Feature is eroded and heavily vegetated making it very difficult to determine its exact form and function. Feature may be agricultural in function.

FEATURE C: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana

CONDITION: Fair/Poor

INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 2.0 m wide; c. 8.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two course high wail faced on the west side but mostly collapsed. Maximum wall height is 20 cm. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2301 PHRI: K-96 BPBM: --

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.4 m long by 4.5 m wide; c. 24.3 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation\*/

Animal Control

DESCRIPTION: Circular enclosure with unfaced walls. The southeast wall is built into a small outcrop of rock. Maximum wall height is 40 cm. Walls are comprised of stacked basalt boulders and cobbles. A small drainage is present c. 4.0 m west of the enclosure.

SITE NOS.: State: 2302 PHRI: K-97 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 0.6 m wide; c. 4.2 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Modified bedrock wall c. 0.5 m high (maximum). Feature is probably agricultural. Small

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agricultural terraces present in the area.

SITE NOS.: State: 2303 PHRI: K-98 BPBM: ---

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

CONDITION: Fair INTEGRITY: Altered\*

DIMENSIONS: 9.5 m long by 8.5 m wide; c. 80.8 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Rectangular enclosure with very low walls which look disturbed. There is some facing in the south corner of the enclosure. About 2.0 m southwest of the enclosure are two rock-retained terraces. Walls average 1.5 m in thickness and have a maximum height of 60 cm. Walls are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2304 PHRI: K-99 BPBM: T-3

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 5.5 m wide; c. 38.5 sq m

PROBABLE AGE: Prehistoric

**FUNCTIONAL INTERPRETATION: Habitation** 

DESCRIPTION: Rectangular enclosure with openings in the south corner and northwest side. The southwest wall of the enclosure is built on a small bedrock outcrop. Possible slab-lined firepit in the center of enclosure. Walls have a maximum height of 70 cm and are comprised of stacked basalt boulders and cobbles.

A test unit excavated in the enclosure sectioning the possible firepit did not reveal any subsuface cultural remains indicating the feature is either not a habitation (i.e., an agricultural enclosure) or that the feature was little used.

SITE NOS.: State: 2305 PHRI: K-100 BPBM: —

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Poor INTEGRITY: Altered

DIMENSIONS: 21.0 m long by 0.8 m wide; c. 16.8 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal/Control DESCRIPTION: Cattle wall roughly faced on both sides. Wall has a maximum height of 60 cm; comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2306 PHRI: K-101 BPBM: T-24

FORMAL TYPE: Mounds and Wall TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 300.0 m long by 1.0 m wide;

c. 300.0 sq m

PROBABLE AGE: Historic/Prehistoric

FUNCTIONAL INTERPRETATION: Animal Control/ Agricultural

DESCRIPTION: Long cattle wall which curves to form a large arc which opens downslope. In the northeast portion of this arc are several probable agricultural mounds. The wall is roughly faced on both sides. Wall has a maximum height of 60 cm; comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2307 PHRI: K-102 BPBM: —

FORMAL TYPE: Terrace and Wall
TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Fair

INTEGRITY: Unaltered

DIMENSIONS: 18.0 m long by 6.0 m wide; c. 108.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Rectangular terrace built on the top of a knoll. The wall is built across a small steep-sided drainage situated 6.0 m south of the terrace. The south and north walls of the terrace are situated on the edge of the knoll. An alignment extends 4.0 m north from the northwest corner of the terrace.

SITE NOS.: State: 2308 PHRI: K-103 BPBM: T-56

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

**VEGETATION:** Wattle forest

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 32.0 m long by 22.0 m wide;

c. 704.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Feature includes large walled area in front of the 80 cm high overhang. The walls of the area run down a steep, short slope (from the cliff to the bottom of the drainage) where the northeast wall runs parallel to the drainage. A level area extends 5.0 m out from the dripline of the overhang.

SITE NOS.: State: 2035 PHRI: K-105 BPBM: -

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, lantana

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 26.0 m long by 26.0 m wide; c. 676.0 sq m PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Rectangular enclosure. Outside of the east wall and portions of the inside of the north and south walls are faced. Walls are collapsed on the north and west sides. In the northeast corner is a possible rock-filled pit. Terraces are present north of the enclosure.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containing fish and mammal bone, kukui nut shell, and and charcoal. A radiocarbon sample from the deposit yielded three posssible calendric age ranges of AD 1470-1670, AD 1775-1793, and AD 1947-

SITE NOS.: State: 2310 PHRI: K-106 BPBM: —

FORMAL TYPE: Stone

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 2.0 m long by 2.0 m wide; c. 4.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Tool Manufacturing DESCRIPTION: Site consists of abraded depressions in several pahoehoe slabs at the bottom of a hill. The slabs range in size from 20 cm to 90 cm in diameter.

SITE NOS.: State: 2311 PHRI: K-107 BPBM: —

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, Christmas-berry, wattle,

koa-haole **CONDITION:** Good INTEGRITY: Altered\*

DIMENSIONS: 14.0 m long by 6.0 m wide; c. 84.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial/Agricultural DESCRIPTION: Consists of a burial in a lava blister overhang. The blister is  $0.3\,\mathrm{m}$  high and  $c.\,4.0\,\mathrm{m}$  in diameter. Bones (patella and rib) were observed inside. A wall extends from the opening 9.0 m to the northwest. The entrance may have been plugged at one time, but is now open. Agricultural features surround the site.

SITE NOS.: State: 2312 PHRI: K-108 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24.0 sq m PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: C-shaped enclosure open to the northwest; interior of the southeast portion is faced. The southeast wall, which is the highest, abuts a slope. The wall averages 60 cm in thickness and has a maximum height of 90 cm. Wall is comprised of stacked basalt boulders and cobbles.

SITE NOS:: State: 2313 PHRI: K-109 BPBM: T-49 FORMAL TYPE: Complex (2 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 55.0 m long by 40.0 m wide:

c. 2,200.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: The complex consists of a C-shaped terrace, and agricultural features. Several terraces extend from an outcrop. Terraces situated downslope from C-

shape.

FEATURE A: Terraces

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, wattle, 'ilima, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 3-5 m long by 0.5-1.0 m wide by

0.3-0.5 m high

PROBABLE AGE: Prehistoric

DESCRIPTION: Small terraces scattered across slope. Most incorporate bedrock outcrops and are roughly constructed. They are opportunistically placed to utilized scattered pockets

of soil.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, wattle, Christmas-berry

**CONDITION:** Good **INTEGRITY:** Unaltered

DIMENSIONS: 3.7 m long by 3.4 m wide; c. 12.6 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped terrace, probably agricultural in function. A slightly modified bedrock terrace is present

immediately below the feature.

SITE NOS.: State: 2314 PHRI: K-110 BPBM: T-48

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 36.0 m long by 14.0 m wide;

c. 504.0 sq m

PROBABLE AGE: Prehistoric

terrace and continues downslope.

FUNCTIONAL INTERPRETATION: Agricultural DESCRIPTION: Large terrace forms a rough C-shape. Terrace is situated in the bottom and sides of a drainage. A wall extends upslope-downslope from the south end of the

SITE NOS.: State: 2036 PHRI: K-111 BPBM: -

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 40.0 m long by 20.0 m wide;

c. 800.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Complex consists of a pair of adjoining overhangs, a paved terrace, and a small overhang with possible walls delineating a level area.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 11.0 m wide;

c. 132.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two adjoining overhangs with a possible wall in front of the western one. In front of the overhangs is a natural terrace area which extends 4.0 m to the west. Subsurface testing was conducted at the feature.

The test unit excavated near the dripline of the overhang revealed a subsurface cultural deposit containing volcanic glass flakes, marine shell, bone and charcoal. A radiocarbon sample from the deposit yielded a calendric age range of AD 1640-1955.

FEATURE B: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 7.5 m wide; c. 75.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: This paved terrace is on a very steep slope and is built to extend the top of the ridge. About 1.5 m of the north wall is faced, and the other 1.5 m of the same wall is collapsed.

FEATURE C: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, Christmas-berry, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 5.0 m long by 4.0 m wide; c. 20.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Overhang alone measures 1.4 m by 0.7 m; a level area fronts it. A possible modified bedrock wall is situated west of the overhang; this wall curves and connects with Feature B and encloses a level area.

SITE NOS.: State: 2315 PHRI: K-112 BPBM: T-43

FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 60.0 m long by 50.0 m wide:

c. 3,000.0 sq m

PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural/Animal Control

DESCRIPTION: Complex consists of an overhang, an oval enclosure, and a cattle wall. Agricultural features surround the site.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 2.0 m deep by 1.8 m wide; c. 3.6 sq m

PROBABLE AGE: Prehistoric

**DESCRIPTION:** Feature consists of an 1 m high overhang with collapsed bedrock in front. Soil deposit present inside overhang.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini

**CONDITION: Poor** 

INTEGRITY: Unitered

DIMENSIONS: 5.5 m long by 5.0 m wide; c. 27.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Mostly collapsed oval enclosure. alls have a maximum height of 30 cm and are comprised of stacked basalt boulders and cobbles. No facing remains and

the walls are rounded in cross-section.

FEATURE C; Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 60.0 m long by 0.75 m wide

PROBABLE AGE: Historic

DESCRIPTION: Cattle wall which may be connected to the walls of Site K-12. Multiple-stacked wall comprised of stacked basalt boulders and cobbles. Wall is 80 cm high and 75 cm in thickness.

SITE NOS.: State: 2316 PHRI: K-115 BPBM: T-42 FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, grasses, 'ilima, kiawe
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 35.0 m long by 20.0 m wide;

c. 700.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Complex consists of a square enclosure, an enclosure irregular in plan, and agricultural terraces.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, kiawe

CONDITION: Excellent INTEGRITY: Unaltered

DIMENSIONS: 8.9 m long by 7.9 m wide; c. 70.3 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure with a 3.5 m square platform adjacent to the walls in the northeast quadrant of the structure's interior. The level upper surface of the platform is flush with the upper surfaces of the adjacent walls which are also level. Both sides of all walls are well-faced. The south wall is massive, 1.9 m thick. The walls average 80 cm in height and average 1.5 m in thickness. A possible external cupboard is present on the outside of the north wall near the northeast corner. The walls are comprised of stacked basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, kiawe

CONDITION: Poor INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 20.0 m wide;

c. 600.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Enclosure irregular in plan view surrounding a small sink. The walls of the enclosure are poorly constructed and are low. The north wall may have been altered during fence building. The western wall is the

only wall which is easily discernible; the east wall is covered with lantana. The walls have a maximum height of 80 cm and are comprised of stacked basalt boulders and cobbles.

SITE NOS.: State: 2317 PHRI: K-116 BPBM: T-41

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, grasses, kiawe

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 75.0 m long by 55.0 m wide;

c. 4,125.0 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: Complex consists of two large enclosures, one square and one trapezoidal. Both are probably historic corrals for cattle based on their size, location relative to other similar features, and construction.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 30.0 m long by 22.0 m wide;

c. 660.0 sq m

PROBABLE AGE: Historic

DESCRIPTION: Large square enclosure with intermittent facing on the walls. Most of the west wall is missing due to buildozer activity during the building of a fence in the area. A upslope-downslope oriented wall segment extends for c. 5.0 m off the northeast corner. The walls average 75 cm to 80 cm in thickness and have a maximum height of 1.0 m. The walls are of multiple-stacked to core-filled construction and are composed of stacked basalt cobble and boulders.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, panini

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 30.0 m long by 22.0 m wide;

c. 660.0 sq m

PROBABLE AGE: Historic

DESCRIPTION: Large trapezoidal enclosure with only the north and east walls intact. The other walls are linear piles of rubble having been probably destroyed by bulldozer activity. There is a depression in the northwest one-third of the enclosure. The walls average 80 cm in thickness and have a maximum height of 1.3 m. The walls are of multiple-stacked to core-filled construction and are composed of stacked basalt cobble and boulders.

SITE NOS.: State: 2318 PHRI: K-118 BPBM: ---FORMAL TYPE: Complex (3 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 70.0 m long by 40.0 m wide;

c. 2,800.0 sq m

PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural/Animal Control

DESCRIPTION: Complex consists of a large square enclosure, a circular enclosure, a sub-rectangular enclosure and associated agricultural features. The large enclosure is probably a historic cattle corral based on it's size, location relative to other similar features, and construction.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 35.0 m long by 30.0 m wide;

c. 1,050.0 sq m

PROBABLE AGE: Prehistoric/Historic

DESCRIPTION: Large square enclosure. Most of the walls are faced, the west wall, however, is somewhat collapsed. The south wall is in the best condition. A collapsed terrace extends c. 5.0 m from the north corner, then extends 8.0 m to the northeast, then extends eastward and ends 5.0 m from Feature B. The enclosure walls average 70 cm in thickness and have a maximum height of 1.2 m. The walls are of multiple-stacked construction and are composed of stacked basalt cobble and boulders.

FEATURE B: Enclosure

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TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

**CONDITION:** Good INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.3 m wide; c. 21.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure. The north half of the enclosure is collapsed, and the south half is in very good condition. Walls of the south half are faced on both sides. The enclosure walls average 70 cm in thickness and have a maximum height of 90 m. The walls are of multiple-stacked construction and are composed of stacked basalt cobble and boulders.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 4.5 m wide; c. 40.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Sub-rectangular enclosure with very collapsed walls. Most of the south half of the east wall is

missing.

SITE NOS.: State: 2319 PHRI: K-120 BPBM: T-40

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, panini, morning glory

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 60.0 m long by 25.0 m wide;

c. 1,500.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of a paved terrace, a

small lava tube, and a rectangular enclosure.

FEATURE A: Paved terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, grasses, panini,

morning glory **CONDITION: Good** 

INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 4.5 m wide; c. 31.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of an outcrop of cobbles which has been modified into a terrace. A faced retaining wall is present on the southeast downslope side of the platform. The upper surface of the terrace is roughly paved.

FEATURE B: Lava Tube

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini.

morning glory

**CONDITION: Good** 

INTEGRITY: Unaltered

DIMENSIONS: 1.8 m long by 0.8 m wide; c. 1.4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A small lava tube open at both ends. Some possible stacking of cobbles at one opening, or the cobbles may represent collapse. Floor of tube has a soil deposit. internal height ranges from 35 cm to 55 cm.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini,

morning glory

APPENDIX E E→2

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 3.7 m wide; c. 22.9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with all walls faced. There may be an opening in the south corner. Walls have a maximum height of 1.1 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2037 PHRI: K-124 BPBM: — FORMAL TYPE: Complex (3 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, grasses, wattle
CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 65.0 m long by 60.0 m wide;

c. 3,900.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

**DESCRIPTION:** Complex consists of an oval enclosure, an overhang wall, a rectangular enclosure, and surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: An oval enclosure built into an natural collapsed lava tube depression. Portions of the interiors and exteriors of the walls are faced. The walls range from 60 cm to 80 cm in thickness and range from 1.2 m to 1.4 m in height. The walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Just north of the enclosure is a small lava tube which extends to the northwest for an indeterminable length.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containingsmall and medium mammal bone, three basalt flakes, and charcoal. Aradiocarbon sample from the deposit yielded a calendric age range of AD 1640-1955.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.4 m long by 2.5 m wide; c. 8.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Overhang with a small curved wall

fronting it. The wall encloses a small area in front of the overhang and both ends of the wall connects to an outcrop equal in height to the wall. Afew boulders are present on the outcrop, above the lip of the overhang. The walls have a maximum height of 1.0 m and a maximum thickness of 50 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses lantana, 'ilima, wattle

CONDITION: Poor INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 6.0 m wide; c. 48.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure. The walls of the enclosure are quite collapsed making it difficult to determine their exact dimensions. The north wall, being on the side of a swale, is higher than the others. Part of the exterior of the west wall is faced. The walls have a maximum height of 1.0 m and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2320 PHRI: K-127 BPBM: —

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 65.0 m long by 35.0 m wide;

c. 2275.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of a circular enclosure, a small overhang with an associated wall, and many surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, 'ilima, lantana, panini, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 8.2 m wide; c. 73.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure; the interior of the south wall and the exterior of the north wall are faced. A possible cupboard is present in the south wall. The walls have a maximum height of 85 cm and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

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CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 3.7 m wide; c. 22.9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with all walls faced. There may be an opening in the south corner. Walls have a maximum height of 1.1 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2037 PHRI: K-124 BPBM: — FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, 'ilima, grasses, wattle CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 65.0 m long by 60.0 m wide;

c. 3,900.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of an oval enclosure, an overhang wall, a rectangular enclosure, and surrounding agricultural features.

FEATURE A: Enciosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: An oval enclosure built into an natural collapsed lava tube depression. Portions of the interiors and exteriors of the walls are faced. The walls range from 60 cm to 80 cm in thickness and range from 1.2 m to 1.4 m in height. The walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Just north of the enclosure is a small lava tube which extends to the northwest for an indeterminable length.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containingsmall and medium mammal pone, three basalt flakes, and charcoal. A radiocarbon sample from the deposit yielded a calendric age range of AD 1640-1955.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 3.4 m long by 2.5 m wide; c. 8.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Overhang with a small curved wall

fronting it. The wall encloses a small area in front of the overhang and both ends of the wall connects to an outcrop equal in height to the wall. Afew boulders are present on the outcrop, above the lip of the overhang. The walls have a maximum height of 1.0 m and a maximum thickness of 50 cm. Walls are comprised of stacked basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses lantana, 'ilima, wattle

CONDITION: Poor INTEGRITY: Unaitered

DIMENSIONS: 8.0 m long by 6.0 m wide; c. 48.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure. The walls of the enclosure are quite collapsed making it difficult to determine their exact dimensions. The north wall, being on the side of a swale, is higher than the others. Part of the exterior of the west wall is faced. The walls have a maximum height of 1.0 m and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2320 PHRI: K-127 BPBM: -

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini, wattle

CONDITION: Good INTEGRITY: Unaltered

**DIMENSIONS:** 65.0 m long by 35.0 m wide;

c. 2275.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of a circular enclosure, a small overhang with an associated wall, and many surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, 'ilima, lantana, panini, wattle

CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 9.0 m long by 8.2 m wide; c. 73.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure; the interior of the south wall and the exterior of the north wall are faced. A possible cupboard is present in the south wall. The walls have a maximum height of 85 cm and a maximum thickness of 1.0 m. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

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FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 1.8 m long by 0.4 m wide; c. 0.7 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A small shallow overhang in a lava blister. A 8.0 m long somewhat informal appearing wall extends north from the overhang. The wall measures 0.5 m wide; c. 0.5 m high. The overhang is 0.7 m high.

SITE NOS.: State: 2038 PHRI: K-130 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 40.0 m long by 40.0 m wide;

c. 1.600.0 sa m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/ Agricultural

DESCRIPTION: Rectangular enclosure with a small associated overhang containing a pig mandible. Most of the interior walls are faced. The walls have a maximum height of 1.3 m and a maximum thickness of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. The overhang is 1.4 m high, 1.4 m wide, and 50 cm deep. There are many agricultural features in the area.

A test unit excavated inside the enclosure revealed a subsurface cultural deposit containing small mammal bone, marine shell, three basalt flakes, and charcoal. A radiocarbon sample from the deposit yielded five possible calendric age ranges: AD 1523-1566, AD 1629-1696, AD 1726-1818, AD 1859-1861, and AD 1921-1955.

SITE NOS.: State: 2321 PHRI: K-131 BPBM: —

FORMAL TYPE: Complex (3 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory, panini

CONDITION: Good INTEGRITY: Altered

DIMENSIONS: 80.0 m long by 50.0 m wide;

c. 4,000.0 sq m

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PROBABLE AGE: Prehistoric/Historic

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture/Animal Control

DESCRIPTION: Complex consists of a square enclosure, an oval enclosure, an overhang and a wall, and associated agricultural features. A wall of Site K-12 bisects the site.

FEATURE A: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory,

panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.0 m long by 0.4 m wide; c. 1.2 sq m

PROBABLE AGE: Prehistoric
DESCRIPTION: Very shallow, 50 cm high overhang with a possible deposit on the floor. A nearby wall is probably not associated with the overhang, as it appears to be a cattle wall. The wall is 50+ m long, 70 cm thick, and 50 cm high. There is also a probable road between this wall and the wall of Site K-12.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory,

panini

CONDITION: Fair/Poor INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 5.0 m wide; c. 25.00 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Square enclosure with collapsed walls and rock mounds possibly associated with the enclosure. The walls have a maximum height of 30 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE C: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory, panini

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 5.0 m wide; c. 30.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure with collapsed walls. No facing was present on any of the walls. The walls have a maximum height of 50. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2322 PHRI: K-134 BPBM: --

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini

CONDITION: Fair-Poor INTEGRITY: Altered

DIMENSIONS: 18.5 m long by 13.2 m wide;

c. 244.2 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*/

Habitation

E-44

DESCRIPTION: Large substantial rectangular enclosure with wide walls and internal features. The east wall is intermittently faced on both sides. There is a possible internal step, or bench along the south half of the east wall. A natural step in the bedrock floor separates the higher north one-quarter of the floor from the lower south three-quarters. The later portion of the interior may have been futher subdivided by a wall which is now completely collapsed. A cattle wall has been constructed along the west wall of the feature. Stones from the remaining walls, especially the north and south ones, have been removed to construct the cattle wall. The walls average 70 cm in height and have a maximum thickness of up-to 2.0 m. Walls are comprised of stacked basalt boulders and cobbles. The feature commands a broad view of the surrounding terrain. The enclosure is one of the largest within the project area and probably represents a small heiau, a men's house, or high status residence based on its size, construction, and location.

SITE NOS.: State: 2323 PHRI: K-135 BPBM: — FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, panini.

morning glory
CONDITION: Good
INTEGRITY: Unaltered

DIMENSIONS: 35.0 m long by 15.0 m wide;

c. 525.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of an enclosed portion of a collapsed lava tube, and an L-shaped wall within a collapsed lava tube. Along the tube, throughout the site, there are small associated features. A long wall, which may be part of Site K-112 or Site K-12, is situated nearby.

FEATURE A: Lava Tube

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, morning glory,

ferns

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 12.0 m wide;

c. 144.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: An enclosure built within a collapsed lava tube; the northeast and southwest walls have been built on the sides of the tube. The walls have a maximum height of 1.5 m and a maximum thickness of 85 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE B: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, 'ilima, morning glory,

ferns

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: L-shaped wall built within a collapsed lava tube. One leg of the L-shape is on the top of the tube and the other crosses the tube. The northeast side of the tube is steep enough to act as a wall—which creates an over all U-shape open to the northwest. The walls have a maximum height of 1.5 m and a maximum thickness of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2324 PHRI: K-137 BPBM: -

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, Christmas-berry

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.6 m wide; c. 14.4 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Sub-rectangular enclosure with some facing on the east wall. Northeast side of structure is built into an outcrop. The walls have a maximum height of 70 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Agicultural features, mounds, terraces, and modified outcrops, surround site.

SITE NOS.: State: 2325 PHRI: K-140 BPBM: —

FORMAL TYPE: Complex (2 Features) TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, vines

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 50.0 m long by 40.0 m wide:

c. 2,000.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Indeterminate

**DESCRIPTION:** Complex consists of a large ovoid enclosure, and a C-shaped enclosure. Associated with these features are two small overhangs.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, vines

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 16.0 m wide;

c. 480.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Large ovoid enclosure situated in a depression/sink. Much of the south wall consists of a small cliff. The other walls are high and are intermittently faced. Wall average 1.0 m in height. Walls are multiple-stacked comprised of basait cobbles and boulders and frequently incorporate bedrock outcrops. Interior is thickly vegetated possibly indicating feature served as an garden enclosure.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, vines

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.8 m long by 3.8 m wide; c. 18.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the west. The walls are low and are not faced. The walls have an average height of 20 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2326 PHRI: K-142 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, vines

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 7.8 m long by 6.0 m wide; c. 46.8 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Rectangular enclosure with intermittent facing on all sides. Terraces are present north and south of the west wail. The terraces form the edge of a level area which runs to the base of a ridge situated to the east and north. The walls have an average height of 40 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

A test unit excavated in the enclosure sectioning the possible firepit did not reveal any subsuface cultural remains indicating the feature is either not a habitation (i.e., an agricultural enclosure) or that the feature was little used.

SITE NOS.: State: 2327 PHRI: K-143 BPBM: --FORMAL TYPE: Complex (2 Features)

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,

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**CONDITION:** Good **INTEGRITY:** Unaltered DIMENSIONS: 50.0 m long by 25.0 m wide;

c. 1.250.00 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agricultural

DESCRIPTION: Complex consists of an irregular enclosure, an overhang, and surrounding agricultural features.

FEATURE A: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry, panini

CONDITION: Good **INTEGRITY:** Unaltered

DIMENSIONS: 8.0 m long by 7.0 m wide; c. 56.0 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Enclosure is irregular in plan view. Walls are infrequently faced on the north and west sides. In the southwest corner is a possible small platform. In the northwest corner is a low area defined by a terrace connected to the possible platform and north wall. The walls have an maximum height of 80 cm and a maximum thickness of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE B: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,

panini

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 2.5 m long by 1.5 m wide; c. 3.8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: A 80 cm overhang with short wails of modified bedrock on either side of the entrance. Present in the vicinity of the overhang are numerous agricultural

SITE NOS.: State: 2328 PHRI: K-146 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, 'ilima, Christmas-berry, wattle

CONDITION: Good

INTEGRITY: Unaltered

DIMENSIONS: 7.0 m long by 6.0 m wide; c. 42.0 sq m

PROBABLE AGE: Prehistoric

**FUNCTIONAL INTERPRETATION: Habitation** 

DESCRIPTION: U-shaped enclosure open to the southeast. Northwest side of enclosure is built into a small outcrop. A level area is present on the other side of the outcrop. The walls have a maximum height of 70 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FORMAL TYPE: Complex (5 Features)

TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima, wattle,
Christmas-berry
CONDITION: Fair
INTEGRITY: Unaltered
DIMENSIONS: 90.0 m long by 60.0 m wide;
c. 5,400.0 sq m
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Habitation
DESCRIPTION: Site consists of three circular enclosures,
one U-shaped enclosure, one rectangular enclosure, and

FEATURE A: Enclosure
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima, wante,
Christmas-berry
CONDITION: Fair
INTEGRIFY: Unaltered
DIMENSIONS: 6.5 m long by 6.5 m wide; c. 42.3 sq m
PROBABLE AGE: Prehistoric
DESCRIPTION: Circular enclosure with low, unfaced

walls. The walls have a maximum height of 25 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,
wattle
CONDITION: Fair
INTEGRITY: Unaltered
DIMENSIONS: 10.0 m long by 7.5 m wide; c. 75.0 sq m
PROBABLE AGE: Prehistoric

DESCRIPTION: U-shaped enclosure open to the northeast, with associated walls. Small portion of southwest wall is faced. Present within the enclosure is a small wall which extends 2.0 m northeast off the enclosure's southwest wall. The walls have a maximum height of 80 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles and occasionally incorporating bedrock outcrops. Three meters east of the enclosure is what appears to be a very collapsed U-shape.

FEATURE C: Enclosure
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,
wattle
CONDITION: Fair
INTEGRITY: Unaltered

DIMENSIONS: 7.5 m long by 7.0 m wide; c. 52.5 sq m PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure with unfaced walls quite collapsed. The walls have a maximum height of 35 cm. Walls are of multiple-stacked construction comprised

FEATURE D: Enclosure
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima, Christmas-berry,
wattle

of basait boulders and cobbles.

CONDITION: Poor INTEGRITY: Unaltered DIMENSIONS: 5.4 m long by 5.2 m wide; c. 28.1 sq m

PROBABLE AGE: Prehistoric
DESCRIPTION: Rectangular enclosure with very
collapsed walls. The only portions of the enclosure above

collapsed walls. The only portions of the enclosure above ground level are the south wall, the southeast corner, and a small bit of the east wall. A wall extends c. 4.0 m south from the southwest corner of the enclosure. The walls have a maximum height of 30 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2330 PHRI: K-149 BPBM: —
FORMAL TYPE: Overhang
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: lantana, 'ilima, wattle, grasses, panini
CONDITION: Fair
INTEGRITY: Unaltered
DIMENSIONS: 8.0 m long by 3.5 m wide; c. 28.0 sq m
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Habitation
DESCRIPTION: Overhang is enclosed; it is small and low, and a wall seals off one-quarter of the entrance.
Fronting the overhang is a fairly level area which is terraced.
The overhang measures 2.9 by 1.1 by 0.5 m.

FORMAL TYPE: Complex (2 Features)
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Lantana, 'ilima, grasses, wantle
CONDITION: Good
INTEGRITY: Unaltered
DIMENSIONS: 40.0 m long by 40.0 m wide;
c. 1,600.0 sq m
PROBABLE AGE: Prehistoric
FUNCTIONAL INTERPRETATION: Habitation/
Agricultural
DESCRIPTION: Complex consists of a double terrace, a
U-shaped enclosure, and surrounding agricultural features.

SITE NOS.: State: 2331 PHRI: K-152 BPBM: —



Figure E-11. SITE K-148, FEATURE B. VIEW TO SOUTHWEST. (PHRI Neg.# 1154-20)

E-48

FEATURE A: Double terrace

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, wattle, 'ilima, lantana

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.9 m long by 5.8 m wide; c. 34.2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Feature consists of two attached paved terraces. The downslope and northwest side of each level area is well faced. The upper terrace surface is 80 cm above the lower one. The southeast corner of each terrace is level with the slope of the hill. The lower terrace is 70 cm high.

FEATURE B: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 5.7 m long by 5.0 m wide; c. 28.5 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: U-shaped enclosure open to the southwest. The walls of the enclosure are faced. The back wall of the U-shape, the northeast side, is collapsed. The walls have a maximum height of 40 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles.

SITE NOS.: State: 2332 PHRI: K-200 BPBM: -

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, wattle, Christmas-berry,

grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 10.7 m long by 3.0 m wide; c. 32.1 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Site consists of an 1.1 m high overhang with a partially walled entrance. One wall is on the southeast side of the entrance. The wall has a faced corner. The wall on the other side is collapsed. Inside the overhang is a small oval-shaped level terraced area.

SITE NOS.: State: 2333 PHRI: K-201 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana

**CONDITION: Fair** INTEGRITY: Unaltered

DIMENSIONS: 3.3 m long by 2.8 m wide; c. 9.3 sq m

PROBABLE AGE: Prehistoric

**FUNCTIONAL INTERPRETATION: Habitation** 

DESCRIPTION: Small square enclosure with collapsed walls. There is a bit of facing on the southwest corner. A possible entryway is present in the southwest wall. The walls have a maximum height of 30 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles. Five meters south of the enclosure is a wall of Site K-12.

SITE NOS.: State: 2334 PHRI: K-202 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, lantana, wattle

CONDITION: Poor INTEGRITY: Unaltered

DIMENSIONS: 4.0 m long by 3.0 m wide; c. 12.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: A small rectangular enclosure with a modified bedrock terrace extending 10.0 m off the southwest corner. The walls have a maximum height of 70 cm. Walls are of multiple-stacked construction comprised of basalt boulders and cobbles occasionally incorporating bedrock outcrops.

SITE NOS.: State: 2335 PHRI: K-203 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, grasses, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 45.0 m long by 22.0 m wide;

c. 990.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Large irregular-shaped enclosure with two rooms on the southwest side. Probable agricultural features within enclosure including modified outcrops and terraces. The walls have a maximum height of 1.5 m. Walls are of multiple-stacked to core-fill construction. Walls are comprised of basalt boulders and cobbles occasionally incorporating bedrock outcrops.

SITE NOS.: State: 2336 PHRI: K-204 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: grasses, lantana, 'ilima, wattle,

Christmas-berry **CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 5.0 m wide; c. 31.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Circular enclosure with collapsed walls. The interior of the southwest wall is partially faced. Possible

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1 ρį. opening present in a section of the west wall. The walls have a maximum height of 55 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

SITE NOS.: State: 2337 PHRI: K-205 BPBM: --

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, Christmas-berry, panini

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 18.0 m long by 5.0 m wide; c. 90.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Overhang with a terraced area in front of it. Overhang has two deep recesses at either end; recesses differ in elevation and are separated by a collapsed modified bedrock wall. Overhang ceiling ranges from 50 cm to 90 cm in height.

SFTE NOS.: State: 2338 PHRI: K-206 BPBM: T-1

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Grasses, 'ilima, lantana

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.6 m long by 5.5 m wide; c. 36.30 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation\*/

Agricultural

DESCRIPTION: The northwest and southeast walls of this enclosure are formed by a collapsed lava tube. Possible cupboard present in the middle of the northeast wall. Within the tube, 6.0 m upslope of the enclosure, is a terrace. The walls have a maximum height of 90 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

SITE NOS.: State: 2339 PHRI: K-207 BPBM: T-45

FORMAL TYPE: Sink, Burial

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, Christmas-berry, panini

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 36.0 m long by 5.0 m wide;

c. 180.00 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial/Habitation DESCRIPTION: Very deep sink with a small circular alignment in lava tube at the bottom. A lava tube extends to the west. Human bone noted on surface in tube. Sink is filled with trash and dead animals. Areas of charcoal-stain noted on floor of tube.

SITE NOS.: State: 2340 PHRI: K-208 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, Christmas-berry

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.3 m wide; c. 21.5 sq m

PROBABLE AGE: Prehistoric

**FUNCTIONAL INTERPRETATION: Habitation** 

DESCRIPTION: Sub-rectangular enclosure built on a bedrock outcrop. Interiors and exteriors of walls are faced. The walls have a maximum height of 90 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles. Many agricultural terraces present northwest of the enclosure.

SITE NOS.: State: 2341 PHRI: K-209 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, morning glory, kiawe

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 30.0 m long by 15.0 m wide;

c. 450.0 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: Large oval enclosure encircling a sink. Aside from the east wall, which is built on a slope and which utilizes bedrock, all walls are faced on both sides. The walls have a maximum height of 1.4 m and a maximum thickness of 90 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles. Agricultural

terraces surround the enclosure.

SITE NOS.: State: 2342 PHRI: K-210 BPBM: --

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Grasses, lantana, 'ilima, wattle

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.1 m long by 2.9 m wide; c. 11.9 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation

DESCRIPTION: Overhang with irregular enclosure in front. Two sides of the enclosure consist of bedrock; one of the bedrock sides has a small overhang. The interior portion of the northwest wall is faced; all other walls are collapsed. The walls have a maximum height of 90 cm and a maximum thickness of 60 cm. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

SITE NOS.: State: 2343 PHRI: K-211 BPBM: —
FORMAL TYPE: Terrace
TOPOGRAPHY: Dissected alluvial slope
VEGETATION: Grasses, lantana, 'ilima, wattle, lilikoi
CONDITION: Good
INTEGRITY: Unaltered
DIMENSIONS: 13.0 m long by 6.5 m wide; c. 84.50 sq m
PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation DESCRIPTION: Probable residential terrace with modified bedrock walls present on the south and west sides. The other walls were vaguely defined. Terrace is situated on the end of a ridge. The walls have a maximum height of 80 cm and a maximum thickness of 1.1 m. Walls are of multiple-stacked and are comprised of basalt boulders and cobbles.

## APPENDIX F

# FULL UTM COORDINATES, ELEVATION AND PROXIMITY TO WATER FOR IDENTIFIED SITES

W-1 774,450 2,295,100 1820 625 (5) W-2 774,350 2,295,850 1820 175 (N) W-3 774,300 2,295,800 1820 175 (N) W-4 774,300 2,295,700 1820 175 (N) W-4 774,300 2,295,700 1820 175 (N) W-4 774,300 2,295,700 1820 175 (N) W-6 774,300 2,295,700 1820 175 (SW) W-6 774,300 2,295,700 1820 175 (SW) W-10 774,500 2,295,700 1820 150 (S/S) W-11 774,500 2,295,900 1900 500 (S) W-12 774,500 2,295,900 1900 150 (S/S) W-13 774,500 2,295,600 1900 150 (S/S) W-14 774,800 2,295,600 1900 150 (S/S) W-27 775,000 2,295,600 1900 175 (N) W-21 775,000 2,295,600 2100 375 (N) W-23 775,000 2,295,600 2100 375 (N) W-34 775,000 2,295,600 2100 375 (N) W-35 775,000 2,295,600 2100 175 (N) W-36 775,000 2,295,600 2100 175 (N) W-37 775,000 2,295,600 2100 175 (N) W-37 775,000 2,295,600 2100 175 (N) W-37 775,000 2,295,600 2100 175 (N) W-37 775,000 2,295,600 2200 175 (N) W-37 775,000 2,295,500 2200 2200 175 (N) W-37 775,000 2,295,500 2200 2200 220 (W-3 W-47 776,530 2,294,950 2200 2200 220 (W-3 W-47 776,530 2,294,950 2800 220 (S/S) W-48 776,550 2,294,900 2800 200 (S/S) W-49 776,550 2,294,900 2800 100 (S/S) W-49 776,550 2,294,900 2800 100 (S/S) W-49 776,550 2,294,900 2800 200 (S/S) W-49 776,550 2,294,900 2800 200 (S/S) W-49 776,550 2,294,900 2800 200 (S/S)	EVATION DISTANCE AND	PIIRI	FUL	FULL UTM	ELEVATION	DISTANCE AND
774,450 2,296,100 1820 1774,350 2,295,850 1820 1774,300 2,295,800 1820 1774,300 2,295,800 1820 1774,300 2,295,700 1820 1774,300 2,295,700 1820 1774,300 2,295,700 1820 1774,500 2,295,750 1980 1774,500 2,295,500 1900 1774,500 2,295,500 1940 1774,500 2,295,500 1940 1774,700 2,295,500 1940 1774,800 2,295,600 1960 1774,800 2,295,600 1960 1775,000 2,295,600 2100 175,000 2,295,600 2100 175,000 2,295,600 2100 175,000 2,295,000 2100 175,000 2,295,000 2100 175,000 2,295,100 2,295,100 275,000 1775,000 2,295,100 2720 1775,000 2,295,100 2720 1775,000 2,295,100 2720 1775,000 2,295,500 2320 1775,000 2,295,500 2320 1775,000 2,295,500 2320 1776,500 2,295,500 2320 1776,500 2,295,500 2320 1776,500 2,295,500 2200 2776,500 2,295,500 2200 2776,500 2,295,000		NUMBER	EASTING	ING NORTHING	(ft. abuve sea level)	DIRECT. TO WATER (A.) (approx.)
774,450 2,296,100 1820 774,350 2,295,850 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,200 2,295,700 1820 774,500 2,295,750 1980 774,500 2,295,400 1990 774,500 2,295,400 1980 774,500 2,295,400 1980 774,500 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 2100 775,050 2,295,600 2100 775,050 2,295,600 2100 775,050 2,295,600 2100 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2320 775,600 2,295,500 2320 776,550 2,294,950 2880 776,550 2,294,950 2880 776,550 2,294,900 2880		W-57	776,250	2,294,650	2780	550 (N)
774,450 2,296,100 1820 774,350 2,295,850 1820 774,300 2,295,800 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,200 2,295,700 1920 774,500 2,295,750 1920 774,500 2,295,900 1900 774,500 2,295,400 1900 774,500 2,295,500 1940 774,500 2,295,600 1940 774,800 2,295,600 1960 774,800 2,295,600 1960 774,800 2,295,600 1960 775,050 2,295,600 2100 775,050 2,295,600 2100 775,050 2,295,100 2100 775,050 2,295,100 2100 775,050 2,295,100 2100 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,500 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,294,950 2860 776,550 2,294,900 2840		W-58	776,200	2,294,600	2760	675 (N)
774,350 2,295,850 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,500 2,295,750 1960 774,500 2,295,900 1960 774,500 2,295,900 1940 774,500 2,295,850 1980 774,800 2,295,850 1980 774,800 2,295,850 1980 774,800 2,295,600 1960 775,050 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,100 2100 775,000 2,295,100 2100 775,000 2,295,100 2100 775,000 2,295,100 2100 775,000 2,295,100 2100 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 775,000 2,295,100 2200 776,550 2,294,950 2860 776,550 2,294,900 2200	_	W-59	776,150	2,294,500	2760	(N) 0001
774,300 2,295,800 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,300 2,295,700 1820 774,500 2,295,550 1960 774,500 2,295,900 1960 774,500 2,295,900 1940 774,500 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1960 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,100 2100 775,100 2,295,100 2180 775,000 2,295,100 2180 775,000 2,295,100 2180 775,000 2,295,100 2180 775,000 2,295,100 2280 775,600 2,295,100 2280 776,550 2,294,950 2860 776,550 2,294,950 2860 776,550 2,294,950 2860 776,550 2,294,900 2840	320 175 (N)	W-60	776,250	2,294,550	2820	800 (N)
774,300 2,295,700 1820 774,350 2,295,700 1820 774,300 2,295,700 1820 774,200 2,295,700 1820 774,500 2,295,750 1900 774,600 2,295,900 1900 774,500 2,295,900 1940 774,500 2,295,500 1940 774,700 2,295,500 1980 774,800 2,295,600 1980 774,800 2,295,600 1960 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,100 2100 775,100 2,295,100 2100 775,100 2,295,100 2180 775,000 2,295,100 2180 775,000 2,295,100 2180 775,000 2,295,100 2200 775,600 2,295,100 2200 775,600 2,295,100 2280 776,550 2,294,950 2860 776,550 2,294,950 2860 776,550 2,294,900 2840	320 375(N/NE),450(S)	W-65	775,650	2,294,750	2500	1000 (S)
774,350 2,295,700 1840 774,300 2,295,700 1820 774,200 2,295,750 1820 774,500 2,295,750 1900 774,500 2,295,900 1900 774,500 2,295,900 1900 774,500 2,295,400 1940 774,700 2,295,500 1980 774,800 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1960 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,000 2,295,600 2200 775,000 2,295,100 2720 775,600 2,295,100 2720 776,500 2,295,100 2720 776,500 2,295,500 2840 776,500 2,295,500 2840	•	W-67	775.400	2.294.800	2400	(%) SSS (S)
774,300 2,295,700 1820 774,200 2,295,550 1820 774,500 2,295,750 1880 774,600 2,295,750 1900 774,500 2,295,400 1940 774,700 2,295,600 1940 774,800 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1980 774,800 2,295,600 1960 774,800 2,295,600 1960 775,150 2,295,600 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2200 775,000 2,295,600 2200 775,000 2,295,600 2200 775,600 2,295,100 2220 776,550 2,294,950 2280 776,650 2,294,950 2840 776,550 2,294,950 2840 776,550 2,294,950 2840	340 225 (SW)	W-71	775,400	2.294.950	2340	1000 (S)
774,200 2,295,550 1820 774,500 2,295,750 1880 774,600 2,295,900 1900 774,500 2,295,200 1960 774,500 2,295,400 1940 774,700 2,295,600 1940 774,700 2,295,650 1980 774,800 2,295,850 1980 774,800 2,295,600 1960 774,800 2,295,600 1960 775,050 2,295,600 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,600 2,295,100 2200 776,500 2,295,100 2280 776,500 2,295,100 2280 776,500 2,295,100 2280 776,500 2,295,100 2280 776,500 2,295,100 2280 776,550 2,294,950 2840		W-73	776,400	2,294,700	2800	75 (N)
774,500 2,295,750 1880 774,600 2,295,900 1900 774,600 2,295,900 1900 774,500 2,295,900 1900 774,500 2,295,500 1940 774,700 2,295,650 1980 774,700 2,295,650 1980 774,800 2,295,600 1960 774,800 2,295,600 1960 775,050 2,295,600 2100 775,150 2,295,600 2100 775,150 2,295,600 2100 775,150 2,295,600 2100 775,150 2,295,600 2100 775,150 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 776,550 2,295,100 2280 776,550 2,295,100 2280 776,550 2,295,100 2280 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320	320 550 (SW)	W-75	776,050	2.294.800	2640	225 (N)
774,600 2,296,000 1900 774,600 2,295,900 1900 774,500 2,295,250 1960 774,500 2,295,400 1940 774,700 2,295,850 1980 774,800 2,295,850 1980 774,800 2,295,800 1960 775,050 2,295,600 1960 775,150 2,295,600 2100 775,150 2,295,600 2100 775,150 2,295,100 2100 775,150 2,295,100 2100 775,150 2,295,100 2100 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 2200 775,500 2,295,100 22200 776,550 2,294,950 2860 776,550 2,294,950 2840		W-77	776,050	2,294,850	2640	125 (N)
774,600 2,295,900 1900 774,500 2,295,250 1960 774,500 2,295,400 1940 774,700 2,295,650 1980 774,800 2,295,600 1980 774,800 2,295,600 1980 775,050 2,295,600 1960 775,150 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,100 2100 775,100 2,295,100 2100 775,050 2,295,100 2200 775,050 2,295,100 2200 775,050 2,295,100 22200 775,600 2,295,100 22200 775,600 2,295,100 22200 775,600 2,295,100 22200 775,500 2,295,100 22200 775,500 2,295,100 22200 775,500 2,295,100 22200 775,500 2,295,100 2720 776,550 2,295,100 2280 776,550 2,294,950 2840	•	W-80	775,750	2,295,050	2400-2540	
774,500 2,295,250 1960 774,500 2,295,400 1940 774,700 2,295,650 1940 774,700 2,295,650 1940 774,800 2,295,650 1980 774,800 2,295,600 1980 774,800 2,295,600 1960 775,050 2,295,550 2100 775,150 2,295,600 2100 775,150 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,050 2,295,100 2200 776,350 2,295,100 22200 776,350 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720 776,550 2,295,100 2720	300 150 (S)	W-82	775,700	2,295,050	2440	
774,500 2,295,400 1940 774,700 2,295,500 1980 774,700 2,295,650 1940 774,850 2,295,850 1980 774,800 2,295,600 1980 774,700 2,295,600 1960 775,050 2,295,150 2100 775,150 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,050 2,295,100 22200 776,350 2,295,100 22200 776,350 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320	360 250 (S)	W-83	775,450	2,295,250	2300	100 (N)
774,700 2,295,500 1980 774,700 2,295,650 1940 774,850 2,295,700 1980 774,800 2,295,700 1960 775,050 2,295,600 1960 775,150 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,050 2,295,100 2280 776,350 2,295,100 2280 776,350 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,100 2320 776,650 2,295,500 2320 776,650 2,295,500 2840 776,550 2,294,950 2840	940 625 (S), 575 (N)	W-88	776,450	2,294,750	2840	(S) (O)
774,700 2,295,650 1940 774,850 2,295,850 1980 774,800 2,295,700 1980 774,700 2,295,600 1960 775,050 2,295,600 2100 775,150 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,100 2,295,600 2100 775,000 2,295,600 2200 776,950 2,295,100 2280 776,350 2,295,100 2280 776,550 2,295,100 2280 776,550 2,295,100 2280 776,550 2,295,100 2840 776,550 2,295,500 2840 776,550 2,294,950 2840		W-90	775,950	2,295,050	2540	125 (S)
774,850 2,295,850 1980 774,800 2,295,700 1980 774,700 2,295,600 1960 775,050 2,295,550 2100 775,150 2,295,600 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 775,050 2,295,100 2200 776,350 2,294,950 2200 776,550 2,294,950 2280 776,550 2,294,950 2860 776,550 2,294,950 2860 776,550 2,294,950 2860	940 300 (S)	W-96	774,250	2,295,650	1820	100 (N)
774,800 2,295,700 1980 774,700 2,295,600 1960 775,050 2,295,550 2100 775,150 2,295,150 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 775,200 2,295,600 2100 774,950 2,294,900 2200 774,950 2,295,100 2180 776,350 2,295,100 2720 776,550 2,295,100 2320 775,600 2,295,100 2320 775,600 2,295,100 2320 776,550 2,295,100 2320 776,550 2,295,500 2280	980 375 (SW)	W-97	774,200	2,295,400	1820	125 (S)
774,700 2,295,600 1960 775,050 2,295,550 2100 774,800 2,295,150 2100 775,150 2,295,600 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 775,050 2,294,900 2200 776,350 2,295,100 2180 776,350 2,295,100 2220 776,550 2,295,100 2320 776,550 2,295,100 2320 775,600 2,295,500 2320 776,650 2,295,500 2840 776,550 2,294,950 2840		W-98	775,000	2,295,750	2020	200 (S)
775,050 2,295,550 2100 774,800 2,295,150 2100 775,150 2,295,600 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 774,950 2,294,900 2200 774,950 2,295,100 2180 776,350 2,295,100 2220 776,350 2,295,100 2320 775,600 2,295,500 2320 775,500 2,295,500 2320 776,650 2,294,950 2860 776,550 2,294,900 2840		W-101	776,500	2,294,750	2860	200 (S)
774,800 2,295,150 2100 775,150 2,295,600 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 774,950 2,294,900 2200 774,950 2,294,900 2180 776,350 2,294,950 2200 776,350 2,295,100 2720 775,500 2,295,500 2320 775,500 2,295,500 2280 775,500 2,295,500 2840 776,550 2,294,900 2840	•			•		
775,150 2,295,600 2100 775,100 2,295,600 2100 775,200 2,295,600 2100 774,950 2,294,900 2200 774,950 2,294,950 2200 776,350 2,294,950 2220 776,350 2,295,100 2720 775,600 2,295,500 2320 775,500 2,295,500 2280 775,500 2,295,500 2840 776,650 2,294,900 2840 776,450 2,294,900 2840		KEOKEA				
775,100 2,295,600 2100 775,200 2,295,600 2100 774,950 2,294,900 2200 775,050 2,295,100 2180 776,350 2,295,100 2720 775,600 2,295,100 2720 775,600 2,295,500 2320 775,600 2,295,500 2280 775,500 2,295,550 2860 776,550 2,294,900 2840 776,450 2,294,900 2840	•					
775,200 2,295,600 2100 774,950 2,294,900 2200 775,050 2,294,950 2200 774,950 2,294,950 2200 776,350 2,295,100 2720 775,500 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2840 776,550 2,294,900 2840		K- 1	774,150	2,293,450	2220-2260	•
774,950 2,294,900 2200 775,050 2,295,100 2180 774,950 2,294,950 2200 776,350 2,295,100 2720 775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2840 776,550 2,294,900 2840		K-2	774,200	2,293,400	2240	•
775,050 2,295,100 2180 774,950 2,294,950 2200 776,350 2,295,100 2720 775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2840 776,550 2,294,900 2840	175 (N) 175 (D)	K-3	774,300	2,293,600	2300-2320	•
774,950 2,294,950 2200 776,350 2,295,100 2720 775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050	180 875 (W/SW)	K-4	774,300	2,293,350	2280	•
776,350 2,295,100 2720 775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050	•	K.5	774,250	2,293,300	2280-2300	
775,600 2,295,500 2320 775,500 2,295,550 2280 776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050	720 575 (S)	K-6	774,150	2,293,250	2260-2280	
775,500 2,295,550 2280 776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050 2760		K-7	774,100	2,293,200	2250-2280	•
776,650 2,294,950 2860 776,550 2,294,900 2840 776,450 2,295,050 2760		K-8	774,050	2,293,150	2260-2280	•
776,550 2,294,900 2840 776,450 2,295,050 2760		K-9	773,900	2,292,850	2280-2320	,
776,450 2,295,050 2760		K-10	773,900	2,292,800	2320-2340	•
33.1	,	K-11	773,850	2,292,750	2300-2320	•
W-55 776,250 2,294,500 2820 950 (	(N) 050 (N)	K-12	773,900	2,292,400	2380-2480	•

\* Water = Internitent drainage. There are no known water sources in the Keokea parcel.

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FULL UTM COORDINATES, ELEVATION AND PROXIMITY TO WATER FOR IDENTIFIED SITES (cont.)

TEMP.	COÓR	COORDINATES	ELEVATION (ft. above	DISTANCE AND	PHRI	FULL	FULL UTAL	El.EVATION	DISTANCE AND
NUMBER	EASTING	NORTHING	sea level)	(II.) (approx.)	NUMBER	EASTING NORTH	NORTHING	(fl. above sea level)	DIRECT. TO WAYER (A.) (approx.)
K-13	773,800	2,292,650	2320-2360	•					
K-14	773,900	2,292,700	2360	•	K-64	774,400	2,292,800	2480	•
K-16	774,000	2,292,700	2360		K-65	774,400	2,292,600	2540-2600	
K-19	774,100	2,292,900	2340	•	K-69	774,450	2,292,350	2680	,
K-20	774,150	2,292,900	2360	•	K-70	774,450	2,292,400	2640	•
K-21	774,100	2,293,000	2320	•	K-71	774,500	2,292,550	2580-2600	
K-25	774,200	2,293,100	2320-2380	•	K-76	774,550	2,292,700	2540-2560	
K-26	774,200	2,293,200	2300	•	K-78	774,650	2,292,700	2560	,
K-27	774,300	2,293,200	2340	•	K-79	774,650	2,292,850	2560	
K-29	774,250	2,293,250	2300	•	K-80	774,700	2,292,800	2560	•
K-30	774,300	2,293,300	2300		K-81	774,500	2,292,650	2580-2600	
K-31	774,300	2,293,500	2300	•	K-84	774,500	2,292,400	2660	•
K-32	774,400	2,293,450	2320	•	K-85	774,450	2,292,300	2680	
K-35	774,250	2,293,100	2320-2340	•	K-87	774,450	2,292,200	2720	
K-36	774,200	2,293,000	2260-2280	•	K-89	774,400	2,292,150	2700-2720	
K-39	774,000	2,292,600	2340-2420		K-90	774,250	2,292,150	2660	•
K40	774,000	2,292,600	2420	•	K-95	774,200	2,291,900	2700	•
K41	774,050	2,292,500	2560-2480	•	K-96	774,450	2,292,100	2740	•
K42	774,250	2,292,800	2440	•	K-97	774,550	2,292,100	2760	•
× 44	774,300	2,292,800	2440-2460	•	K-98	774,650	2,292,500	2640	
K-45	774,300	2,292,850	2440		K-99	774,700	2,292,650	2600	•
K-46	774,300	2,292,900	2420-2440	•	K-100	774,750	2,292,650	2600-2620	,
X 48	774,400	2,293,000	2320-2520	•	K-101	774,550	2,292,200	2700-2740	,
K-50	774,200	2,292,600	2480-2520	•	K-102	774,600	2,292,100	2780	•
K-51	774,100	2,292,400	2540	•	K-103	774,700	2,292,400	2680-2700	,
K-52	774,200	2,292,400	2560	•	· K-105	774,100	2,291,900	2680	
K-53	774,250	2,292,450	. 2560	•	K-106	774,100 € €		2620	•
K-54	774,200	2,292,500	2540		K-107	774,200	2,292,150	2640	•
K-55	774,300	2,292,600	2520	•	K-108	774,150	2,292,300	. 2580	
K-57	774,350	2,292,700	2500	•	K-109	774,100	2,292,200.	2580-2600	
K-59	774,350	2,292,750	2480		K-110	774,1000	. 2,292,150	2600	•,
%-60 -	774,400	2,292,950	2440	_	K-11	774,000	2,292,100	2600	. •
K-62	774,500	2,293,000	2440-2460		K-112	773,400	2,292,200	2360	
K-63	774,500	2,292,800	2480-2500		K-115	773,500	2,292,300	2360	•
					4	V22 CCC	מטר רטכ כ		

FULL: UTM COORDINATES, ELEVATION AND PROXIMITY TO WATER FOR IDENTIFIED SITES (cont.)

74

1.0

PHRI	TOS	FULL UTM	ELEVATION	DISTANCE AND
NUMBER	EASTING	ING NORTHING	(II. above sca level)	DIRECT. TO WATER (ft.) (approx.)
K-118	773,600	2,292,400	2380	•
K-120	773,700	2,292,450	2380	
K-124	773,850	2,292,600	2380	
K-127	773,800	2,292,450	2400	
K-130	773,600	2,292,200	2400-2420	
K-131	773,700	2,292,150	2460-2480	
K-134	773,800	2,292,300	2460	
K-135	773,800	2,292,350	2440	
K-137	773,950	2,292,400	2440	•
K-140	773,900	2,292,300	2480-2500	
K-142	773,800	2,292,250	2480	•
K-143	773,800	2,292,100	2500	•
K-146	773,950	2,292,250	2520	
K-148	774,050	2,292,350	2520	•
K-149	774,050	2,292,400	2500-2520	
K-152	774,000	2,292,200	2560	
K-200	774,300	2,293,100	2360-2380	
K-201	773,950	2,202,500	2420	•
K-202	774,500	2,293,450	2360	
K-203	774,150	2,292,800	2400	
K-204	774,250	2,292,700	2500	
K-205	773,900	2,292,700	2360	
K-206	000,577	2,292,400	2800	
K-207	774,250	2,291,950	2700	•
K-208	774,250	2,292,300	2600	•
K-209	773,500	2,292,150	2380	•
K-210	774,250	2,292,650	2500	•
K-211	774,200	2,292,600	2500	•

COMMENTS RECEIVED DURING DRAFT ENVIRONMENTAL ASSESSMENT REVIEW PERIOD



CIVIL & STRUCTURAL ENGINEERING • LAND SURVEYING • CONSTRUCTION MANAGEMENT & INSPECTIONAL SERVICES

October 16, 2000

State of Hawaii Office of Environmental Quality Control (OEQC) 220 South King Street, 4<sup>th</sup> Floor Honolulu, HI 96813

Attention: Ms. Genevieve Salmonson

Director

Re: Draft Environmental Assessment

Lower Kula and Waiohuli Water System Improvements

At Kula, Maui, Hawaii

TMK: (2) 2-2-02:56 (Portion)

(2) 2-3-06:32

Ladies & Gentlemen:

Pursuant to your office's comment letter dated December 20, 1996 (copy attached), the following are our responses.

To minimize the visual impact, the new reservoirs were painted green. The shade of green was determined by the County Department of Water Supply with the assistance of community input. In addition, wedelia groundcover and hibiscus hedging planted at the site's perimeter were also added to soften visual impact.

Thank you for the opportunity to address your comments.

Should you have any questions or comments, please do not hesitate to call me.

Very truly yours,

Kirk T. Tanaka, P.E., L.S.

Kis. Jaml

President

KTT:sh

Att.

cc: Mr. Gerald Lee

871 KOLU STREET SUITE 201 • WAILUKU, MAUI, HAWAII 96793-1436 • PHONE 242-6861

BENJAMIN J. CAYETANO



### STATE OF HAWAII

### OFFICE OF ENVIRONMENTAL QUALITY CONTROL

236 SOUTH BERETANIA STREET SUITE 702 HONOLULU, HAWAII 86813 TELEPHONE (808) 886-4185 FACSIMILE (808) 886-4186

December 20, 1996

Mr. Kali Watson, Chair Department of Hawaiian Homelands 335 Merchant Street Honolulu, Hawaii 96813

Dear Mr. Watson:

Draft Environmental Assessment for the Lower Kula and Subject:

Waiohuli Water System Improvements, Kula, Maui

Thank you for the opportunity to review the subject document. We have the following comment.

According to the environmental assessment, the proposed reservoirs will be painted green to match the character and color of the surrounding residential subdivision. We commend your effort in minimizing the visual impacts of the project. To further improve the area's aesthetics, we suggest landscaping with native Hawaiian plants.

Should you have any questions, please call Jeyan Thirugnanam at 586-4185.

Sincerely,

Gary Gill Director

R. T. Tanaka Engineers

GARY GILL DIRECTOR

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2000-11-08-MA-FEA-

### FILE COPY

### FINAL ENVIRONMENTAL ASSESSMENT FOR IOWER KULA AND WAIOHULI WATER SYSTEM IMPROVEMENTS AT KULA, MAUI, HAWAII TAX MAP KEY: (2) 2-2-02:56 (PORTION) (2) 2-3-06:32

PREPARED FOR:
DEPARTMENT OF HAWAIIAN HOME LANDS
STATE OF HAWAII
P. O. BOX 1879
HONOLULU, HAWAII - 96805

PREPARED BY: R. T. TANAKA ENGINEERS, INC. 871 KOLU STREET, SUITE 201 WAILUKU, MAUI, HAWAII - 96793

OCTOBER 2000

### TABLE OF CONTENTS

ı.	APPLICANT	1
II.	APPROVING AGENCIES	1-2
III.	AGENCIES CONSULTED	2
IV.	DESCRIPTION OF THE PROPOSED PROJECT	2-3
V.	DESCRIPTION OF THE AFFECTED ENVIRONMENT	3-6
VI.	PROBABLE IMPACT OF PROJECT ON THE ENVIRONMENT AND MITIGATIVE MEASURES TO MINIMIZE ADVERSE IMPACTS AND ALTERNATIVES	
	A. PRIMARY IMPACTS B. SECONDARY IMPACTS C. ALTERNATIVES	7 - 13 13 14
VII.	OTHER INTEREST AND CONSIDERATION OF GOVERNMENTAL POLICES THAT OFFSET ADVERSE ENVIRONMENTAL EFFECTS	14
VIII.	DETERMINATION AND SUPPORTING REASONS	14 - 17
IX.	EXHIBITS	
	FIG. 1 - LOCATION MAP	
	FIG. 2 - VICINITY MAP	
	FIG. 3 - SUBDIVISION LAYOUT MAP	
	FIG. 4 - WATER DISTRIBUTION MAP	
	FIG. 5 - KULA KAI RESERVIOR PUMPING IMPROVEMENTS	
	FIG. 6 - SERVICE ZONE NO. 2 RESERVOIR PLAN	
	FIG. 7 - SERVICE ZONE NO. 3 RESERVOIR PLAN	
	FIG. 8 - SERVICE ZONE NO. 4 RESERVOIR PLAN	

### X. APPENDICES

- A. SOILS REPORT
  - 1) SERVICE ZONE NO.2
  - 2) SERVICE ZONE NO. 3
  - 3) SERVICE ZONE NO. 4
- B. BOTANICAL SURVEY
- C. AVIFAUNA AND FERAL MAMMALS SURVEY
- D. ARCHAEOLOGICAL STUDY
- E. COMMENTS RECEIVED DURING DRAFT ENVIRONMENTAL ASSESSMENT REVIEW PERIOD AND RESPONSE LETTERS

### LOWER KULA AND WAIOHULI WATER SYSTEM IMPROVEMENTS

TMK; (2) 2-2-02:56 (PORTION) (2) 2-3-06:32

### KULA, MAUI, HAWAII

### **ENVIRONMENTAL ASSESSMENT**

### I. APPLICANT:

Department of Hawaiian Home Lands, State of Hawaii, P. O. Box 1879, Honolulu, Hawaii - 96805.

### II. <u>APPROVING AGENCIES</u>:

The applicant will have to obtain the following approvals before proceeding with the project:

### County of Maui

### Maui County Planning Department:

1. Environmental Assessment

### Department of Public Works:

1. Grading and Grubbing Permit

### Department of Water Supply:

1. Construction Plan Approvals

### State of Hawaii

Department of Hawaiian Home Lands

### III. AGENCIES CONSULTED:

Prior to the development of project plans, the following have been or will

be consulted:

### County of Maui:

**Environmental Coordinator** 

Department of Planning

Department of Public Works

Department of Water Supply

### State of Hawaii:

Department of Transportation

Department of Land & Natural Resources

Department of Agriculture

Office of Environmental Quality Control

### IV. <u>DESCRIPTION OF THE PROPOSED PROJECT:</u>

### A. General:

The proposed project involves the construction of three (3) concrete reservoirs and appurtenant pumping facilities serving proposed Kula Residence Lots, Unit 1 to satisfy the subdivision's water storage requirement imposed by the Maui County Department of Water Supply.

### B. Proposed Improvements:

The proposed improvements include the construction of three (3) reinforced concrete reservoirs to be constructed on Lot G, Lot 11 and Lot 71 with a 0.2 MG, 0.5 MG and a 0.2 MG reservoir, respectively (see Figures 6, 7 and 8). Appurtenant pumping improvements onsite and at the existing Kula Kai reservoir site is also included in the improvements (see Figure 5) to move the point of adequacy in the existing waterline to the Hawaiian Home Lands parcel.

These proposed improvements are necessary to satisfy the subdivision's storage component of the requirements of the County Department of Water Supply.

These reservoirs will store potable water for the domestic needs and fire flow requirements of the subdivision.

### V. <u>DESCRIPTION OF THE AFFECTED ENVIRONMENT:</u>

### A. Physical Characteristics

### 1. Project Location

The proposed project site is located in Kula, Maui, Hawaii, within the proposed Kula Residence Lots, Unit 1 owned by the Department of Hawaiian Home Lands, State of Hawaii.

Figure 2 shows the proposed development site relative to existing roads.

### 2. Soils

The U.S.D.A. Soil Conservation Services Soil Survey classifies the site (Kula Cobbly Loam, KxaD). This type of soil is characterized as having rapid permeability slow to medium runoff and moderate erosion hazard.

### 3. Climate

Climate at the project site is typical of Kula region, receiving little annual rainfall, as it lies on the Leeward slopes of Mount Haleakala. Typical of the Hawaiian Islands, northeastern trades are the prevailing winds while storm winds are usually from the south or southeasterly direction.

The average annual rainfall in the Kula area ranges from 25 to 40 inches.

### 4. Topography

The three (3) reservoir sites are presently vacant and covered with scrubby vegetation used for cattle grazing and black wattle trees.

These sites generally slope in a mauka to makai direction ranging from 14 to 18 percent.

### 5. <u>Drainage</u>

Drainage runoff from the reservoir sites generally sheet flow through the sites running into an adjacent ravine.

### 6. Flooding

According to the Flood Insurance Rate Maps for Maui County the site is within Zone C designation which are areas of minimal flooding.

### B. <u>Biological Characteristics</u>

### 1. Plant Life

There is no indication of any rare or endangered plants associated with the property. See Botanical Study in Appendix "B" of this report.

### 2. Animal Life

There is no indication of any rare or endangered species of animal associated with this property.

See Avifauna and Feral Mammals Survey in the Appendix "C" of this report.

### C. Land Use and Zoning

### 1. State Land Use and Zoning

The property is located within the agriculture district as designated by the Land Use Commission of the State of Hawaii.

### 2. County Zoning and Upcountry Community Plan

The project site is currently zoned agriculture by the County.

The site is within the agricultural district as designated by the Upcountry Community Plan.

### 3. Existing Land Use

The reservoir sites are presently undeveloped supporting growth of miscellaneous pasture grasses, and black wattle trees.

### 4. Adjacent Land Use

Lands surrounding the project site are presently used for cattle grazing and are owned by Kaonoulu Ranch and the Department of Hawaiian Home Lands.

Rural residential development is scattered throughout the Kula area.

### VI. PROBABLE IMPACT OF PROJECT ON THE ENVIRONMENT AND MITIGA-TIVE MEASURES TO MINIMIZE ADVERSE IMPACTS AND ALTERNATIVES

### A. Primary Impacts

### 1. Anticipated Short-Term Impacts

Short-term construction related impacts are anticipated. These impacts will last no longer than the construction phase and can be mitigated by proper construction techniques, adherence to generally accepted construction practices and compliance with the Maui County Soil Erosion and Sedimentation Control, OSHA Standards, State Air, Noise and Water Quality Regulations. These short-term effects will include the following:

### a. - Dust from Construction Operations

Waterwagons and sprinklers will be used to control dust resulting from construction activities. The proposed project site will be kept moist after working hours and on weekends, if necessary. These requirements will be stated in the construction plans and specifications.

### b. Noise from Construction Equipment

Noise from construction equipment will be kept within the limits permitted by the State, County and OSHA regulations. Construction activities will be restricted to daylight

hours between 7:00 a.m. and 3:30 p.m. No work will be permitted at night except to complete work activities that would endanger the health and safety of the community if left undone.

### c. <u>Disruption of Normal Traffic Flow</u>

No serious traffic problems are anticipated during the construction phase since the activity will be confined within the proposed project site. Minor traffic inconvenience may be experienced along Kula Highway. All applicable safety precautions will be adhered to for the safety of motorists and pedestrians.

### d. Soil Erosion

The soils at the site are described in the Appendix of this assessment and are characterized as susceptible to wind erosion if the surface vegetation is removed. This being the case, the contractor will be required to keep the graded areas moist by means of waterwagons or temporary sprinkler systems and to have all exposed areas paved, grassed or landscaped immediately upon completion of finished grading. Furthermore, soil erosion, will be minimized by adhering to the requirements of Chapter 20.08 of

the Maui County Code. No adverse environmental impact is anticipated due to soil erosion.

### 2. <u>Anticipated Long-Term Impacts</u>

### a. Physical Impacts

### 1) Grading

All graded areas will either be paved or permanently landscaped.

Long-term grading impacts will be non-existent.

### 2) <u>Drainage</u>

The completion of the project will negligibly result in increased runoff.

Thus, long-term drainage impacts will be non-existent.

### 3) Air Quality and Water Quality

Upon completion of the construction of this project, the existing conditions of the area will remain unchanged.

Therefore, long-term air and water quality will also remain unchanged.

### 4) Noise

Only short-term impacts associated with noise will be encountered as described earlier. Long-term impacts will be non-existent.

### 5) <u>Aesthetics</u>

Upon completion of the project, the reservoirs will stand approximately 20 feet high and will be painted green to match the character and color of the surrounding residential subdivision.

### 6) <u>Historical and Archaeological Features</u>

Except for an agricultural terrace located on Lot 11 (Site W-49, SIHP Site No. 2368) there were no historic or archaeological features discovered during an archaeological reconnaissance of the project sites.

The recommendations of the State Historic Preservation Division will be followed. Prior to construction of the reservoir on Lot 11, data recovery work, approved by the State Historic Preservation Division, will be completed.

The State Historic Preservation Officer and the County of Maui will be informed immediately should any archaeological features be discovered during grading.

Grading operations will not continue until clearance from the State and County is received.

### b. <u>Biological Impacts</u>

### 1) Plant

No significant impact on plant life is anticipated as a result of this proposed project. There are no rare or endangered species of plants on the site, nor are there favorable conditions for such species (see Appendix "B").

### 2) Animal and Bird

No significant impact on animal and bird life is anticipated as a result of this proposed project (see Appendix "C").

### c. <u>Public Facilities and Services</u>

### 1) School

There are no impacts to school facilities as a result of the development of the reservoirs and pumping facilities.

### 2) Public Safety

There are minimal impacts to public safety as a result of this project. During the construction phase the Contrac-

tor will be responsible for the safety of the public affected by his operations.

### 3) Parks and Recreation

There are no impacts to parks and recreational facilities as a result of the development of the reservoirs and pumping facilities.

### d. <u>Infrastructure and Utilities</u>

### 1) Water

When completed and online, the proposed project will provide water storage for domestic needs and fire flow requirements for the subdivision.

### 2) Sewer

The County of Maui does not operate any sewage collection or treatment facilities in the Kula area. Completion of this project will not have an impact on sewage disposal in the area.

### 3) <u>Utilities</u>

The project site is located in an area presently served by Maui Electric Company, and Hawaiian Telephone

Company. There should be minimal impact as a result of this project.

### 4) Access and Circulation

Access and circulation patterns in the Kula area will not be impacted by the completion of the proposed reservoirs and pumping facilities.

### B. <u>Secondary Impacts</u>

### Anticipated Short-Term Impacts

The proposed development will provide short-term employment during the period of construction. Most or all of these shortterm impacts will affect the contractors and material suppliers that will be involved in this project.

### 2. <u>Anticipated Long-Term Impacts</u>

Anticipated long-term impacts of the project include the delivery of potable water to serve the domestic needs and fire flow requirements of the subdivision.

### C. Alternatives

### 1. No Project

Any beneficial or adverse impacts associated with the development of this proposed project would not be generated.

This alternative is not a preferred alternative due to the fact that upon development of the subdivision, the domestic needs and fire flow requirements of the homesteaders must be met.

### VII. OTHER INTEREST AND CONSIDERATION OF GOVERNMENTAL POLICES THAT OFFSET ADVERSE ENVIRONMENTAL EFFECTS

Sufficient governmental control as mandated by the Maui County Code,
State Health regulations and Soil Conservation requirements will be enforced to
mitigate any adverse environmental impact.

### VIII. <u>DETERMINATION AND SUPPORTING REASONS</u>:

In accordance with the Rules and Regulations, the proposed project does not have significant adverse effects upon the environment, as follows:

Involves an irrevocable commitment to loss or destruction of any natural or cultural resource.

Other than the agricultural terrace located within Lot 11 there are no natural or cultural resources associated with the project site. The State Historic Preservation Division recommendations will be attentively

followed. If any others are discovered, the appropriate agencies will be consulted.

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

The proposed project will be compatible with the surrounding uses of the area.

3. Conflicts with the County's or State's long-term environmental policies or goals and guidelines.

No long-term environmental conflicts are noted.

4. <u>Substantially affects the economic or social welfare activities of the community, County or State.</u>

The completion of the reservoirs is not expected to affect the area's economic or social welfare.

### 5. Substantially affects public health.

The proposed project is not expected to cause any detrimental effect on the well-being of the public.

6. <u>Involves substantial secondary impacts, such as population changes and effects on public facilities.</u>

The completion of the pumps and reservoirs will not involve substantial secondary impacts such as population changes and effects on public facilities.

### Involves a substantial degradation of environmental quality.

The proposed project doesn't involve activities that will lower the existing quality of the environment in the area.

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

The proposed project does not have considerable effect upon the environment. Development is regulated by the County of Maui through its planning and approval process. Approval of the project does not involve a commitment for any larger actions.

### 9. Substantially affects a rare, threatened, or endangered species of animal or plant, or its habitat.

There are no known rare, threatened or endangered species or habitat associated with the project sites.

### 10. <u>Detrimentally affects air or water quality or ambient noise levels.</u>

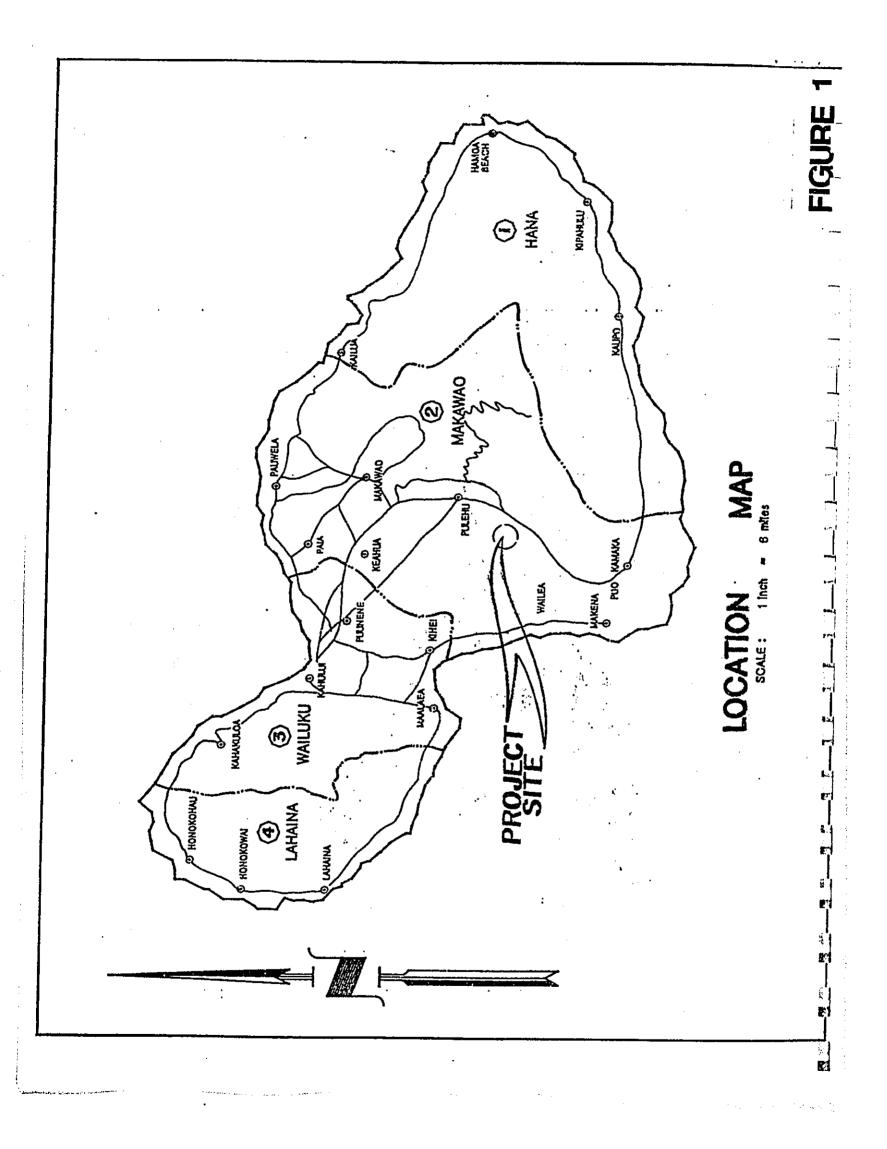
There will be no long-term effects on air quality due to the proposed project.

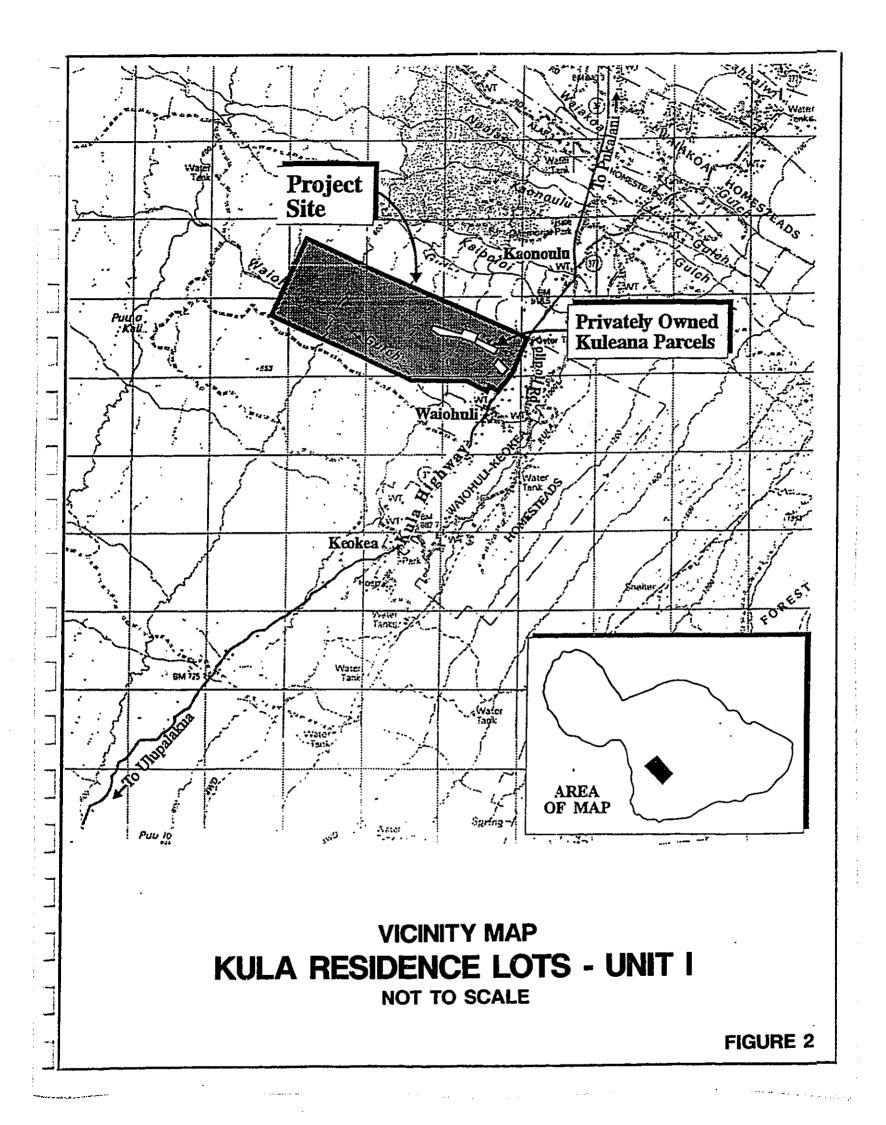
Short-term impacts on air and water quality, as well as noise, will occur during the construction period, but will be mitigated by normal construction practices and will be regulated and imposed within the plans and specifications.

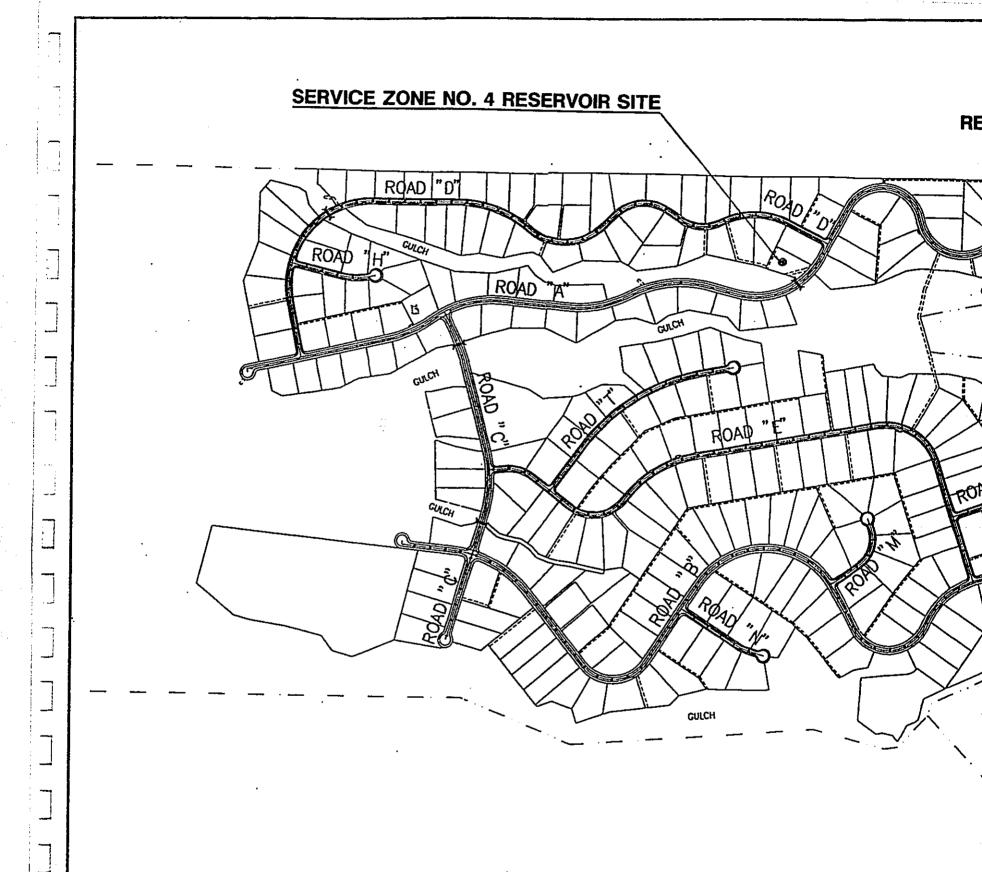
11. Affects an environmentally sensitive area, such as flood plains, tsunami zones, erosion prone areas, geologically hazardous lands, estuaries, fresh waters or coastal waters.

The proposed project is not anticipated to have any adverse impact on flood plains, tsunami zones, geologically hazardous lands, estuaries, fresh waters or coastal waters. Major flooding or erosion problems are not expected. The project site falls within Zone "C" where minimal flooding is expected as established by the "Flood Insurance Rate Maps" for County of Maui. The project site contains soils which are essentially Kula Series Soil classification and construction of the project will require that all graded areas be grassed, landscaped or paved as soon as finish grading is completed.

Therefore, it is concluded that this proposed project will not have a significant effect on the environment.

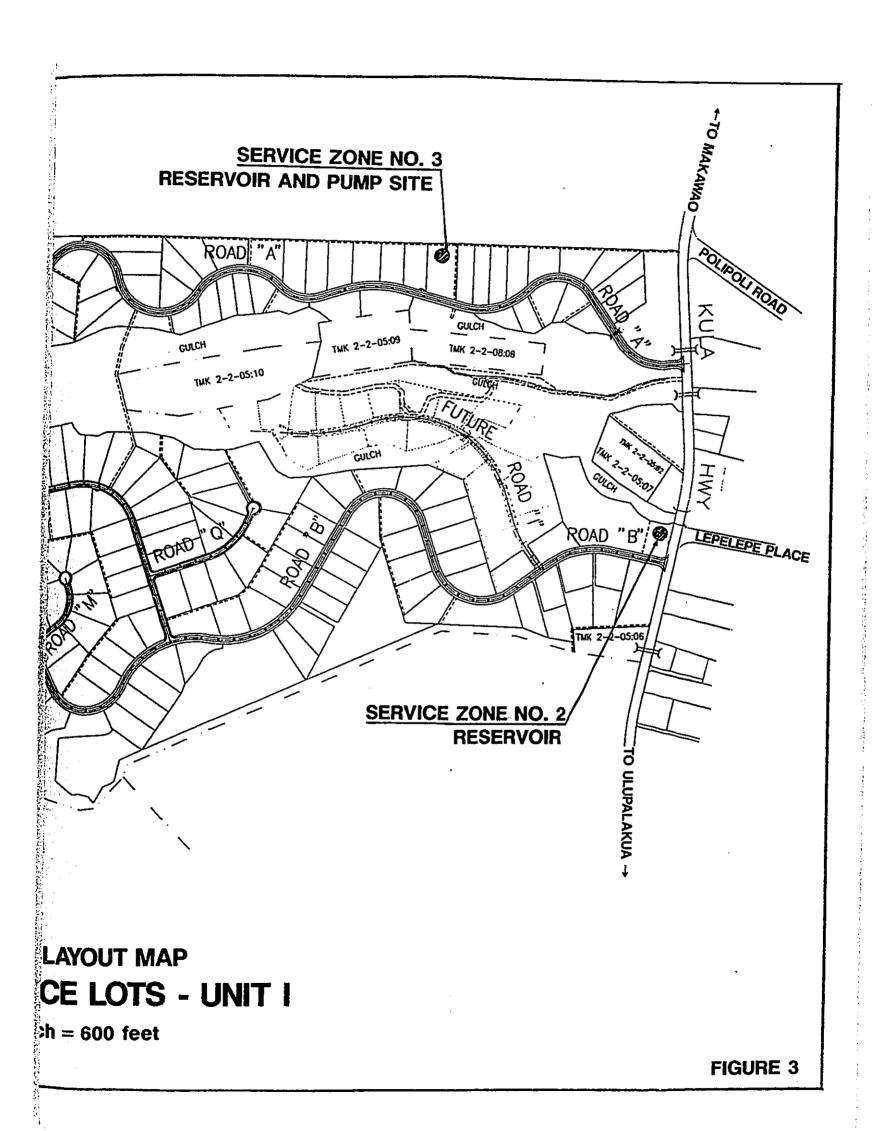


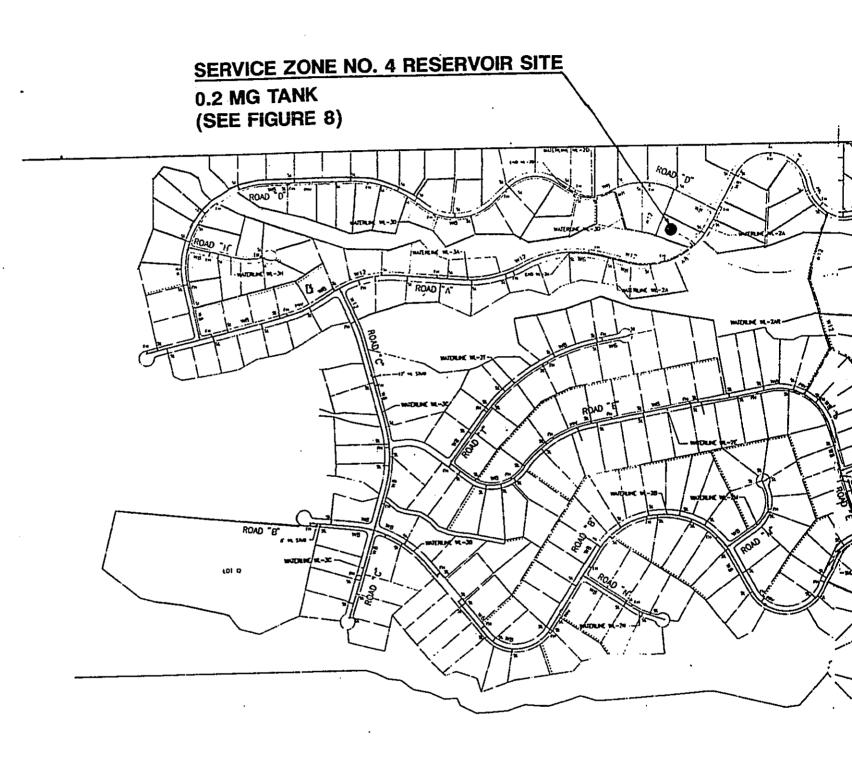




# SUBDIVISION LAYOUT MAI KULA RESIDENCE LOTS

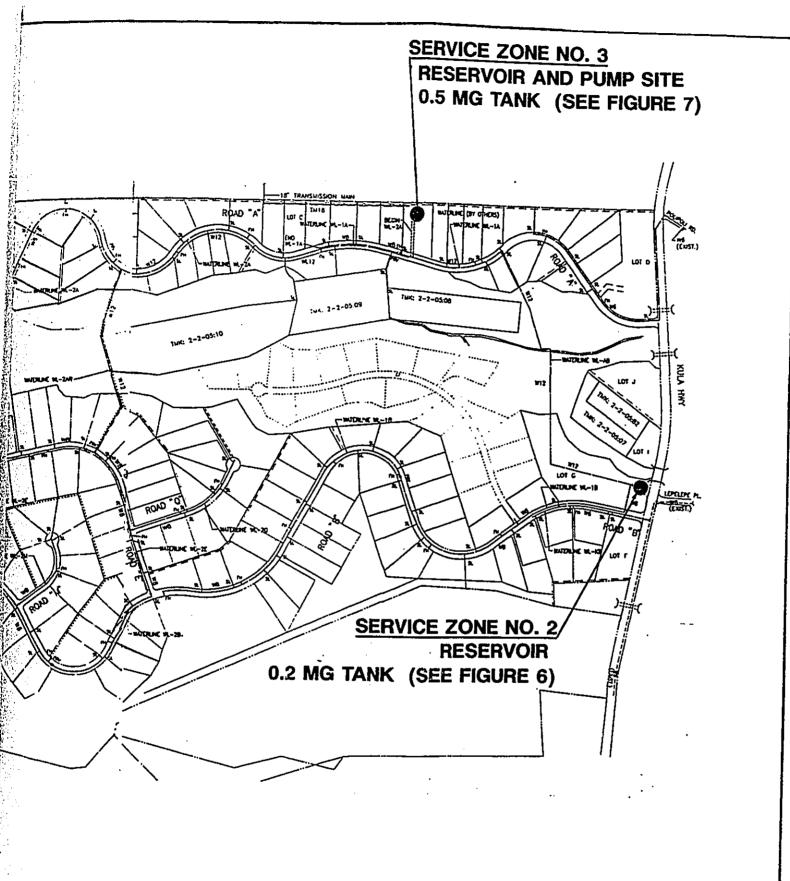
Scale: 1 inch = 600 feet





# WATER DISTRIBUTION MA KULA RESIDENCE LOTS -

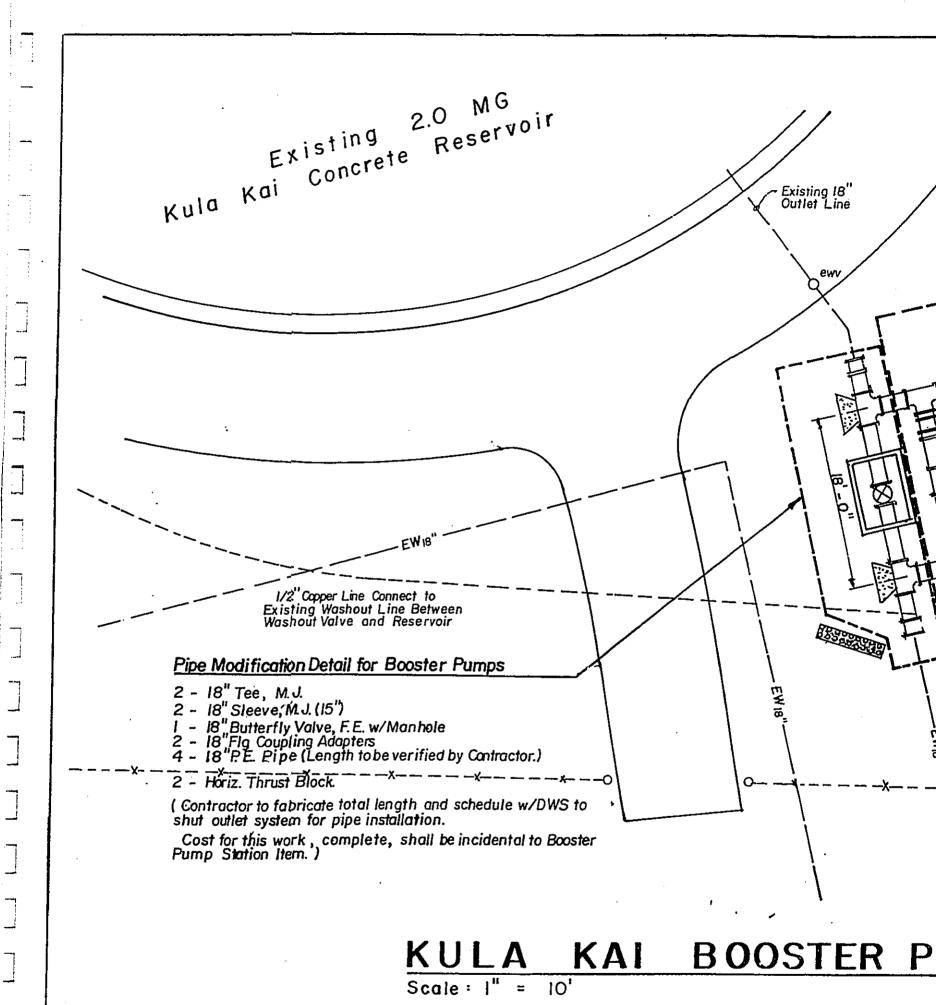
Scale: 1 inch = 600 feet

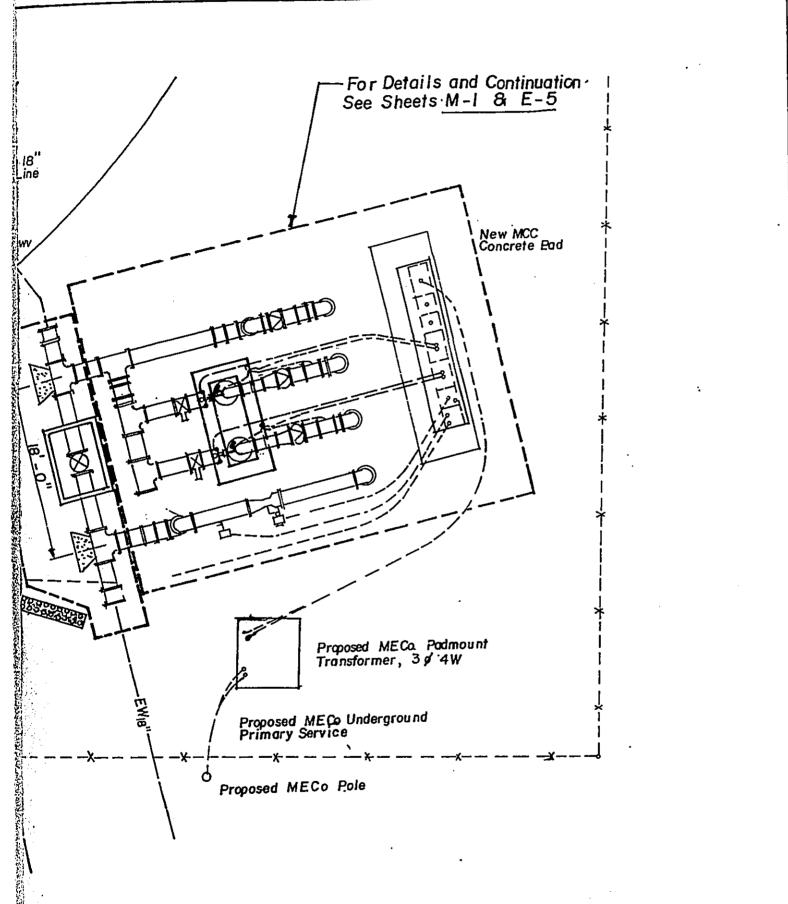


RIBUTION MAP CE LOTS - UNIT I

h = 600 feet

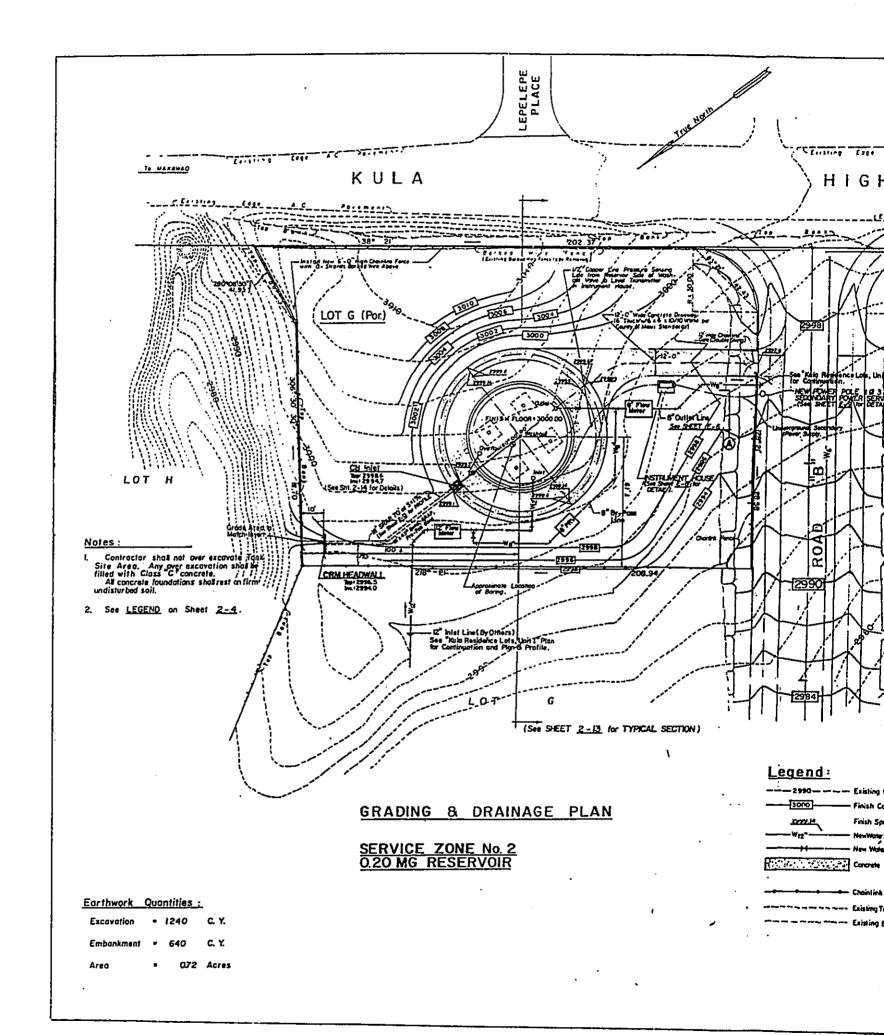
FIGURE 4



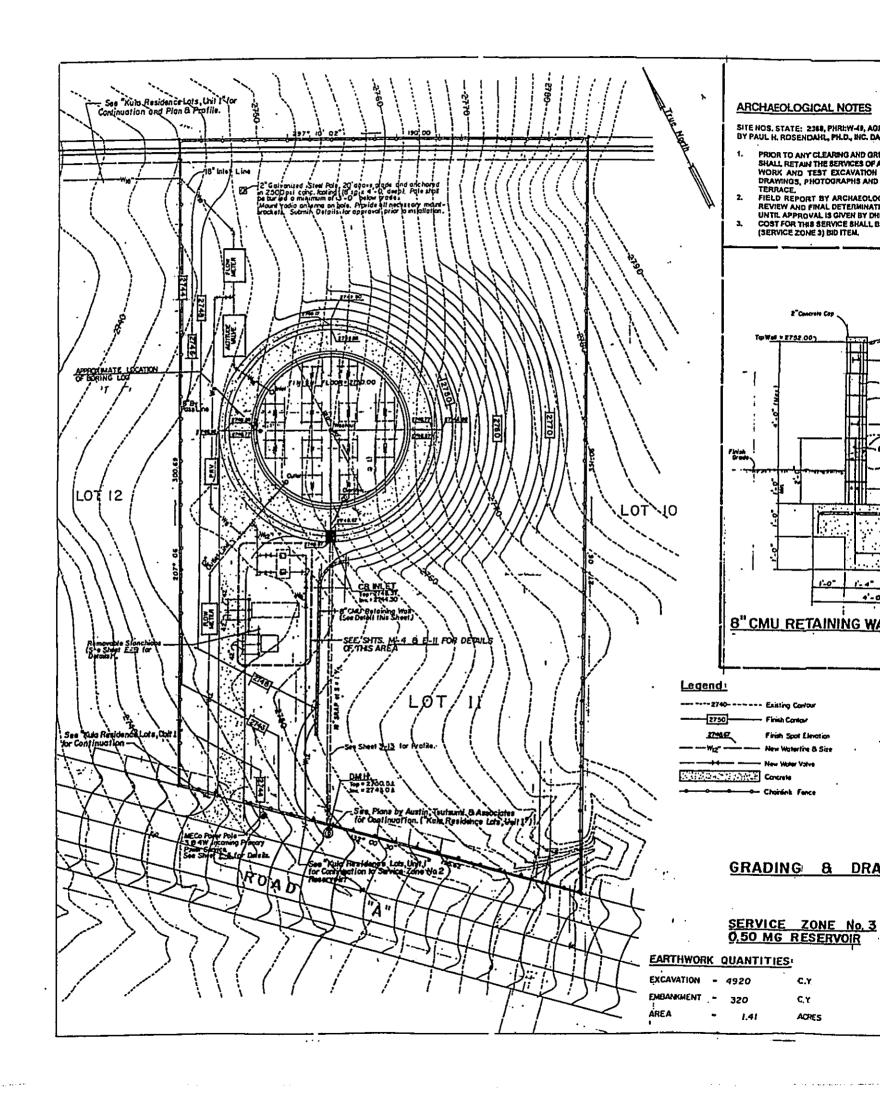


## TER PUMP SITE PLAN

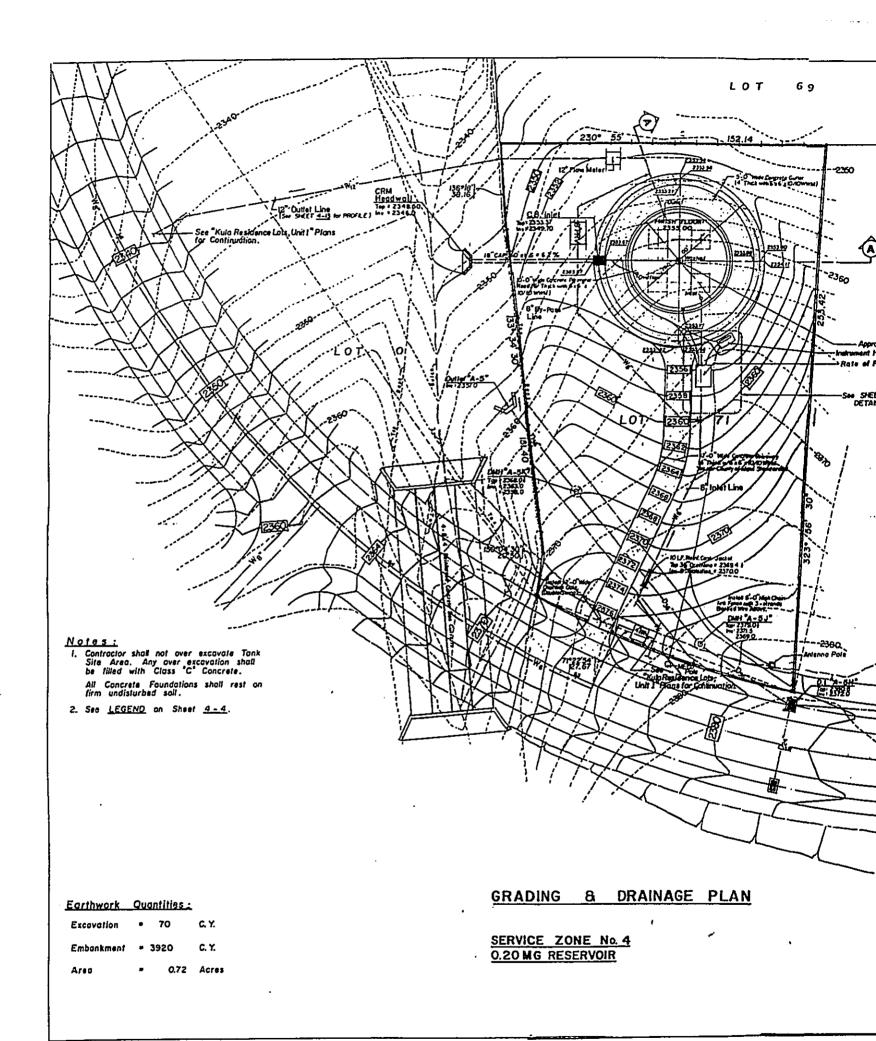
FIGURE 5



		LOG OF BORING NO. 1  EQUIPMENT USED: SIMCO 2400 Dilling Rg DATE DRILLED: 8-8-98		ELEVATION: +3002* DEPTH OF BURING (FT.): 19 DEPTH TO GROUNDWATER: NIA			N/A	lana	ko	
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HIGHWAY	erer		All thinking times at 2" LL = 50, Pro. LL = 50, Pro and growt, feet hong - and growt, fe	70-0" 10-0" 10-0" 10-0"		Genea Genea	72   21 61   19 74   14	,	WALOHULI PROVEMENTS REBERVOIR R NO. 2 DB. CTATE OF HAWAI	BORING LOG NO. 1
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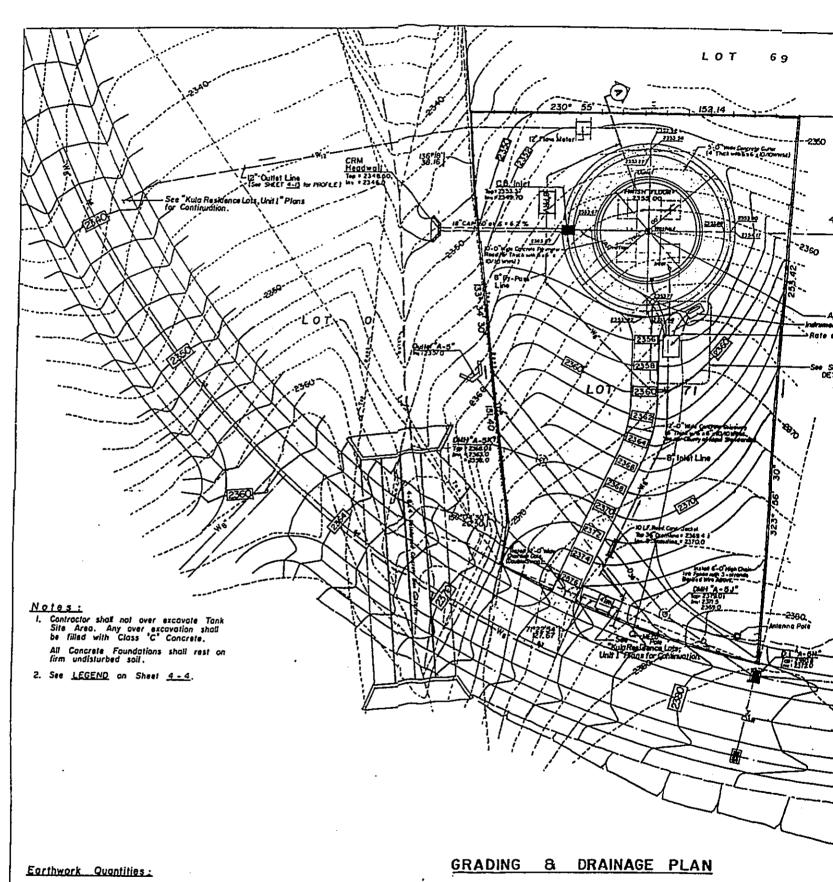
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# CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING



Excavation • 70 C.Y.

Embankment - 3920 C.Y.

Ares = 0.72 Acres

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	H. FOOTING EXCAVATIONS SHALL BE CLEANED OF LOOSE MATERIAL THAT HAS FALLEN INTO THE EXCAVATION PRIOR TO POURING OF CONCRETE.	SCALE: DESIGNED BY: CHECKED BY: DRAWN BY: DATE:
	Existing contours, roadway improvements and roadway finish grades (contours) as shown have been taken from Construction Plans for "KULA RESIDENCE LOTS, UNIT 1" at Watchwill, Kula, Maul, Hawall for the Department of Hawalish Hame Lands, State of Hawali by Austin, Tsutsumi & Associates	JOB No.: SHEET
		FIGURE

SOILS INVESTIGATION REPORT SERVICE ZONE NO. 2

## REPORT SOILS INVESTIGATION

PROPOSED RESERVOIR
WAIOHULI SUBDIVISION SERVICE ZONE 2
KULA, MAUI, HAWAII

for

R. T. TANAKA ENGINEERS, INC. Engineers

> Project No. H-2681-F September 24, 1996



99-1255 Waiua Place Aiea, Hawaii 96701 Phone: (808) 488-0433 Fax: (808) 488-9535

335 Hoohana Street Building 7, Unit O Kahului, Maui, Hawaii 96732 Phone: (808) 877-3789 Fax: (808) 871-1592

99-1255 WAIUA PLACE, AIEA, HAWAII 96701

(808) 488-0433 FAX (808) 488-9535

\$

September 24, 1996 Project No. M-2681-F

R. T. Tanaka Engineers, Inc. 871 Kolu Street, Suite 201 Wailuku, Maui, Hawaii 96793

Attention:

Mr. Kirk Tanaka, P.E.

#### Gentlemen:

The attached report presents the results of a soils investigation for the proposed Waiohuli Subdivision Reservoir at Service Zone 2 in Kula, Maui, Hawaii.

A summary of the findings is as follows:

- 1) The subsurface conditions at the site were explored by drilling 1 test boring to a depth of 19 feet below existing grade. The boring revealed yellow brown and gray silty GRAVEL (CLINKERS) to a depth of 8.5 feet, followed by hard, gray BASALTIC ROCK to the final depth of the boring at 19 feet. The GRAVEL consistency was loose from ground surface to a depth of 1.5 feet, moderately dense from 1.5 to 3.5 feet, then dense to 8.5 feet.
- 2) Groundwater was not encountered in the boring at the time of the field investigation.
- Based on the findings and observations of this investigation, the reservoir foundation may bear on the underlying dense silty GRAVEL, underlying hard BASALTIC ROCK, or properly compacted fill.
- 4) The upper loose to moderately dense silty GRAVEL is not suitable bearing material. Foundation should be deepened to the dense silty GRAVEL or hard BASALTIC ROCK, or the loose to moderately dense material shall be removed and then be replaced with properly compacted fill.
- 5) Excavations are susceptible to caving. Provisions shall be made to protect the excavations from cave-ins.

R. T. Tanaka Engineers, Inc. September 24, 1996 Page Two

Details of the findings and recommendations are presented in the attached report.

This investigation was made in accordance with generally accepted engineering procedures and included such field and laboratory test considered necessary for the project. In the opinion of the undersigned, the accompanying report has been substantiated by mathematical data in conformity with generally accepted engineering principles and presents fairly the design information requested by your organization. No other warranty is either expressed or given.

Respectfully submitted,

SOILS INTERNATIONAL

Lawrence S. Shinsato, P.E.

Vice-President

LSS:BHH:bh

This work was prepared by me or under my supervision.

LICENSET PROFESSIO

### TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
SCOPE OF WORK	1
PLANNED DEVELOPMENT	1
SITE CONDITIONS	2 2 2 3
CONCLUSIONS AND RECOMMENDATIONS  General	4 4 4 6 6 7 7
INSPECTION	10
REMARKS	10
VICINITY MAP Plate	1
PLOT PLAN Plate	2
APPENDIX Field Investigation Laboratory Testing Log of Test Boring	

#### INTRODUCTION

This investigation was made for the purpose of obtaining information on the subsurface conditions from which to base recommendations for the proposed Waiohuli Subdivision Reservoir for Service Zone 2 to be located in Kula, Maui, Hawaii. The location of the site, relative to the existing streets and landmarks, is shown on the Vicinity Map, Plate 1.

#### SCOPE OF WORK

The services included drilling 1 test boring to a depth of 19 feet below existing grade, obtaining samples of the underlying soils, conducting laboratory tests on representative samples, and performing an engineering analysis to determine foundation design parameters. The following information is provided for use by the Architect and/or Engineer:

- 1. General subsurface conditions, as disclosed by the boring.
- 2. Physical characteristics of the soils encountered.
- 3. Recommendations for foundation design, including bearing values, embedment depth and estimated settlement.
- 4. Recommendations for placement of fill and backfill.
- 5. Special design considerations.

#### PLANNED DEVELOPMENT

From the information provided, the project will consist of constructing a 44-foot diameter, 0.2 million gallon water reservoir

-

for a subdivision in Service Zone 2. The Grading and Drainage Plan indicate the existing surface elevations at the reservoir site to range from +2998' at the westerly side of the proposed reservoir to +3010' at the easterly side. Finished floor elevation is at +3000'.

#### SITE CONDITIONS

#### Surface

The property is located at the northwest side of Kula Highway, across Lepelepe Place. The project site is located near the highway and is heavily vegetated with trees and plants.

#### Subsurface

The subsurface conditions at the site was explored by drilling 1 test boring to a depth of 19 feet below existing grade at the location shown on the Plot Plan, Plate 2. A detailed log of the boring is presented in the Appendix to this report.

The boring revealed yellow brown and gray silty GRAVEL (CLINKERS) to a depth of 8.5 feet, followed by hard, gray BASALTIC ROCK to the final depth of the boring at 19 feet. The GRAVEL consistency was loose from ground surface to a depth of 1.5 feet, moderately dense from 1.5 to 3.5 feet, then dense to 8.5 feet.

Groundwater was not encountered in the boring at the time of the field investigation.

From the USDA Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii", the site is located in an area classified as Kula loam, 12 to 20 percent slopes (KxD). This series consists of well-drained soils on uplands that developed in volcanic ash (USDA, 1972, Plate 108, pp. 76 to 77).

#### Geology

The site is located on the southwesterly flank of the Haleakala Volcano. The development of the island above sea level is believed to have occurred between later Pliocene and Pleistocene time (approximately 1 and 12 million years ago). Haleakala was built over three rift zones that trend north, southwest and east. These rift zones are studded with large cinder cones. The lava flows making up the main mass of the mountain is known as the Honomanu volcanic series which consist of thin-bedded pahoehoe and aa lava flows.

Above the Hononamu volcanics is the Kula volcanic series which consist of thicker andesitic aa flows. Most of the lava flows dip about 12 degrees. Along the southwest and east rift zones only, the volcano is capped with the Hana volcanic series (Stearns, 1966).

#### CONCLUSIONS AND RECOMMENDATIONS

#### General

Based on the findings and observations of this investigation, the reservoir foundations may bear on the underlying dense silty GRAVEL, underlying hard BASALTIC ROCK, or properly compacted fill.

#### Special Consideration

- 1) The upper loose to moderately dense silty GRAVEL (to a depth of 3.5 feet inthe boring) is not suitable bearing material. Foundations should be either deepened to bear on the dense silty GRAVEL or hard BASALTIC ROCK, or the loose to moderately dense material shall be removed and replaced with properly compacted fill.
- 2) Excavations are susceptible to caving. Provisions shall be made to protect the excavations from cave-ins.
- 3) The underlying ROCK is hard and will be difficult to excavate.

#### Foundation Design

An allowable soil bearing value of 3,000 pounds per square foot may be used for footings that bear on the underlying dense silty GRAVEL, or properly compacted fill. The minimum footing embedment depth shall be 18 inches below lowest adjacent grade.

An allowable rock bearing value of 20,000 pounds per square foot may be used for footings bearing on the underlying hard BASALTIC ROCK.

For footings located adjacent to utility trenches, the bottom of the footing shall be deepened below a 1 horizontal to 1 vertical plane projected upwards from the edge of the utility trench.

For footings located on or adjacent to slopes, the footing shall be deepened such that there is a minimum horizontal distance of 5 feet from the edge of the footing to the slope face.

Where new footings are to be located adjacent to retaining walls or other structural elements which are not designed for surcharge loading, the new footing shall be deepened below a 45 degree plane projected upwards from the adjacent structure.

The bearing values are for dead plus live loads and may be increased by one-third for momentary loads due to wind or seismic forces. If any footing is eccentrically loaded, the maximum edge pressure shall not exceed the bearing pressure for permanent or for momentary loads.

All loose and disturbed soil at the bottom of footing excavations shall be removed to firm soil or the disturbed soil shall be compacted prior to laying of steel or pouring of concrete.

Under the fully applied recommended bearing pressure, it is estimated that the total settlement of the foundation will be less than 1/2 inch.

Differential settlement between footings will vary according to the size and bearing pressure of the footing.

### Lateral Resistance

For resistance of lateral loads, such as wind or seismic forces, an allowable passive earth resistance equivalent to that exerted by a fluid weighing 300 pounds per cubic foot may be used for footings, or other structural elements, provided the vertical surface is in direct contact with undisturbed soil or properly compacted fill.

Frictional resistance between footings and slabs, and the underlying soils may be assumed as 0.4 times the dead load for the on-site dense silty GRAVEL or properly compacted structural fill, and 0.7 times the dead load for the underlying hard BASALTIC ROCK.

Lateral resistance and friction may be combined.

### Slab-on-Grade

For design of concrete slabs-on-grade, a modulus of subgrade reaction of 300 pci may be used for the on-site soils, or imported

# CORRECTION

THE PRECEDING DOCUMENT(S) HAS
BEEN REPHOTOGRAPHED TO ASSURE
LEGIBILITY
SEE FRAME(S)
IMMEDIATELY FOLLOWING

An allowable rock bearing value of 20,000 pounds per square foot may be used for footings bearing on the underlying hard BASALTIC ROCK.

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select granular material (see Site Preparation and Grading section to this report).

It is recommended that the subgrade soil be prepared in accordance with the Site Preparation and Grading section to this report.

#### Slopes

Permanent fill and cut slopes for soil type materials shall not exceed 2 horizontal to 1 vertical.

Cut slopes into the underlying hard BASALTIC ROCK may be made at 1 horizontal to 2 vertical.

Exposed soil slopes shall be covered as soon as practical after construction to minimize erosion.

Fill slopes shall be constructed by either overfilling and cutting back to compacted soil, or the slope shall be track-rolled.

#### Site Preparation and Grading

It is recommended that the site be prepared in the following manner:

In areas to receive fill and beneath structural and pavement areas, all vegetation, weeds, brush, roots, stumps, rubbish, debris, and other deleterious material shall be removed from the site.

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If foundations are not deepened to bear on the underlying dense silty GRAVEL or hard BASALTIC ROCK, the upper loose to moderately dense silty GRAVEL shall be removed to the dense GRAVEL layer.

- 2. The exposed surface shall then be scarified to a depth of 6 inches, moisture conditioned to near optimum moisture content (ASTM D1557-91), and then compacted to the degree of compaction indicated below. If encountered, loose or soft areas shall be removed to firm material and the resulting depression shall be filled with properly compacted fill.
- 3. Fill and backfill material shall consist of soil which is free of organics, debris and expansive clayey material. The material shall be less than 3 inches in greatest dimension. Imported structural fill and backfill material shall contain no more than 20% fines (passing the #200 sieve).

The on-site silty GRAVEL is suitable for use as fill and backfill.

4. Fill and backfill shall be placed in lifts not exceeding 8 inches in loose thickness. Prior to placing, the material shall be aerated or moistened to near optimum moisture content (ASTM D1557-91 test procedure).

Where fill is placed on existing ground that is steeper than 5 horizontal to 1 vertical, the existing ground surface shall be benched into firm soil as the fill is placed.

- 5. In the upper 2 feet from finished subgrade, each layer of structural fill and backfill (under and 3 feet beyond the edges of structures and pavements) shall be thoroughly compacted to at least 95 percent of the maximum dry density (ASTM D1557-91). All other fill and backfill shall be compacted to at least 90 percent relative compaction (ASTM D1557-91).
- 6. Drainage shall be provided to minimize ponding of water. Ponded areas shall be drained immediately or water pumped out without damaging adjacent structures and property. If water accumulation softens the subgrade materials, the affected soils shall be removed and replaced with properly compacted fill.
- 7. Footing excavations shall be cleaned of loose material that has fallen into the excavation prior to pouring of concrete.

It is particularly important to see that all backfill soils are properly compacted especially if these are designed to resist lateral forces.

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#### INSPECTION

During the progress of construction, so as to evaluate compliance with the design concepts, specifications and recommendations contained in this report, a representative from this office should be present to observe the following operations:

- 1. Site preparation.
- 2. Placement of fill and backfill.
- 3. Footing excavations.

#### REMARKS

The conclusions and recommendations contained herein are based on the findings and observations made at the boring location. For the purpose of providing geotechnical design information, conditions beyond the boring are assumed to be similar to those found at the boring location. If conditions are encountered during construction which appear to differ from those disclosed by the boring, this office shall be notified so as to consider the need for modifications.

This report has been prepared for the exclusive use of R. T. Tanaka Engineers, Inc., and their respective design consultants. It shall not be used by or transferred to any other party or to another project without the consent and/or thorough review by this facility. Should the project be delayed beyond the period of one year from the

date of this report, the report shall be reviewed relative to possible changed conditions.

Samples obtained in this investigation will deteriorate with time and will be unsuitable for further laboratory tests within one (1) month from the date of this report. Unless otherwise advised, the samples will be discarded at that time.

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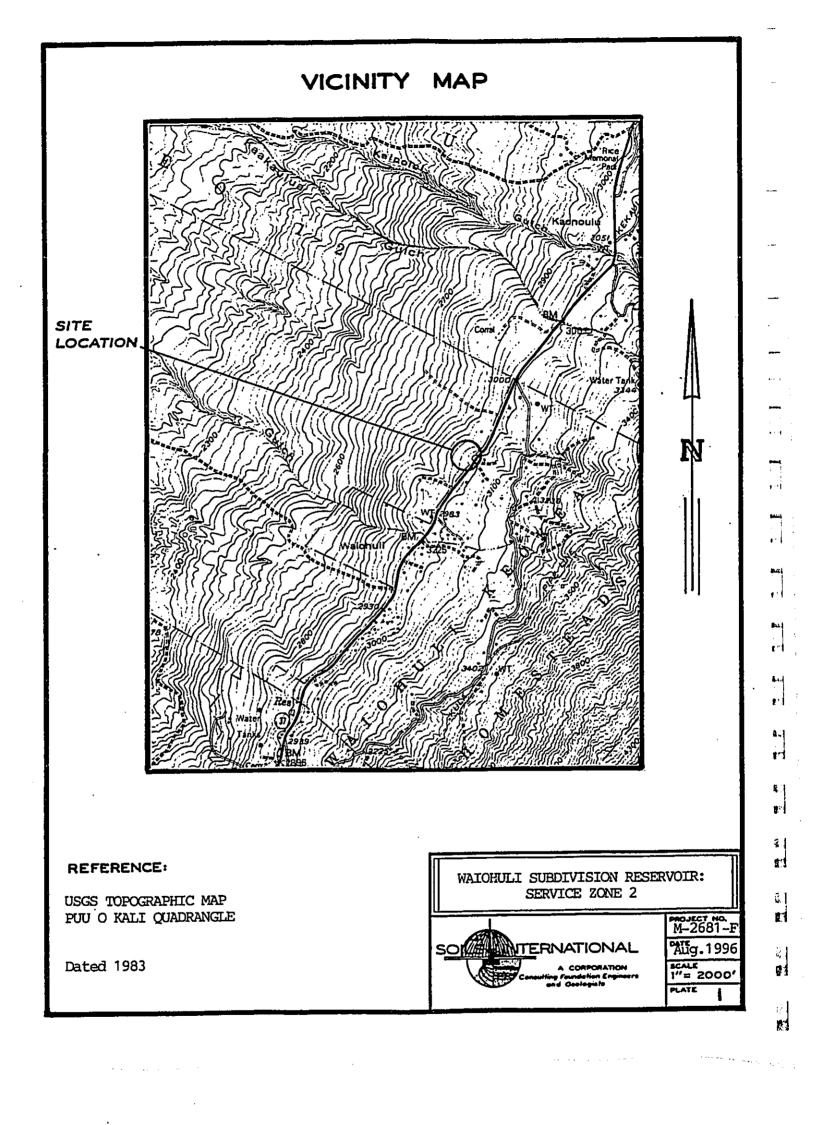
The following are included and complete this report:

Vicinity Map ------ Plate 1

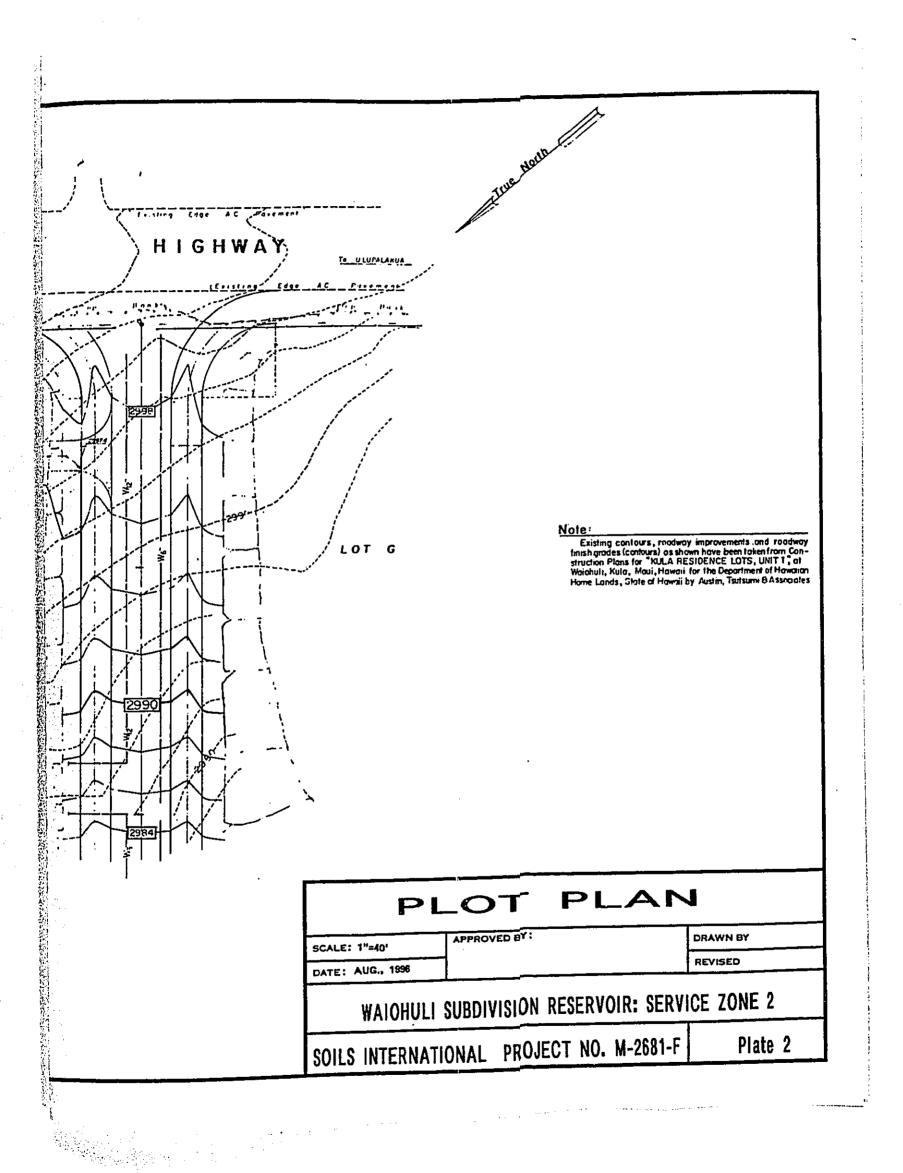
Plot Plan ----- Plate 2

Appendix

Field Investigation
Laboratory Testing
Log of Boring



LEPELEPE PLACE KULA BORING LOT H Note: Contractor shall not over excavate Tank Site Area. Any over excavation shall be filled with Class. "Concrete All concrete foundations shall rest in firm undistricted soil GRADING & DRAINAGE PLAN SERVICE ZONE No. 2 0.20 MG RESERVOIR 11 X 17 PRINTED ON NO. 1000H CLEARPRINT .



## **APPENDIX**

FIELD INVESTIGATION AND LABORATORY TESTING

#### FIELD INVESTIGATION

#### **General**

The field investigation consisted of performing explorations at the locations shown on the Plot Plan. The method used for the exploratory work is shown on the respective exploration log. A description of the various method or methods used is presented below.

#### Test Borings Using Truck-Mounted Drilling Equipment

Truck-mounted borings are drilled using a gas-powered drilling rig. The hole is advanced using continuous flight augers, wash boring and/or NX coring.

Auger drilling is used in soils where caving does not occur. The augers are 4-1/2 inch diameter continuous helical flight augers with the lead auger having a head equipped with changeable cutting teeth. Soil cuttings are brought to the surface by the continuous flights. After the bore hole is advanced to the required depth and cleaned of cuttings by additional rotation of the augers, the augers are retracted for soil sampling or in-situ testing.

In soils where caving of the bore hole occurs, the hole is advanced by wash boring or hollow-stem augering. Wash boring consists of advancing steel casing by rotary action and water pressure to flush the soil from the casing. The lead section of the casing is equipped with a carbide or diamond casing bit. After the casing has been advanced to the required depth, soil samples are obtained through the inside of the casing. Hollow-stem drilling consists of advancing the hole with 7-5/8 inch outside diameter and 4-1/4 inch inside diameter augers. The leading drill bit is connected to drilling rods through the central portion of the auger. At the required sampling depth, the interior drill rods and lead bit are removed, and the soil sample is taken by driving a sampler through the "hollow" section of the augers.

Coring is used for hard formations such as rock, coral or boulders. The core barrel, consisting of a 5-foot long double tube, hardened steel barrel with either a carbide or diamond bit, is attached to drilling rods and set on the hard formation. The core barrel is advanced through the formation by rotation of the core barrel. Water is used to flush out the cuttings. Upon completion of the core run, the sample is removed from the core barrel and inspected. The total core recovery length and the sum of all intact pieces over 4-inch in length are measured. The length of core recovery divided by the length of the core run is the recovery ratio. The combined length of the 4-inch or longer pieces divided by the length of core run is the Rock Quality Designation (RQD). The values provide an indication of the quality of the formation.

## Test Borings Using Portable Drilling Equipment

In areas inaccessible to truck-mounted equipment, portable drilling equipment is used to drill the test boring. The boring is advanced by either 1) continuous drive sampling or by 2) using a small gas-powered drill rig with continuous flight augers, wash boring or NX coring.

Soil samples are obtained with a tripod and cathead assembly using soil sampling methods described below.

#### Test Pits Using Excavators/Hopto

Test pits are excavated using a hopto or backhoe. Material excavated from the pit and the sides and bottom of the pit are visually inspected and a continuous log of the hole is kept.

#### Explorations Using Hand Tools

In inaccessible areas requiring only shallow explorations, borings and test pits are made using hand equipment. Borings are drilled using hand augers. Test pits

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are excavated using hand tools. Cuttings from the boring and/or pit are inspected and visually classified.

#### Soil Sampling

Relatively undisturbed samples of the underlying soils are obtained from borings by driving a sampling tube into the subsurface material using a 140-pound safety hammer falling from a height of 30 inches. Ring samples are obtained using a 3-inch outside diameter, 2.5 inch inside diameter steel sampling tube with an interior lining of one-inch long, thin brass rings. The tube is driven approximately 18 inches into the soil and a section of the central portion is placed in a close fitting waterproof container in order to retain field conditions until completion of the laboratory tests. Standard Penetration Test (SPT) values and disturbed soil samples are obtained with a 2-inch (outside diameter) split-barrel sampler instead of the 3-inch sampler. The number of blows required to drive the sampler into the ground is recorded at 6-inch intervals. The blow count for the last 12-inches is shown on the boring logs.

From test pit excavations, undisturbed samples are retained from cohesive type soil formations and disturbed bulk samples are retained from friable and cohesionless soil formations.

The soil samples are visually classified in the field using the Unified Soil Classification System. Samples are packed in moisture proof containers and transported to the laboratory for testing.

#### LABORATORY TESTING

#### <u>General</u>

Laboratory tests are performed on various soil samples to determine their engineering properties. Description of the various tests are listed below.

## Unit Weight and Moisture Content

The in-place moisture content and unit weight of the samples are used to correlate similar soils at various depths. The sample is weighed, the volume determined, and a portion of the sample is placed in the oven. After oven-drying, the sample is again weighed to determine the moisture loss. The data is used to determine the wet-density, dry-density and in-place moisture content.

#### Direct Shear

Direct shear tests are performed to determine the strength characteristics of the representative soil samples. The test consists of placing the sample into a shear box, applying a normal load and then shearing the sample at a constant rate of strain. The shearing resistance is recorded at various rates of strain. By varying the normal load, the angle of internal friction and cohesion can be determined.

## Consolidation Test

Consolidation tests are performed to obtain data from which time rates of consolidation and amounts of settlement may be estimated. The test is performed by placing a specimen in a consolidation apparatus. Loads are applied in increments to the circular face of a one (1) inch high sample. Deformation or changes in thickness of the specimen are recorded at selected time intervals. Water is introduced to or allowed to drain from the sample through porous disks placed against the top and bottom faces of the specimen. The data is then used to plot a stress-volume strain curve which is used in estimating settlement.

#### Expansion Test - Ring Swell

Expansion tests are performed on clayey soils to determine the expansion potential of the sample. The test is performed using either a remolded or relatively undisturbed field sample. The sample is placed in an expansion apparatus with a one (1) psi surcharge. The sample is saturated and the change in vertical height is recorded. The initial moisture content is varied (field moisture or air-dried) to determine the variation in expansion potential with moisture changes. The data is used to determine the expansion potential of the soil.

#### Classification Tests

The soil samples are classified using the Unified Soil Classification System. Classification tests include sieve and hydrometer analysis to determine grain size distribution, and Atterberg Limits to determine the liquid limit, plastic limit and plasticity index.

#### California Bearing Ratio Test

California Bearing Ratio (CBR) tests are performed on materials to determine the bearing strength of the soil for determination of pavement sections. The sample is compacted into a 6-inch diameter mold in 5 equal layers. Each layer is compacted with a 10-pound hammer falling from a height of 18-inches, with each layer receiving 56 blows. The mold is then placed in a water bath for 4-days and the vertical swell is measured under a surcharge weight of 10 pounds. After the soaking period, the sample is placed in a CBR apparatus that has a 3-square inch penetrometer. The penetrometer is pressed vertically into the soil at constant strain and the loads required to press the penetrometer are recorded. A plot of the load-strain relationship is made to determine the CBR value.

## Maximum Dry Density/Optimum Moisture Content

The maximum dry density and optimum moisture content of the material is determined in accordance with the ASTM D1557-78 test procedure. The sample is compacted into a mold in 5 equal layers using a 10 pound hammer falling from a height of 18 inches. The diameter of the mold is either 4-inches or 6-inches depending on the proportion of gravel in the sample. The sample is compacted at various moisture contents to develop a compaction curve for the soil. The curve is usually bell-shaped with a peak indicating the maximum dry density and optimum moisture content.

#### Penetrometer Test

Penetrometer tests are performed on clayey soils to determine the consistency of the material and an approximate value of the unconfined compressive strength.

#### <u>Torvane</u>

Torvane tests are used to determine the approximate undrained shear strength of clayey soils. The torvane apparatus consists of a torque device with a small diameter plate that has vanes situated perpendicular to the plate. The vanes are pushed into the soil and torque is applied until failure occurs. The torque required to cause failure is converted to approximate undrained strength of the soil.

LO	G OF	ВО	RING NO. 1			]	ELEVATIO	)N: +300	2'			
EQUIPMENT USED: SIMCO 2400 Drilling Rig			DEPTH OF BORING (FT.): 19									
DATE DRILLED: 8-8-96			_	DEPTH TO GROUNDWATER: N/A							,	
ОЕРТН (FT.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION	SAMPLE	BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT (% OF DRY WT.)	PENETROMETER (TSF)	TORVANE STRENGTH (TSF)
2-		GM	silty GRAVEL (CLINKERS); some sand, few roots  Atterberg Limits at 2' LL=90, Pl=3 cobble at 3' more gravel, few fines		7/6" 35 5/0" 28/6"	yellow brown and gray	sl. moist	mod. dense	73 81	21.1		
6-				1	70/9"				74	14.8		
10 - 12 - 14 - 14 - 18 - 18 - 18 - 18 - 18 - 18		(RX)	BASALTIC ROCK; vesicular, fractured Coring Times 9-19' 5.42 min - 1st foot 4.50 min - 2nd foot 6.50 min - 3rd foot 4.33 min - 4th foot 7.50 min - 5th foot 5.33 min - 6th foot 8.50 min - 7th foot 2.33 min - 8th foot 2.50 min - 9th foot 3.17 min - 10th foot  Recovered = 9.00 feet ROD Length = 6.42 feet ROD (%) = 64%		10/0*	gray		hard rock				
o –			END OF BORING									
PROJ	ECT NA	ME: W	/AIOHULI SUBDIVISION								PLA	TE
		R	ESERVOIR SZ-2			S	O	TERNA	TION: A CORPORI Inical Consti	ATION	3	

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SOILS INVESTIGATION REPORT SERVICE ZONE NO. 3

# REPORT SOILS INVESTIGATION

PROPOSED RESERVOIR
WAIOHULI SUBDIVISION SERVICE ZONE 3
KULA, MAUI, HAWAII

for

R. T. TANAKA ENGINEERS, INC. Engineers

Project No. H-2682-F October 28, 1996



99-1255 Waiua Place Aiea, Hawaii 96701 Phone: (808) 488-0433 Fax: (808) 488-9535

335 Hoohana Street Building 7, Unit O Kahului, Maui, Hawaii 96732 Phone: (808) 877-3789 Fax: (808) 871-1592

99-1255 WAIUA PLACE, AIEA, HAWAII 96701

(808) 488-0433 FAX (808) 488-9535

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October 28, 1996 Project No. M-2682-F

R. T. Tanaka Engineers, Inc. 871 Kolu Street, Suite 201 Wailuku, Maui, Hawaii 96793

Attention:

Mr. Kirk Tanaka, P.E.

#### Gentlemen:

The attached report presents the results of a soils investigation for the proposed Waiohuli Subdivision Reservoir at Service Zone 3 in Kula, Maui, Hawaii.

A summary of the findings is as follows:

- The subsurface conditions at the site were explored by drilling 1 test boring to a depth of 22.5 feet below existing grade. The boring revealed soft to moderately stiff, light brown clayey SILT to a depth of 2.5 feet, followed by very stiff, brown to light brown clayey SILT to a depth of 7.5 feet. Below the clayey SILT, moderately hard, gray BASALTIC ROCK was found to a depth of 10 feet, followed by dense, gray CLINKERS to a depth of 19 feet. Below the CLINKERS, soft, gray BASALTIC ROCK was found to the final depth of the boring at 22.5 feet.
- 2) Groundwater was not encountered in the boring at the time of the field investigation.
- Based on the findings and observations of this investigation, the reservoir foundation may bear on the on-site very stiff clayey SILT, underlying dense CLINKERS, underlying hard BASALTIC ROCK, or properly compacted fill.
- 4) The upper soft to moderately stiff clayey SILT is not suitable bearing material. This material shall be removed and if necessary to obtain finished subgrade elevation shall be replaced with properly compacted fill. The removed soft to moderately stiff soil will not be suitable for reuse as compacted fill due to high existing moisture content.

R. T. Tanaka Engineers, Inc. October 28, 1996 Page Two

5) A layer of moderately hard rock was encountered in the boring at a depth of 7.5 feet. Excavation into this material will be difficult to accomplish.

Details of the findings and recommendations are presented in the attached report.

This investigation was made in accordance with generally accepted engineering procedures and included such field and laboratory test considered necessary for the project. In the opinion of the undersigned, the accompanying report has been substantiated by mathematical data in conformity with generally accepted engineering principles and presents fairly the design information requested by your organization. No other warranty is either expressed or given.

Respectfully submitted,

SOILS INTERNATIONAL

Lawrence S. Shinsato, P.E.

Vice-President

LSS:BHH:bh

This work was prepared by me or under my supervision.

NCE S. SHIN

LICENSED PROFESSION AL ENGINEET No. 4169-C

## TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
SCOPE OF WORK	1
PLANNED DEVELOPMENT	1
SITE CONDITIONS	2
Subsurface	2 2
Geology	. 3
CONCLUSIONS AND RECOMMENDATIONS	4 4
Special Considerations	4
Foundation Design	5
Lateral Resistance	6 6
Slab-on Grade	7
Slopes	7
Site Preparation and Grading	8
INSPECTION	10
REMARKS	11
VICINITY MAP Plate	1
PLOT PLAN Plate	2
APPENDIX	
Field Investigation	
Laboratory Testing Log of Boring	
Results of Laboratory Testing	

## INTRODUCTION

This investigation was made for the purpose of obtaining information on the subsurface conditions from which to base recommendations for the proposed Waiohuli Subdivision Reservoir for Service Zone 3 to be located in Kula, Maui, Hawaii. The location of the site, relative to the existing streets and landmarks, is shown on the Vicinity Map, Plate 1.

#### SCOPE OF WORK

The services included drilling 1 test boring to a depth of 22.5 feet below existing grade, obtaining samples of the underlying soils, conducting laboratory tests on representative samples, and performing an engineering analysis to determine foundation design parameters. The following information is provided for use by the Architect and/or Engineer:

- 1. General subsurface conditions, as disclosed by the boring.
- 2. Physical characteristics of the soils encountered.
- 3. Recommendations for foundation design, including bearing values, embedment depth and estimated settlement.
- 4. Recommendations for placement of fill and backfill.
- 5. Special design considerations.

## PLANNED DEVELOPMENT

From the information provided, the project will consist of constructing a 68-foot diameter, 0.5 million gallon water reservoir

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for a subdivision in Service Zone 3. Finished floor elevation for the reservoir will be at +2750.00'.

## SITE CONDITIONS

#### Surface

The property is located at the northwest side of Kula Highway, about 1,500 feet from the highway. The project site is heavily vegetated with trees and plants.

Existing surface elevations (according to the Grading and Drainage Plan provided) range from approximately +2748' at the west side of the proposed reservoir to +2766' at the east side of the site.

## Subsurface

The subsurface conditions at the site was explored by drilling 1 test boring to a depth of 22.5 feet below existing grade at the location shown on the Plot Plan, Plate 2. A detailed log of the boring is presented in the Appendix to this report.

The boring revealed soft to moderately stiff, light brown clayey SILT to a depth of 2.5 feet, followed by very stiff, brown to light brown clayey SILT to a depth of 7.5 feet. Below the clayey SILT, moderately hard, gray BASALTIC ROCK was found to a depth of 10 feet, followed by dense, gray CLINKERS to a depth of 19 feet. Below the

CLINKERS, soft, gray BASALTIC ROCK was found to the final depth of the boring at 22.5 feet.

Groundwater was not encountered in the boring at the time of the field investigation.

From the USDA Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii", the site is located in an area classified as Kula cobbly loam, 12 to 20 percent slopes (KxaD). This series consists of well-drained soils on uplands that developed in volcanic ash (USDA, 1972, Plate 108, p. 59).

#### Geology

The site is located on the southwesterly flank of the Haleakala Volcano. The development of the island above sea level is believed to have occurred between later Pliocene and Pleistocene time (approximately 1 and 12 million years ago). Haleakala was built over three rift zones that trend north, southwest and east. These rift zones are studded with large cinder cones. The lava flows making up the main mass of the mountain is known as the Honomanu volcanic series which consist of thin-bedded pahoehoe and aa lava flows.

Above the Hononamu volcanics is the Kula volcanic series which consist of thicker andesitic aa flows. Most of the lava flows dip about 12 degrees. Along the southwest and east rift zones only, the volcano is capped with the Hana volcanic series (Stearns, 1966).

#### CONCLUSIONS AND RECOMMENDATIONS

#### General

Based on the findings and observations of this investigation, the reservoir foundation should bear on the on-site very stiff clayey SILT, underlying hard ROCK, dense CLINKERS, or on properly compacted fill.

## Special Consideration

- 1) The upper soft to moderately stiff clayey SILT is not suitable bearing material. This material shall be removed and if necessary to obtain finished subgrade elevation shall be replaced with properly compacted fill. The removed soft to moderately stiff soil will not be suitable for reuse as compacted fill due to high existing moisture content.
- 2) A layer of moderately hard rock was encountered in the boring at a depth of 7.5 feet. Excavation into this material will be difficult to accomplish.

### Foundation Design

An allowable soil bearing value of 2,500 pounds per square foot may be used for footings bearing on the on-site very stiff clayey SILT or on properly compacted fill. The minimum footing embedment depth shall be 18 inches below lowest adjacent finished grade.

An allowable soil bearing value of 6,000 pounds per square foot may be used for footings bearing on the on-site underlying dense CLINKERS, or soft to moderately hard BASALTIC ROCK. The minimum footing embedment depth shall be 12 inches below lowest adjacent finished grade.

For footings located adjacent to utility trenches, the bottom of the footing shall be deepened below a 1 horizontal to 1 vertical plane projected upwards from the edge of the utility trench.

For footings located on or adjacent to slopes, the footing shall be deepened such that there is a minimum horizontal distance of 5 feet from the edge of the footing to the slope face.

Where new footings are to be located adjacent to retaining walls or other structural elements which are not designed for surcharge loading, the new footing shall be deepened below a 45 degree plane projected upwards from the adjacent structure.

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The bearing values are for dead plus live loads and may be increased by one-third for momentary loads due to wind or seismic forces. If any footing is eccentrically loaded, the maximum edge pressure shall not exceed the bearing pressure for permanent or for momentary loads.

All loose and disturbed soil at the bottom of footing excavations shall be removed to firm soil or the disturbed soil shall be compacted prior to laying of steel or pouring of concrete.

## Settlement

Under the fully applied recommended bearing pressure, it is estimated that the total settlement of foundation will be less than 1/2 inch.

Differential settlement between footings will vary according to the size and bearing pressure of the footing.

## Lateral Resistance

For resistance of lateral loads, such as wind or seismic forces, an allowable passive earth resistance equivalent to that exerted by a fluid weighing 300 pounds per cubic foot may be used for footings, or other structural elements, provided the vertical surface is in direct contact with undisturbed soil or properly compacted fill.

Frictional resistance between footings and slabs, and the underlying soils may be assumed as 0.4 times the dead load for the on-site materials or properly compacted structural fill.

Lateral resistance and friction may be combined.

## Slab-on-Grade

For design of concrete slabs-on-grade, a modulus of subgrade reaction of 150 pci may be used for the on-site clayey SILT and 300 pci for imported select granular material or the underlying CLINKERS and ROCK (see Site Preparation and Grading section to this report).

It is recommended that the subgrade soil be prepared in accordance with the Site Preparation and Grading section to this report.

#### Slopes

Permanent fill and cut slopes of soil type materials shall not exceed 2 horizontal to 1 vertical.

Cut slopes into the underlying CLINKERS and BASALTIC ROCK may be made at 1 horizontal to 1 vertical.

Exposed soil slopes shall be covered as soon as practical after construction to minimize erosion.

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Fill slopes shall be constructed by either overfilling and cutting back to compacted soil, or the slope shall be track-rolled.

## Site Preparation and Grading

It is recommended that the site be prepared in the following manner:

 In areas to receive fill and beneath structural and pavement areas, all vegetation, weeds, brush, roots, stumps, rubbish, debris, and other deleterious material shall be removed from the site.

The existing soft to moderately stiff clayey SILT shall be removed from beneath the structure and if necessary to obtain finished grade, shall be replaced with properly compacted fill.

- 2. The exposed surface (except ROCK and CLINKERS) shall then be scarified to a depth of 6 inches, moisture conditioned to near optimum moisture content (ASTM D1557-91), and then compacted to the degree of compaction indicated below. If encountered, loose or soft areas shall be removed to firm material and the resulting depression shall be filled with properly compacted fill.
- 3. Fill and backfill material shall consist of soil which is free of organics, debris and expansive clayey material. The material shall be less than 3 inches in greatest dimension.

Imported structural fill and backfill material shall contain no more than 20% fines (passing the #200 sieve).

The on-site clayey SILT is <u>not</u> suitable for use as fill and backfill.

Excavated ROCK and CLINKER material which can be crushed to meet the maximum particle size requirement may be used as fill. In the case of "bony" or coarse material, sufficient fines or earth filler shall be mixed with the coarse material to fill the interstices between the larger particles.

4. Fill and backfill shall be placed in lifts not exceeding 8 inches in loose thickness. Prior to placing, the material shall be aerated or moistened to near optimum moisture content (ASTM D1557-91 test procedure).

Where fill is placed on existing ground that is steeper than 5 horizontal to 1 vertical, the existing ground surface shall be benched into firm soil as the fill is placed.

5. In the upper 2 feet from finished subgrade, each layer of structural fill and backfill (under and 3 feet beyond the edges of structures and pavements) shall be thoroughly compacted to at least 95 percent of the maximum dry density (ASTM D1557-91).

22

All other fill and backfill shall be compacted to at least 90 percent relative compaction (ASTM D1557-91).

- 6. Drainage shall be provided to minimize ponding of water.

  Ponded areas shall be drained immediately or water pumped out without damaging adjacent structures and property. If water accumulation softens the subgrade materials, the affected soils shall be removed and replaced with properly compacted fill.
- 7. Footing excavations shall be cleaned of loose material that has fallen into the excavation prior to pouring of concrete.

It is particularly important to see that all backfill soils are properly compacted especially if these are designed to resist lateral forces.

#### INSPECTION

During the progress of construction, so as to evaluate compliance with the design concepts, specifications and recommendations contained in this report, a representative from this office should be present to observe the following operations:

- Site preparation.
- 2. Placement of fill and backfill.
- 3. Footing excavations.

#### REMARKS

The conclusions and recommendations contained herein are based on the findings and observations made at the boring location. For the purpose of providing geotechnical design information, conditions beyond the boring are assumed to be similar to those found in the boring location. If conditions are encountered during construction which appear to differ from those disclosed by the boring, this office shall be notified so as to consider the need for modifications.

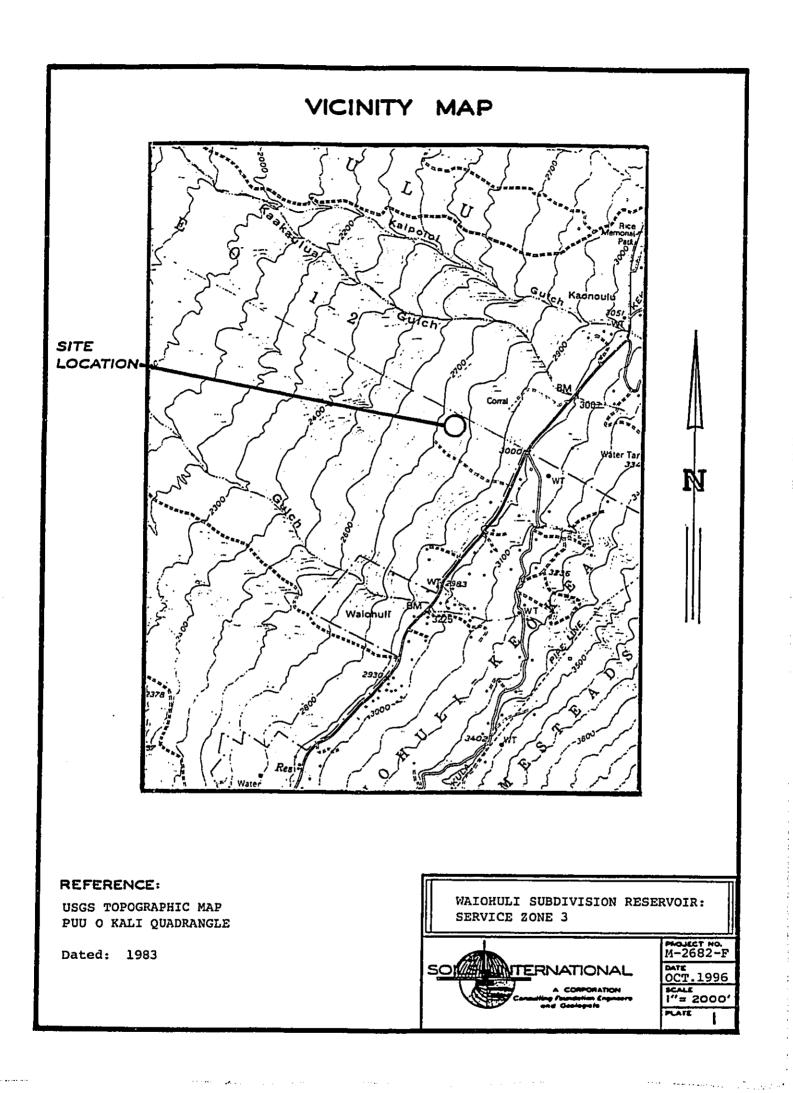
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Samples obtained in this investigation will deteriorate with time and will be unsuitable for further laboratory tests within one (1) month from the date of this report. Unless otherwise advised, the samples will be discarded at that time.

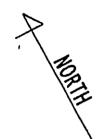
The	following are included and complete this report:		
	Vicinity Map	Plate	∍ 1
	Plot Plan	Plate	2
	Appendix		
	Field Investigation		
	Laboratory Testing		1
	Log of Boring		
	Results of Laboratory Testing		

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**GRADING** SERVICE ZONE 0:50 MG RESERVI TANK DIA. : 68.0' 71.33'



#### GRADING & DRAINAGE PLAN

SERVICE ZONE No. 3 0.50 MG RESERVOIR TANK DIA. : 68.0 ± 1.D. 71.33 0.D.

PLOT PLAN				
SCALE: 1"=40'	DRAWN BY			
DATE:OCTOBER, 1996	i	REVISED		
WAIOHULI S	SUBDIVISION RESERVO	OIR: SERVICE ZONE 3		
SOILS INTERNAT	IONAL PROJECT NO.	M-2682-F Plate 2		

APPENDIX FIELD INVESTIGATION AND LABORATORY TESTING

## FIELD INVESTIGATION

#### General

The field investigation consisted of performing explorations at the locations shown on the Plot Plan. The method used for the exploratory work is shown on the respective exploration log. A description of the various method or methods used is presented below.

## Test Borings Using Truck-Mounted Drilling Equipment

Truck-mounted borings are drilled using a gas-powered drilling rig. The hole is advanced using continuous flight augers, wash boring and/or NX coring.

Auger drilling is used in soils where caving does not occur. The augers are 4-1/2 inch diameter continuous helical flight augers with the lead auger having a head equipped with changeable cutting teeth. Soil cuttings are brought to the surface by the continuous flights. After the bore hole is advanced to the required depth and cleaned of cuttings by additional rotation of the augers, the augers are retracted for soil sampling or in-situ testing.

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In soils where caving of the bore hole occurs, the hole is advanced by wash boring or hollow-stem augering. Wash boring consists of advancing steel casing by rotary action and water pressure to flush the soil from the casing. The lead section of the casing is equipped with a carbide or diamond casing bit. After the casing has been advanced to the required depth, soil samples are obtained through the inside of the casing. Hollow-stem drilling consists of advancing the hole with 7-5/8 inch outside diameter and 4-1/4 inch inside diameter augers. The leading drill bit is connected to drilling rods through the central portion of the auger. At the required sampling depth, the interior drill rods and lead bit are removed, and the soil sample is taken by driving a sampler through the "hollow" section of the augers.

Coring is used for hard formations such as rock, coral or boulders. The core barrel, consisting of a 5-foot long double tube, hardened steel barrel with either a carbide or diamond bit, is attached to drilling rods and set on the hard formation. The core barrel is advanced through the formation by rotation of the core barrel. Water is used to flush out the cuttings. Upon completion of the core run, the sample is removed from the core barrel and inspected. The total core recovery length and the sum of all intact pieces over 4-inch in length are measured. The length of core recovery divided by the length of the core run is the recovery ratio. The combined length of the 4-inch or longer pieces divided by the length of core run is the Rock Quality Designation (RQD). The values provide an indication of the quality of the formation.

#### Test Borings Using Portable Drilling Equipment

In areas inaccessible to truck-mounted equipment, portable drilling equipment is used to drill the test boring. The boring is advanced by either 1) continuous drive sampling or by 2) using a small gas-powered drill rig with continuous flight augers, wash boring or NX coring.

Soil samples are obtained with a tripod and cathead assembly using soil sampling methods described below.

#### Test Pits Using Excavators/Hopto

Test pits are excavated using a hopto or backhoe. Material excavated from the pit and the sides and bottom of the pit are visually inspected and a continuous log of the hole is kept.

## Explorations Using Hand Tools

In inaccessible areas requiring only shallow explorations, borings and test pits are made using hand equipment. Borings are drilled using hand augers. Test pits

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are excavated using hand tools. Cuttings from the boring and/or pit are inspected and visually classified.

## Soil Sampling

Relatively undisturbed samples of the underlying soils are obtained from borings by driving a sampling tube into the subsurface material using a 140-pound safety hammer falling from a height of 30 inches. Ring samples are obtained using a 3inch outside diameter, 2.5 inch inside diameter steel sampling tube with an interior lining of one-inch long, thin brass rings. The tube is driven approximately 18 inches into the soil and a section of the central portion is placed in a close fitting waterproof container in order to retain field conditions until completion of the laboratory tests. Standard Penetration Test (SPT) values and disturbed soil samples are obtained with # 2-inch (outside diameter) split-barrel sampler instead of the 3-inch sampler. The number of blows required to drive the sampler into the ground is  $r \notin corded$  at 6-inch intervals. The blow count for the last 12-inches is shown on the boring logs.

From test pit excavations, undisturbed samples are retained from cohesive type soil formations and disturbed bulk samples are retained from friable and cohesionless soil formations.

The soil samples are visually classified in the field using the Unified Soil Classification System. Samples are packed in moisture proof containers and transported to the laboratory for testing.

#### LABORATORY TESTING

#### <u>General</u>

Laboratory tests are performed on various soil samples to determine their engineering properties. Description of the various tests are listed below.

#### Unit Weight and Moisture Content

The in-place moisture content and unit weight of the samples are used to correlate similar soils at various depths. The sample is weighed, the volume determined, and a portion of the sample is placed in the oven. After oven-drying, the sample is again weighed to determine the moisture loss. The data is used to determine the wet-density, dry-density and in-place moisture content.

#### Direct Shear

Direct shear tests are performed to determine the strength characteristics of the representative soil samples. The test consists of placing the sample into a shear box, applying a normal load and then shearing the sample at a constant rate of strain. The shearing resistance is recorded at various rates of strain. By varying the normal load, the angle of internal friction and cohesion can be determined.

#### Consolidation Test

Consolidation tests are performed to obtain data from which time rates of consolidation and amounts of settlement may be estimated. The test is performed by placing a specimen in a consolidation apparatus. Loads are applied in increments to the circular face of a one (1) inch high sample. Deformation or changes in thickness of the specimen are recorded at selected time intervals. Water is introduced to or allowed to drain from the sample through porous disks placed against the top and bottom faces of the specimen. The data is then used to plot a stress-volume strain curve which is used in estimating settlement.

#### Expansion Test - Ring Swell

Expansion tests are performed on clayey soils to determine the expansion potential of the sample. The test is performed using either a remolded or relatively undisturbed field sample. The sample is placed in an expansion apparatus with a one (1) psi surcharge. The sample is saturated and the change in vertical height is recorded. The initial moisture content is varied (field moisture or air-dried) to determine the variation in expansion potential with moisture changes. The data is used to determine the expansion potential of the soil.

#### Classification Tests

The soil samples are classified using the Unified Soil Classification System. Classification tests include sieve and hydrometer analysis to determine grain size distribution, and Atterberg Limits to determine the liquid limit, plastic limit and plasticity index.

#### California Bearing Ratio Test

California Bearing Ratio (CBR) tests are performed on materials to determine the bearing strength of the soil for determination of pavement sections. The sample is compacted into a 6-inch diameter mold in 5 equal layers. Each layer is compacted with a 10-pound hammer falling from a height of 18-inches, with each layer receiving 56 blows. The mold is then placed in a water bath for 4-days and the vertical swell is measured under a surcharge weight of 10 pounds. After the soaking period, the sample is placed in a CBR apparatus that has a 3-square inch penetrometer. The penetrometer is pressed vertically into the soil at constant strain and the loads required to press the penetrometer are recorded. A plot of the load-strain relationship is made to determine the CBR value.

#### Maximum Dry Density/Optimum Moisture Content

The maximum dry density and optimum moisture content of the material is determined in accordance with the ASTM D1557-78 test procedure. The sample is compacted into a mold in 5 equal layers using a 10 pound hammer falling from a height of 18 inches. The diameter of the mold is either 4-inches or 6-inches depending on the proportion of gravel in the sample. The sample is compacted at various moisture contents to develop a compaction curve for the soil. The curve is usually bell-shaped with a peak indicating the maximum dry density and optimum moisture content.

#### Penetrometer Test

Penetrometer tests are performed on clayey soils to determine the consistency of the material and an approximate value of the unconfined compressive strength.

#### Torvane

Torvane tests are used to determine the approximate undrained shear strength of clayey soils. The torvane apparatus consists of a torque device with a small diameter plate that has vanes situated perpendicular to the plate. The vanes are pushed into the soil and torque is applied until failure occurs. The torque required to cause failure is converted to approximate undrained strength of the soil.

LOG OF BORING NO. 1 ELEVATION: +2750'													
EQUIPMENT USED: Pressure Driller (9" diameter auger) DEPTH OF BORI							BORING	NG (FT.): 22.5					
DAT	E DR		: 10-15-96				DEPTH TO	GROUNI	)WAT	ER: N	I/A		
DEPTH (FT.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION		BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT 1% OF DRY WT 1		TORVANE STRENGTH ITSP	-
0		MH	clayey SILT (volcanic ash); few roots	T		light brown	si. moist to moist	soft					
2-		l d	no roots					mod. stiff	28	80.8	2.75		
		li	less ashy		ļ	brown	moist	very stiff	43	63.7	4.50	1.73	
4 -	<b>!</b>		with cobbles and gravel					stiff					-
6 –			no cobbles or gravel			light brown			56	47.6	4.50	2.25	-
8 -		(RX)	BASALTIC ROCK			gray		mod. hard rock					grade of
10 -		(CLK)	CLINKERS					dense					:
12 - 14 -													·
16 -													
18											- 1		••••
20 -		(RX)	BASALTIC ROCK	$-\parallel$			·	soft rock					246 : 
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PROJE	CT N	o.: M-2	682-F						CORPORA Kel Consul		<u> </u>		

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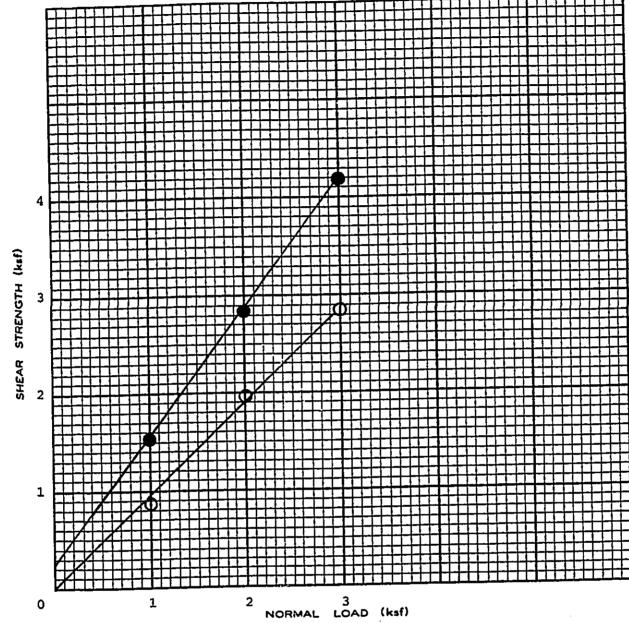
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## DIRECT SHEAR TEST



	LOCATION	DEPTH (ft.)	COHESION (psf)	ANGLE OF	TEST CONDITIONS
~	B-1, S-2	2.5'	250	53°	Field Density - Peak Strength
$\frac{1}{c}$	B-1, S-2	2.5'	0	44°	Field Density - Residual Strength
<u> </u>					

	SECURET NO	TO INTERNATIONAL	PLATE
PROJECT: WAIOHULI SUBDIVISION RESERVOIR SZ-3	N-3603-E	SOILS INTERNATIONAL 99-1255 WAIUA PLACE AIEA, HAWAII 96701	4
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SOILS INVESTIGATION REPORT SERVICE ZONE NO. 4

## REPORT SOILS INVESTIGATION

PROPOSED RESERVOIR
WAIOHULI SUBDIVISION SERVICE ZONE 4
KULA, MAUI, HAWAII

for

R. T. TANAKA ENGINEERS, INC. Engineers

Project No. H-2683-F September 24, 1996



99-1255 Waiua Place Aiea, Hawaii 96701 Phone: (808) 488-0433 Fax: (808) 488-9535

335 Hoohana Street Building 7, Unit O Kahului, Maui, Hawaii 96732 Phone: (808) 877-3789 Fax: (808) 871-1592

99-1255 WAIUA PLACE, AIEA, HAWAII 96701

(808) 488-0433 FAX (808) 488-9535

September 24, 1996 Project No. M-2683-F

R. T. Tanaka Engineers, Inc. 871 Kolu Street, Suite 201 Wailuku, Maui, Hawaii 96793

Attention:

Mr. Kirk Tanaka, P.E.

Gentlemen:

The attached report presents the results of a soils investigation for the proposed Waiohuli Subdivision Reservoir at Service Zone 4 in Kula, Maui, Hawaii.

A summary of the findings is as follows:

- 1) The subsurface conditions at the site were explored by drilling 1 test boring to a depth of 13 feet below existing grade. The boring revealed moderately stiff to stiff, light brown clayey to a depth of 3 feet, followed by hard, gray BASALTIC ROCK to a depth of 7.5 feet. Below the BASALTIC ROCK, dense, gray CLINKERS were found to a depth of 10 feet, followed by hard, gray BASALTIC ROCK to the final depth of the boring at 13 feet.
- 2) Groundwater was not encountered in the boring at the time of the field investigation.
- Based on the findings and observations of this investigation, the reservoir foundation may bear on the underlying dense CLINKERS, underlying hard BASALTIC ROCK, or properly compacted fill.
- The upper moderately stiff to stiff clayey SILT is not suitable bearing material. Footings should either be deepened to the underlying rock or clinker layer, or the upper clayey SILT layer shall be removed and then be replaced with properly compacted fill.
- 5) Excavations are susceptible to caving at the clinker layer. Provisions shall be made to protect the excavations from caveins.

R. T. Tanaka Engineers, Inc. September 24, 1996 Page Two

Details of the findings and recommendations are presented in the attached report.

This investigation was made in accordance with generally accepted engineering procedures and included such field and laboratory test considered necessary for the project. In the opinion of the undersigned, the accompanying report has been substantiated by mathematical data in conformity with generally accepted engineering principles and presents fairly the design information requested by your organization. No other warranty is either expressed or given,

Respectfully submitted,

SOILS INTERNATIONAL

Lawrence S. Shinsato, P.E.

Vice-President

LSS:BHH:bh

This work was prepared by me or under my supervision.

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No. 4169-C

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#### TABLE OF CONTENTS

	<u>Page</u>
INTRODUCTION	1
SCOPE OF WORK	1
PLANNED DEVELOPMENT	1
SITE CONDITIONS	2 2 2 3
CONCLUSIONS AND RECOMMENDATIONS	4 4 4 6 6 7 7
INSPECTION	10
REMARKS	10
VICINITY MAP Plate	1
PLOT PLAN Plate	2
APPENDIX Field Investigation Laboratory Testing Log of Test Boring	

#### INTRODUCTION

This investigation was made for the purpose of obtaining information on the subsurface conditions from which to base recommendations for the proposed Waiohuli Subdivision Reservoir for Service Zone 4 to be located in Kula, Maui, Hawaii. The location of the site, relative to the existing streets and landmarks, is shown on the Vicinity Map, Plate 1.

#### SCOPE OF WORK

The services included drilling 1 test boring to a depth of 13 feet below existing grade, obtaining samples of the underlying soils, conducting laboratory tests on representative samples, and performing an engineering analysis to determine foundation design parameters. The following information is provided for use by the Architect and/or Engineer:

- 1. General subsurface conditions, as disclosed by the boring.
- 2. Physical characteristics of the soils encountered.
- 3. Recommendations for foundation design, including bearing values, embedment depth and estimated settlement.
- 4. Recommendations for placement of fill and backfill.
- 5. Special design considerations.

#### PLANNED DEVELOPMENT

From the information provided, the project will consist of constructing a 54-foot diameter, 0.3 million gallon water reservoir

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for a subdivision in Service Zone 4. Finished floor elevation for the reservoir will be at +2355.00'.

#### SITE CONDITIONS

#### Surface

The property is located at the northwest side of Kula Highway, about 4500 feet from the highway. The project site is heavily vegetated with trees and plants.

Existing surface elevations (according to the Grading and Drainage Plan provided) range from approximately +2355' at the northwest side of the proposed reservoir to +2367' at the southeasterly side of the site.

#### Subsurface

The subsurface conditions at the site was explored by drilling 1 test boring to a depth of 13 feet below existing grade at the location shown on the Plot Plan, Plate 2. A detailed log of the boring is presented in the Appendix to this report.

The boring revealed moderately stiff to stiff, light brown clayey SILT to a depth of 3 feet, followed by hard, gray BASALTIC ROCK to a depth of 7.5 feet. Below the BASALTIC ROCK, dense, gray CLINKERS were found to a depth of 10 feet, followed by hard, gray BASALTIC ROCK to the final depth of the boring at 13 feet.

Groundwater was not encountered in the boring at the time of the field investigation.

From the USDA Soil Conservation Service "Soil Survey of the Islands of Kauai, Oahu, Maui, Molokai and Lanai, State of Hawaii", the site is located in an area classified as Kamaole verly stony silt loam, 3 to 15 percent slopes (KGKC). This series consists of well-drained soils on uplands that developed in volcanic ash (USDA, 1972, Plate 108, p. 59).

#### Geology

The site is located on the southwesterly flank of the Haleakala Volcano. The development of the island above sea level is believed to have occurred between later Pliocene and Pleistocene time (approximately 1 and 12 million years ago). Haleakala was built over three rift zones that trend north, southwest and east. These rift zones are studded with large cinder cones. The lava flows making up the main mass of the mountain is known as the Honomanu volcanic series which consist of thin-bedded pahoehoe and aa lava flows.

Above the Hononamu volcanics is the Kula volcanic series which consist of thicker andesitic aa flows. Most of the lava flows dip about 12 degrees. Along the southwest and east rift zones only, the volcano is capped with the Hana volcanic series (Stearns, 1966).

## CONCLUSIONS AND RECOMMENDATIONS

#### General

Based on the findings and observations of this investigation, the reservoir foundation should bear on the underlying hard ROCK, dense CLINKERS, or on properly compacted fill.

## Special Consideration

- the moderately stiff to stiff clayey SILT is not suitable bearing material. Footings should either be deepened to the underlying rock or clinker layer, or the upper clayey SILT should be removed and if necessary to obtain finished grade, be replaced with properly compacted fill.
- 2) Excavations are susceptible to caving at the clinker layer. Provisions shall be made to protect the excavations from caveins.

#### Foundation Design

An allowable soil bearing value of 3,000 pounds per square foot may be used for footings bearing on the on-site underlying dense CLINKERS, or on properly compacted fill. The minimum footing embedment depth shall be 18 inches below lowest adjacent finished grade.

An allowable rock bearing value of 20,000 pounds per square foot may be used for footings bearing on the hard BASALTIC ROCK.

For footings located adjacent to utility trenches, the bottom of the footing shall be deepened below a 1 horizontal to 1 vertical plane projected upwards from the edge of the utility trench.

For footings located on or adjacent to slopes, the footing shall be deepened such that there is a minimum horizontal distance of 5 feet from the edge of the footing to the slope face.

Where new footings are to be located adjacent to retaining walls or other structural elements which are not designed for surcharge loading, the new footing shall be deepened below a 45 degree plane projected upwards from the adjacent structure.

The bearing values are for dead plus live loads and may be increased by one-third for momentary loads due to wind or seismic forces. If any footing is eccentrically loaded, the maximum edge pressure shall not exceed the bearing pressure for permanent or for momentary loads.

All loose and disturbed soil at the bottom of footing excavations shall be removed to firm soil or the disturbed soil shall be compacted prior to laying of steel or pouring of concrete.

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#### Settlement

Under the fully applied recommended bearing pressure, it is estimated that the total settlement of foundation will be less than 1/2 inch.

Differential settlement between footings will vary according to the size and bearing pressure of the footing.

#### Lateral Resistance

For resistance of lateral loads, such as wind or seismic forces, an allowable passive earth resistance equivalent to that exerted by a fluid weighing 300 pounds per cubic foot may be used for footings, or other structural elements, provided the vertical surface is in direct contact with undisturbed soil or properly compacted fill.

Frictional resistance between footings and slabs, and the underlying soils may be assumed as 0.4 times the dead load for the on-site dense CLINKERS or properly compacted structural fill, and 0.7 times the dead load for the underlying hard BASALTIC ROCK.

Lateral resistance and friction may be combined.

#### Slab-on-Grade

For design of concrete slabs-on-grade, a modulus of subgrade reaction of 300 pci may be used for the on-site soils, or imported

select granular material (see Site Preparation and Grading section to this report).

It is recommended that the subgrade soil be prepared in accordance with the Site Preparation and Grading section to this report.

#### Slopes

Permanent fill and cut slopes of soil type materials shall not exceed 2 horizontal to 1 vertical.

Cut slopes into the underlying hard BASALTIC ROCK may be made at 1 horizontal to 2 vertical.

Exposed soil slopes shall be covered as soon as practical after construction to minimize erosion.

Fill slopes shall be constructed by either overfilling and cutting back to compacted soil, or the slope shall be track-rolled.

#### Site Preparation and Grading

It is recommended that the site be prepared in the following manner:

1. In areas to receive fill and beneath structural and pavement areas, all vegetation, weeds, brush, roots, stumps, rubbish, debris, and other deleterious material shall be removed from the site.

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If the foundations for the structure are not deepened to bear on the underlying ROCK or CLINKER, the existing clayey SILT shall be removed and if necessary to obtain finished grade, shall be replaced with properly compacted fill.

- 2. The exposed surface shall then be scarified to a depth of 6 inches, moisture conditioned to near optimum moisture content (ASTM D1557-91), and then compacted to the degree of compaction indicated below. If encountered, loose or soft areas shall be removed to firm material and the resulting depression shall be filled with properly compacted fill.
- 3. Fill and backfill material shall consist of soil which is free of organics, debris and expansive clayey material. The material shall be less than 3 inches in greatest dimension. Imported structural fill and backfill material shall contain no more than 20% fines (passing the #200 sieve).

The on-site clayey SILT is <u>not</u> suitable for use as fill and backfill.

4. Fill and backfill shall be placed in lifts not exceeding 8 inches in loose thickness. Prior to placing, the material shall be aerated or moistened to near optimum moisture content (ASTM D1557-91 test procedure).

Where fill is placed on existing ground that is steeper than 5 horizontal to 1 vertical, the existing ground surface shall be benched into firm soil as the fill is placed.

- 5. In the upper 2 feet from finished subgrade, each layer of structural fill and backfill (under and 3 feet beyond the edges of structures and pavements) shall be thoroughly compacted to at least 95 percent of the maximum dry density (ASTM D1557-91). All other fill and backfill shall be compacted to at least 90 percent relative compaction (ASTM D1557-91).
- 6. Drainage shall be provided to minimize ponding of water. Ponded areas shall be drained immediately or water pumped out without damaging adjacent structures and property. If water accumulation softens the subgrade materials, the affected soils shall be removed and replaced with properly compacted fill.
- 7. Footing excavations shall be cleaned of loose material that has fallen into the excavation prior to pouring of concrete.

It is particularly important to see that all backfill soils are properly compacted especially if these are designed to resist lateral forces.

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#### INSPECTION

During the progress of construction, so as to evaluate compliance with the design concepts, specifications and recommendations contained in this report, a representative from this office should be present to observe the following operations:

- 1. Site preparation.
- 2. Placement of fill and backfill.
- Footing excavations.

#### REMARKS

The conclusions and recommendations contained herein are based on the findings and observations made at the boring location. For the purpose of providing geotechnical design information, conditions beyond the boring are assumed to be similar to those found in the boring location. If conditions are encountered during construction which appear to differ from those disclosed by the boring, this office shall be notified so as to consider the need for modifications.

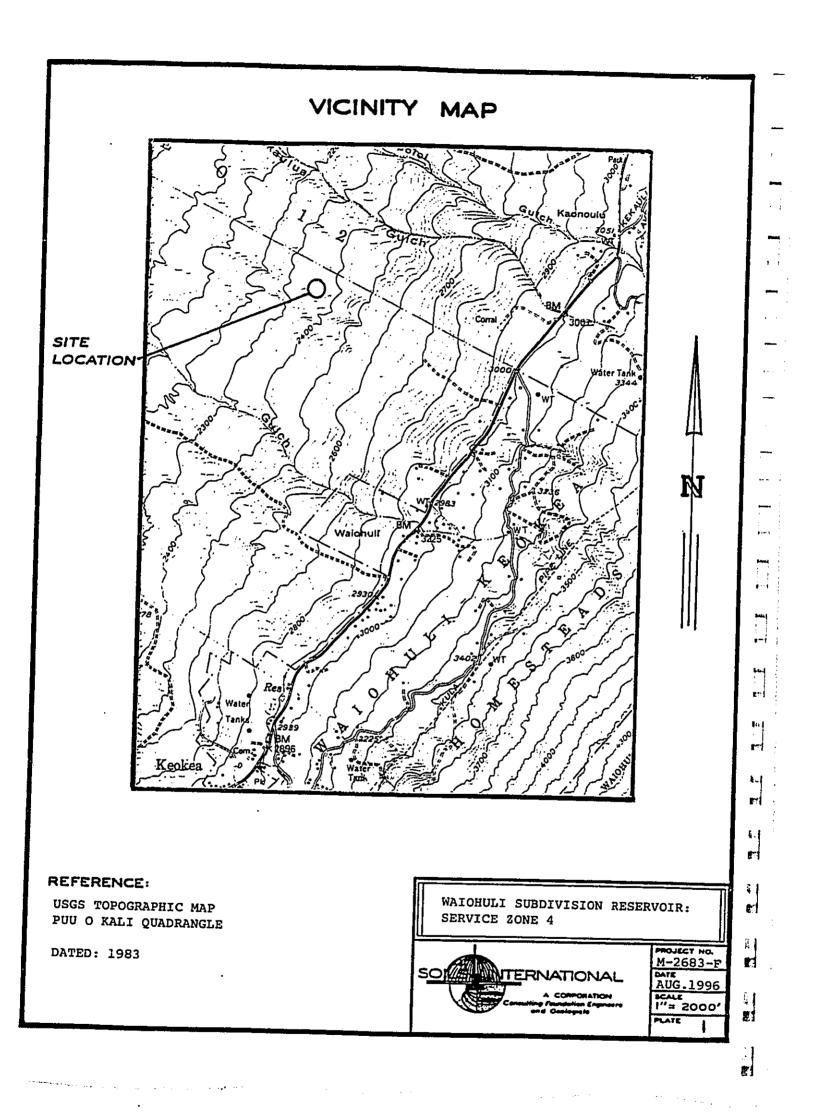
This report has been prepared for the exclusive use of R. T. Tanaka Engineers, Inc., and their respective design consultants. It shall not be used by or transferred to any other party or to another project without the consent and/or thorough review by this facility. Should the project be delayed beyond the period of one year from the

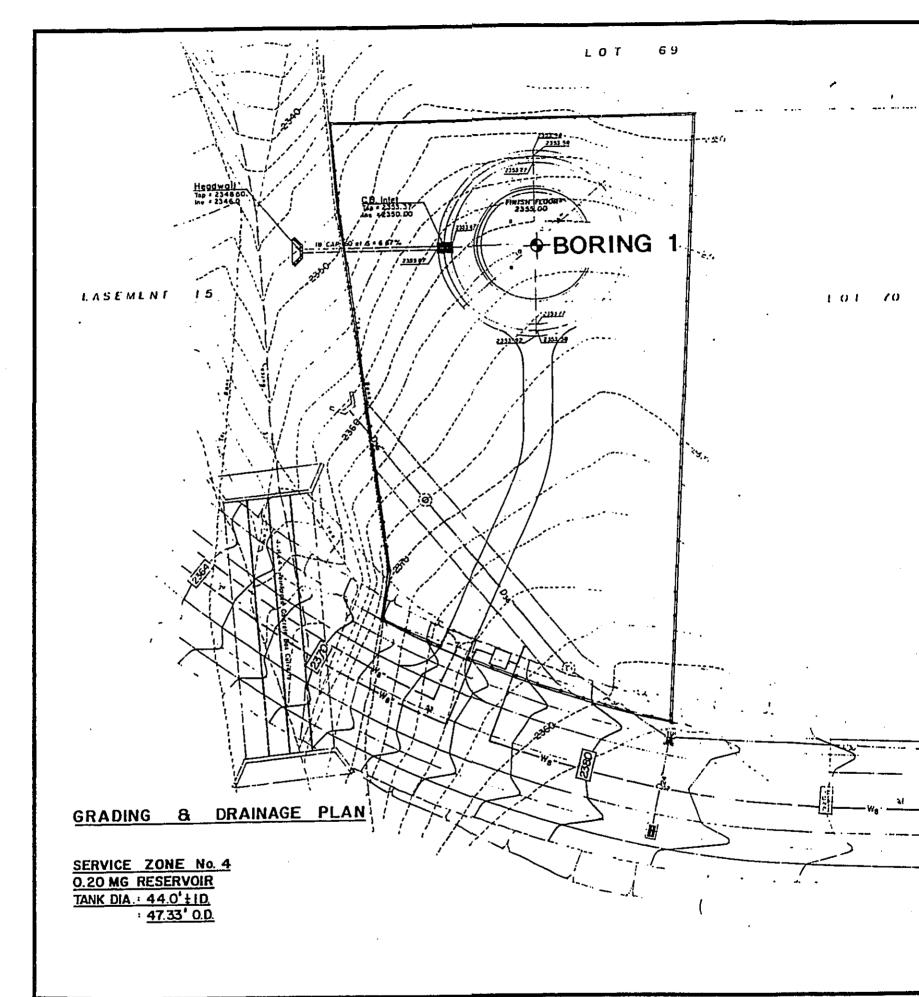
date of this report, the report shall be reviewed relative to possible changed conditions.

Samples obtained in this investigation will deteriorate with time and will be unsuitable for further laboratory tests within one (1) month from the date of this report. Unless otherwise advised, the samples will be discarded at that time.

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Log of Boring





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Note:

Existing contours, roodway improvements and roadway finish grades (contours) as shown have been token from Construction Plans for "KULA RESIDENCE LOTS, UNIT 1", at Waiohuli, Kula, Maui, Hawaii for the Department of Hawaiian Hame Lands, State of Hawaii by Austin, Tsutsumi & Associates.



F	LOT	PLAN				
CALE: 1"=40'	APPROVED BY:		DRAWN BY			
ATE: AUG., 1998			REVISED			

WAIOHULI SUBDIVISION RESERVOIR: SERVICE ZONE 4

SOILS INTERNATIONAL PROJECT NO. M-2683-F

Plate 2

## <u>APPENDIX</u>

FIELD INVESTIGATION AND LABORATORY TESTING

#### FIELD INVESTIGATION

#### General

The field investigation consisted of performing explorations at the locations shown on the Plot Plan. The method used for the exploratory work is shown on the respective exploration log. A description of the various method or methods used is presented below.

#### Test Borings Using Truck-Mounted Drilling Equipment

Truck-mounted borings are drilled using a gas-powered drilling rig. The hole is advanced using continuous flight augers, wash boring and/or NX coring.

Auger drilling is used in soils where caving does not occur. The augers are 4-1/2 inch diameter continuous helical flight augers with the lead auger having a head equipped with changeable cutting teeth. Soil cuttings are brought to the surface by the continuous flights. After the bore hole is advanced to the required depth and cleaned of cuttings by additional rotation of the augers, the augers are retracted for soil sampling or in-situ testing.

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#### California Bearing Ratio Test

California Bearing Ratio (CBR) tests are performed on materials to determine the bearing strength of the soil for determination of pavement sections. The sample is compacted into a 6-inch diameter mold in 5 equal layers. Each layer is compacted with a 10-pound hammer falling from a height of 18-inches, with each layer receiving 56 blows. The mold is then placed in a water bath for 4-days and the vertical swell is measured under a surcharge weight of 10 pounds. After the soaking period, the sample is placed in a CBR apparatus that has a 3-square inch penetrometer. The penetrometer is pressed vertically into the soil at constant strain and the loads required to press the penetrometer are recorded. A plot of the load-strain relationship is made to determine the CBR value.

#### LABORATORY TESTING

#### <u>General</u>

Laboratory tests are performed on various soil samples to determine their engineering properties. Description of the various tests are listed below.

#### Unit Weight and Moisture Content

The in-place moisture content and unit weight of the samples are used to correlate similar soils at various depths. The sample is weighed, the volume determined, and a portion of the sample is placed in the oven. After oven-drying, the sample is again weighed to determine the moisture loss. The data is used to determine the wet-density, dry-density and in-place moisture content.

#### <u>Direct Shear</u>

Direct shear tests are performed to determine the strength characteristics of the representative soil samples. The test consists of placing the sample into a shear box, applying a normal load and then shearing the sample at a constant rate of strain. The shearing resistance is recorded at various rates of strain. By varying the normal load, the angle of internal friction and cohesion can be determined.

#### Consolidation Test

Consolidation tests are performed to obtain data from which time rates of consolidation and amounts of settlement may be estimated. The test is performed by placing a specimen in a consolidation apparatus. Loads are applied in increments to the circular face of a one (1) inch high sample. Deformation or changes in thickness of the specimen are recorded at selected time intervals. Water is introduced to or allowed to drain from the sample through porous disks placed against the top and bottom faces of the specimen. The data is then used to plot a stress-volume strain curve which is used in estimating settlement.

## Maximum Dry Density/Optimum Moisture Content

The maximum dry density and optimum moisture content of the material is determined in accordance with the ASTM D1557-78 test procedure. The sample is compacted into a mold in 5 equal layers using a 10 pound hammer falling from a height of 18 inches. The diameter of the mold is either 4-inches or 6-inches depending on the proportion of gravel in the sample. The sample is compacted at various moisture contents to develop a compaction curve for the soil. The curve is usually bell-shaped with a peak indicating the maximum dry density and optimum moisture content.

#### Penetrometer Test

Penetrometer tests are performed on clayey soils to determine the consistency of the material and an approximate value of the unconfined compressive strength.

#### Torvane

Torvane tests are used to determine the approximate undrained shear strength of clayey soils. The torvane apparatus consists of a torque device with a small diameter plate that has vanes situated perpendicular to the plate. The vanes are pushed into the soil and torque is applied until failure occurs. The torque required to cause failure is converted to approximate undrained strength of the soil.

LO	G O	F BO	RING NO. 1				ELEVATIO	ON: +236	52'			ĺ
EQUIPMENT USED: SIMCO 2400 Drilling Rig						DEPTH OF BORING (FT.): 13						
DATE DRILLED: 8-9-96							DEPTH TO GROUNDWATER: N/A					
рертн (гт.)	GRAPHIC SYMBOL	UNIFIED SOIL CLASSIFICATION	DESCRIPTION		SAMPLE BLOWS/FOOT	COLOR	MOISTURE	CONSISTENCY	DRY DENSITY (PCF)	MOISTURE CONTENT 1% OF DRY WT.)	PENETROMETER (TSF)	TORVANE STRENGTH (TSF)
2 -		МН	clayey SILT; with sand, few gravel and roots		12 10/6"	light brown	al. moist	mod. stiff stiff	58	29.9		
4 -		(RX)	BASALTIC ROCK; fractured, vesicular Coring Times 3.5'-7.5' 8.25 min - 1st foot 7.25 min - 2nd foot 12.5 min - 3rd foot 6.25 min - 4th foot			gray		hard rock				
8-		(CLK)	Recovered = 4.00 feet RQD Length = 4.00 feet RQD (%) = 100%  CLINKERS Coring Times 7.5'-10' 1.00 min - 1st foot					dense				
10 -		(RX)	3.00 min - 1st 166t 3.00 min - 2nd foot 4.00 min - 7'-7.5'  Recovered = 1.17 feet RQD Length = 0 RQD (%) = 0%  BASALTIC ROCK; fractured, vesicular	/				hard rock				
12 -			Coring Times 10'-13' 4.00 min - 1st foot 6.25 min - 2nd foot 2.50 min - 3rd foot  Rocovered = 1.83 feet ROD Length = 1.50 feet								-	_
16 -			RQD (%) = 50% END OF BORING									
18 -												
20 -						į						
PROJ	ECT NA	AME: W	/AIOHULI SUBDIVISION ESERVOIR SZ-4				sol	TERNA	TION	AL	PLAT	E
PROJ	ECT NO	o.: M-2	1683-F					Georeck	A CORPOR			

**BOTANICAL SURVEY** 

# BOTANICAL SURVEY DHHL KULA RESIDENTIAL LOT, UNIT 1 KULA, MAKAWAO DISTRICT, ISLAND OF MAUI

bу

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Prepared for: Munekiyo & Arakawa, Inc.

October 1994

## TABLE OF CONTENTS

	<u>page</u>
INTRODUCTION	1
SURVEY METHODS	2
DESCRIPTION OF THE VEGETATION	3
Black Wattle Forest	4
Lantana-Cactus Scrub	5
Gulch Vegetation	6
DISCUSSION AND RECOMMENDATIONS	7
LITERATURE CITED	10
PLANT SPECIES LIST	12

## BOTANICAL SURVEY DHHL KULA RESIDENTIAL LOT, UNIT 1 KULA, MAKAWAO DISTRICT, ISLAND OF MAUI

#### INTRODUCTION

The ±655-acre Department of Hawaiian Home Lands (DHHL) project site, TMK: 2-2-02: 56, is found on the northwest slope of Hale-akala, near Keokea. The property is bounded to the east by Kula Highway, and on the remaining three sides primarily by undeveloped lands used for pasture. Elevation on the property ranges from about 1,800 ft. along the lower, makai boundary to roughly 3,000 ft. along the upper, mauka boundary where it abuts the Kula Highway. Annual rainfall is about 15 inches on the lower one-quarter of the property, increasing gradually as one moves upslope to 30 inches per year on the upper section.

Only about two-thirds of the project site are planned for residential development. This upper portion of the property is the most suitable for the proposed land use. The climatic conditions are pleasant, with temperatures ranging from the low 60's to the mid-80's, rainfall from 20 to 30 inches annually, and the soil conditions favorable. The site offers spectacular views of the Maui isthmus and the West Maui mountains beyond (Woolsey, Miyabara & Associates 1983).

Field studies to assess the botanical resources found on the DHHL project site were conducted on 08 and 22 to 23 September 1994. The primary objectives of the field studies were to:

- 1) provide a description of the major vegetation types;
- 2) inventory the flora; 3) search for threatened and endangered

species as well as rare and vulnerable plants; and 4) identify areas of potential environmental problems or concerns and propose appropriate mitigation measures.

#### SURVEY METHODS

Prior to undertaking the field studies, a search was made of the pertinent literature to familiarize the principal investigator with other botanical studies conducted in the general area. Topographic maps and recent black and white aerial photographs were examined to determine vegetation cover patterns, terrain characteristics, access, boundaries, and reference points.

Access was from the Kula Highway and then onto the main jeep road which runs the length of the property, following along the southern boundary near Waiohuli Gulch. From the main jeep road, a number of smaller side roads and bulldozer tracks can be accessed. A less well traveled jeep road on the northern portion of the property is found off of the dirt road which provides access to several privately-owned landlocked parcels.

A walk-through survey method was used. The less disturbed areas such as the larger gulches were more intensively surveyed as such areas are more likely to harbor native plant communities, and, perhaps, rare species. Notes were made on plant associations and distribution, substrate types, topography, exposure, grazing damage, drainage, etc. Plant identifications were made in the field; plants which could not be positively identified were collected for later determination in the harbarium, and for comparison with the most recent taxonomic literature.

The species recorded are indicative of the season ("rainy" vs.
"dry") and the environmental conditions at the time of the survey.
A survey taken at a different time of the year and under varying

environmental conditions would no doubt yield slight variations in the species list, especially of the weedy, annual plants.

#### DESCRIPTION OF THE VEGETATION

An earlier archaeological survey (PHRI 1989) included a very short description of the vegetation observed on the project site, then identified as the Waiohuli parcel. Black wattle forests dominated the eastern half of the parcel, while lantana and prickly pear cactus were codominate on the lower western half. A recent botanical reconnaissance assessment (Char 1994) of the lands immediately north of the study site for a proposed waterline which will serve the residential lot also described similar vegetation types in more detail.

The black wattle forest occurs on the upper section of the project site from about the 2,350-foot elevation contour up to the highway. The forest is more or less confined to Kula cobbly loam, 12% to 20% slopes, identified as "KxaD" on the soil maps (Foote et al. 1972). These are well-drained, dark reddish-brown soils found on uplands and derived from ash over pahoehoe bedrock. The lantana-cactus scrub occurs on soils mapped as "KGKC", Kamaole very stony silt loam, 3% to 15% slopes; these are dark brown to dark reddish-brown soils derived from ash over fragmental 'a'a substratum, with 'a'a outcroppings sometimes common.

These two vegetation types along with the gulch vegetation are described in more detail below. A list of all the plant species inventoried on the project site during the field studies is presented at the end of the report.

#### Black Wattle Forest

Black wattle (<u>Acacia mearnsii</u>), a native of Australia, forms a somewhat dense forest cover on the cooler, wetter, upper sections of the property, from the highway at about 3,000 ft. elevation down to about the 2,350-foot contour. The forest occurs on deep, well-developed soils. In many places, the forest appears to have been bulldozed at one time, and large stands of black wattle trees have resprouted from root suckers. In these areas, the trees are about the same size and age; the trees are mostly 18 to 25 ft. tall with trunk diameters 3 to 6 inches. Scattered through this vegetation type are mounds or piles of boulders, rubble, and trunks of larger black wattle trees. Lantana shrubs (<u>Lantana camara</u>) are locally common on these bulldozed piles and also within the small, shallow gullies.

Kikuyu grass (Pennisetum clandestinum), a native of Africa, forms somewhat low mats, about 6 inches tall, between the trees and in open areas. The cattle found throughout the property keep most of the grasses and other smaller species cropped low. Where the tree cover becomes denser, kikuyu grass may be replaced by two more shade-tolerant grass species; these are meadow ricegrass (Ehrharta stipoides) and a Panicum species. Other grasses found on this cooler upland section include a number of temperate species such as wild oat (Avena fatua), soft chess (Bromus mollis), ripgut grass (Bromus rigidus), and barley (Hordeum leporinum).

...:

Seedlings of weedy, annual species and other grasses are common along the old bulldozer tracks which criss-cross the property and along the jeep roads. These include bristly foxtail grass (Setaria verticillata), peppergrass (Lepidium virginicum), keeled goosefoot (Chenopodium carinatum), Bermuda grass (Cynodon dactylon), hairy abutilon (Abutilon grandifolium), Galinsoga parviflora, owi (Stachytarpheta dichotoma), and bull thistle (Cirsium vulgare).

A few of the black wattle trees along the lower edges of the forest, where it interfaces the lantana-cactus scrub, have died back. The curled, brown leaves and seed pods still hang from the branches, suggesting, perhaps, that the trees died of drought stress.

#### Lantana-Cactus Scrub

. . . .

This vegetation type is found at about the 2,350-foot elevation and continues downslope to the project's boundary and beyond. Basically, it consists of dense patches of lantana, a thorny shrub 3 to 6 ft. tall, and clumps of prickly pear cactus or panini (Opuntia ficus-indica), 8 to 12 ft. tall. The lantanacactus cover is roughly 50 to 60%. A mixture of grasses and smaller, mostly weedy species fills in the matrix between the prickly scrub cover. Surveying can become difficult in the areas where the cactus plants are dense.

Two variants of the lantana-cactus scrub can be recognized in the field. The first variant is lantana-cactus scrub with scattered black wattle trees. This variant is found between the 2,350-foot elevation and the 2,000-foot elevation. Trees of black wattle are found as scattered stands among the lantana and cactus. The black wattle trees tend to occur in the shallow gullies and other low-lying areas where it may be somewhat moister. Pitted beardgrass (Bothriochloa pertusa), molasses grass (Melinis minutiflora), and Natal redtop (Rhynchelytrum repens) are the most abundant grasses. Kikuyu grass becomes uncommon, probably because of the drier conditions.

The black wattle trees thin out as one moves downslope and become uncommon at the 2,000-foot contour; rainfall below this elevation is about 15 inches per year. The second scrub variant, lantanacactus with kiawe (Prosopis pallida) trees is found from here on

down. In places, the kiawe cover is 30 to 40%, but lantana and cactus are still abundant. The grass cover changes primarily to buffel grass (Cenchrus ciliaris) with smaller patches of pitted beardgrass. This lower section is drier and the vegetation more heavily grazed. Rocky outcroppings become common. The native wiliwili tree (Erythrina sandwicensis), with flower colors ranging from pale apple green to coral, is locally common in some areas along the lower boundary.

Smaller weedy herbaceous components commonly observed in the lantana-cactus scrub include hedge mustard (<u>Sisymbrium officinale</u>), peppergrass, hairy abutilon, cheeseweed (<u>Malva parviflora</u>) -- which is more abundant during the wetter months, keeled goosefoot, and false mallow (<u>Malvastrum coromandelianum</u>).

Among the smaller shrubs or subshrubs encountered are the native 'uhaloa (Waltheria americana) and 'ilima (Sida fallax). One 'ulei shrub (Osteomeles anthyllidifolia), about 7 ft. tall, is found at the interface between black wattle forest and lantanacactus scrub on a rocky outcropping. 'Ulei is an indigenous species belonging to the rose family. The hard wood was made into 'o'o or digging sticks, fish spears, and a musical instrument, the 'ukeke. The long slender flexible branches were bent into hoops for fish nets (Wagner et al. 1990).

#### Gulch Vegetation

The project site includes a portion of the Waiohuli Gulch on its southern periphery. The gulch has been eroded down to bedrock in most places, and there are large boulder-strewn areas along the dry streambed. Also occasional are a few "dry fall" areas where the streambed plunges over a steep face or overhang.

This gulch and also some parts of the smaller unnamed gulch on

the northern portion of the property remain wetter during most of the year, and thus provide a moister habitat for plants. Gulch vegetation on the project site typically consists of dense clumps of Guinea grass (Panicum maximum), from 3 to 5 ft. tall, with scattered stands of Chinaberry trees (Melia azedarach). In places, lantana shrubs form dense, prickly patches. There are extensive groves of large wiliwili trees on the lower sections of Waiohuli Gulch.

The steep gulch walls and "dry fall" sections of the streambed are damp and remain shaded during parts of the day. Thus, it is not uncommon to find small tussocks of mosses and light green-colored patches of <u>Dumotiera</u>, a thalloid liverwort, on the damp soil. Almost all the ferns found during the survey occur within the gulch areas. Other species observed only in these moister habitats include Mauritius hemp (<u>Furcraea foetida</u>), 'ape (<u>Alocasia macrorrhiza</u>), tarweed (<u>Cuphea cathagenensis</u>), four-o'clock (<u>Mirabilis jalapa</u>), 'ilihe'e (<u>Flumbago zeylanica</u>), and pamakani (<u>Ageratina riparia</u>).

Many of the plants found on the cooler upland portions of the property extend further downslope, following along the bottoms of the moist gulches. These include small patches of a very thorny blackberry species (Rubus sp.), honohono (Commelina diffusa), montbretia (Crocosmia X crocosmiiflora) -- an escaped ornamental member of the iris family, meadow ricegrass, jacaranda (Jacaranda mimosifolia), castor bean (Ricinus communis), etc.

#### DISCUSSION AND RECOMMEDATIONS

The vegetation on the DHHL Kula Residential Lot, Unit 1, is dominated primarily by introduced or alien species. The property is presently used to graze cattle, so much of the vegetation has been browsed. There are also axis deer and feral pigs on the

property. In addition, parts of the site have been bulldozed in the past, probably to control black wattle, lantana, and prickly pear cactus, and to improve pasturage for the cattle. The upper three-quarters of the property where the proposed lots will be developed appear to be the most heavily disturbed.

Certain areas do support native species. These are the larger gulches which cross the property, especially Waiohuli Gulch, and the lower section of the property where there are stands of wiliwili trees. These areas were more intensively surveyed. Several rare native species are known to occur in the area around Pu'u o Kali, between 600 and 1,400 ft. elevation (Cuddihy and Stone 1990).

Of a total of 112 plant species inventoried on the property, 95 (85%) are introduced or alien species, 2 (2%) are originally of Polynesian introduction, and 15 (13%) are native. Of the natives, 12 are indigenous, that is, they are native to the Hawaiian Islands and elsewhere, and 3 are endemic, that is, they are native only to the Hawaiian Islands. The endemic species are the kumu-niu fern (Doryopteris decipiens), wiliwili (Erythrina sandwicensis), and the native poppy or pua-kala (Argemone glauca).

None of the plants is a listed, proposed or candidate threatened and endangered species (U.S. Fish and Wildlife Service 1990, 1992, 1994). None of the plants is considered rare or vulnerable (Wagner et al. 1990). All of the plants can be found in similar environmental habitats throughout the Hawaiian Islands.

Given the findings above, the proposed development should not have a significant negative impact on the botanical resources. It is recommended, however, that areas disturbed by construction activities be revegetated as soon as possible to prevent soil

loss and erosion gullying. Native species found on the site and nearby areas should be considered for landscaping. These species are adapted to the local conditions and would require less water. Some material recommended for landscaping include wiliwili, 'ulei, 'ilihe'e, and 'ilima. There are several interesting flower color forms of the wiliwili already on the project site.

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#### PLANT SPECIES LIST -- DHHL Kula Residential Lot

A checklist of all those vascular plant species inventoried on the project site during the field studies is presented below. The species are arranged alphabetically by families within each of three groups: Ferns and Fern Allies, Monocots, and Dicots. The taxonomy of the Ferns and Fern Allies follow Lamoureux (1988), while the flowering plants, Monocots and Dicots, are in accordance with Wagner et al. (1990).

For each species, the following information is provided:

- 1. Scientific name with author citation.
- 2. Common English and/or Hawaiian name(s), when known.
- 3. Biogeographic status. The following symbols are used:
  - E = endemic = native only to the Hawaiian Islands.
  - I = indigenous = native to the Hawaiian Islands and also elsewhere throughout the Pacific.
  - P = Polynesian = plants originally of Polynesian introduction prior to Western contact (Cook's discovery of the islands in 1778); not native.
  - X = introduced or alien = all those plants brought to the islands by humans, intentionally or accidentally, after Western contact; not native.
- 4. Presence (+) or absence (-) of a particular species within each of three vegetation types recognized on the project site (see text for discussion):

bwf = Black Wattle Forest

1-c = Lantana-Cactus Scrub

g = Gulch Vegetation

Scientific name		ı	Vegeta	Vegetation type	cype
	Common Hame	Status	bwf	1-c	60
FERNS & FERN ALLIES					
ADIANTACEAE (Maidenhair Fern Family) Adiantum hispidulum Sw. Adiantum raddianum Pres1	Australian maidenhair maidenhair fern	××	1 1	1 1	+ +
BLECHNACEAE (Blechnum Family) Blechnum occidentale L.	blechnum	: ×	,	: I	+ +
HEMIONITIDACEAE (Gold Fern Family) Pityrogramma calomelanos (L.) Link	silver fern	×	ł	ı	- 4
NEPHROLEPIDACEAE (Sword Fern Family) Nephrolepis multiflora (Roxb.) Jarrett ex Morton	hairy sword fern	×	1		-
ට PSILOTACEAE (Whisk Fern Family) Psilotum nudum (L.) Beauv.	moa, pipi	<b>:</b> ⊢		<b>I</b> 1	<b>⊦</b> -
SINOPTERIDACEAE (Cliffbrake Family) Doryopteris decipiens (Hook.) J. Sm.	kumu-niu, manawahua,	ı		1	<b>-</b>
Pellaea ternifolia (Cav.) Link	'iwa'iwa kalamoho, lau-kahi	떠	+ 1	1	+ +
THELYPTERIDACEAE (Woodfern Family) Christella parasitica (L.) Levl.	woodfern, oakfern	· ×	ı	1	- +
					•
FLOWERING PLANTS					
MONOCOTS					
AGAVACEAE (Sisal Family) Furcraea foetida (L.) Haw.	Mauritius hemp	×	ı	1	+

Scientific name	Сотпол		Vegetation type	tion	type
ARACEAE (Aroid Familia)	ממשונים וומוווע	Status	bwf	1-c	ଘ
Alocasia macrorhizza (L.) Schott	'ape	р			
COMMELINACEAE (Spiderwort Family) Commelina diffusa N.L. Burm.	honohono	٠ 4	1	ı	+
CYPERACEAE (Sedge Family) Cyperus gracilis R. Br.	McCoy grass	<b>≺</b>	+	1	+
<pre>IRIDACEAE (Iris Family) Crocosmia X crocosmiiflora (Lemaine ex E. Morr.) N.E. Brown</pre>		∢	+	ı	÷
POACEAE (Grass Family)		×	+	ı	+
Avena fatua L. Bothriochloa pertusa (L.) A. Camus Bothriochloa sp.	wild oat pitted beardgrass	××:	+ +	1 +	+ +
Bromus rigidus Roth		××	+ +	1 1	1 1
Cenchrus ciliaris L. Cynodon daetwlen (1 ) n.	tipgut grass buffel grass	××	+ ·	ı	ı
Digitaria radicosa (Pres1) Miq.	Bermuda grass, manienie	<b>∢</b> ⋈ :	++	++	· +
urgicaria setigera Roth	itchy crabgrass, kukae-	×	+	1	ı
Ehrharta stipoides Labill.		ii.	+	•	
Eleusine indica (L.) Gaertn. Hordenm leporism idal	wiregrass, gooseprass	××	+	ı	+
Melinis minutiflora P. Reamy	pál	< ×	+ -	ı	1
	a	<b>:</b> ×	⊢ <del>-</del> i	1 -	ŀ -
Panicum sp.	Guinea grass	×	- +-	<del>-</del> +	+ +
Faspalum scrobiculatum L. Pennisetum clandestinum Hochst.	ricegrass, mau'u laiki	X I?	++	. 1 (	- 1 1
Rhynchelytrum repens (Willd.)	kikuyu grass	×	+	ı	1
Setaria verticillata (L.) P. Beauv. Sporobolus indicus (L.) R. Br.	Natal redtop bristly foxtail Indian dropseed, raffail	××	++	++	++
		×	+	+	+

Scientific name	Common name	Status	Vegeta bwf	Vegetation type $\frac{bwf}{}$	type g
DICOTS				•	l
AMARANTHACEAE (Amaranthus Family) Amaranthus spinosus L.	spiny amaranth, pakai kuku	×	+	+	
APIACEAE (Parsley Family) Anethum graveolens L.	dil1	<b>:</b> ×	- +	<b>.</b>	1
ASCLEPIADACEAE (Milkweed Family) Asclepias physocarpa (E. Mey.) Schlechter	balloon plant	<b>:</b> ×	- +	· -	t
ASTERACEAE (Daisy Family) Ageratina riparia (Regel) R. King & H. Robinson G Artemisia sp.	pamakani	; ×	- ı	<del> </del>	. +
Bidens cynapiifolia Kunth Bidens pilosa L.	West Indian beggar's tick Spanish needle, heggar's	××	+ +	i i	+
Cirsium vulgare (Savi) Ten. Conyza bonariensis (L.) Cronq. Emilia fosbergii Nicolson Galinsoga parviflora Cav.	tick, ki, ki nehe bull thistle hairy horseweed, ilioha pualele	×××:	+++ + 1	1 1 1 1	+ + +
Gnaphalium purpureum L. Hypochoeris glabra L. Pluchea symphytifolia (Mill.) Gillis Sigesbeckia orientalis L. Sonchus oleraceus L. Tridax procumbens L. Zinnia peruviana (L.) L.	purple cudweed smooth cat's ear pluchea, sourbush small yellow crown-beard sow thistle, pua-lele coatbuttons wild zinnia	××××××:	++++++	+ 1 1 1 1 1 1	+
BIGNONIACEAE (Bignonia Family) Jacaranda mimosifolia D. Don	u	× ×	1 +	•	+ +

Scientific name	Common name	Status	Vegetation bwf 1-c	ition 1-c	type g
BRASSICACEAE (Mustard Family) Lepidium virginicum L. Sisymbrium officinale (L.) Scop.	peppergrass hedge mustard	××	+ -	+-	+
CACTACEAE (Cactus Family) Opuntia ficus-indica (L.) Mill.	prickly pear, panini	<b>&lt;</b> >	<del>-</del> -	+ .	1 .
CARYOPHYLLACEAE (Pink Family) Polycarpon tetraphyllum (L.) L. Silene gallica L.	lowered	< ××	+ + +	+ 1	+ 1
CHENOPODIACEAE (Goosefoot Family) Chenopodium carinatum R. Br.	keeled goosefoot	<b>∜</b> ≻	<b>⊦</b> -	i -	ı
CONVOLVULACEAE (Morning-glory Family) Ipomoea alba L. Ipomoea indica (J. Burm.) Merr.	moonflower, koali pehu koali 'awa, koali 'awahia	<b>∻</b> ×⊢	F 14	+ 1-	. +-
CRASSULACEAE (Orpine Family) Kalanchoe pinnata (Lam.) Pers.		ı >	- 4	<b> -</b>	<b>.</b>
EUPHORBIACEAE (Spurge Family) Euphorbia heterophylla L. Ricinus communis L.	kaliko castor bean, koli	<b>*</b> ××	F 14	1 1	+ +.
FABACEAE (Pea Family) Acacia farnesiana (L.) Willd. Acacia mearnsii De Wild. Chamaecrista nictitans (L.) Moench Crotalaria pallida Aiton Desmodium sandwicense E. Mey. Erythrina sandwicensis Degener Glycine wightii (Wight & Arnott)		* ×××××	+ ++++	' ++ ' ' ' +	+
verdc. Indigofera suffruticosa Mill.	glycine indigo, 'iniko	××	+ +	ı <del> </del>	+ +

Scientific name	Сомпоп паще	1	Vegeta	Vegetation type	ype
Leucaena leucocephala (Lam.) de wit		Scarus	bw±	1-c	<b>co</b> )
Macroptilium lathyroides (L.) Urb. Medicago lupulina L. Medicago polymorpha L.	koa-naole Wild bushbean, cowpea black medic	×××	1 1 +	1 +	+ 1
Frosopis pallida (Humb. & Bonpl. ex Willd.) Kunth	bur clover	×	+	1 1	1 1
Senna pendula (Humb. & Bonpl. ex Willd.) H. Irwin & Barneby	kiawe	×	1	+	+
LYTHRACEAE (Loosestrife Family) Cuphea carthagenensis (Jacq.) Macbr.	tarmed Colonia	×	+	t	+
MALVACEAE (Mallow Family) Abutilon grandifolium (Willd.)	corombian cuphea	×	1	ı	+
Malva parviflora L. Halvastrum coromandelianum (L.)	hairy abutilon, mao cheese weed	××	++	++	+ 1
Sida fallax Walp. Sida rhombifolia L.	false mallow, hauuoi 'ilima Cuba inte	×н	++	+ +	+ +
MELIACEAE (Mahogany Family) Melia azedarach L.	V. Pride of	×	+	1	. 1
MENISPERMACEAE (Moonseed Family)		×	ı	+	+
Cocculus trilobus (Thunb.) DC.	huehue				
MYRTACEAE (Myrtle Family) Psidium guajava L.	enava brosso	<b></b>	+	1	+
NYCTAGINACEAE (Four-o'clock Family) Mirabilis jalapa L.	out to the second	×	+	ı	1
ONAGRACEAE (Evening Primrose Family) Oenothera stricta Ledeb, ex Link	Lour-o clock, naniahiahi	×	ı	1	+
VIITH UN I	evening primrose	>			

Scientific name	Common		Vegetation type	tion	type
	Common Hame	Status	bwf	1-1	<b>∞</b> 0∤
OXALIDACEAE (Wood Sorrel Family) Oxalis corniculata L.	yellow wood sorrel 'ihi	ţ			
PAPAVERACEAE (Poppy Family) Argemone glauca (Nutt. ex Prain) Pope Bocconia frutescens L.	, pua-ka	Н E3;	+ +	. +	+ 1
PASSIFLORACEAE (Passion Flower Family) Passiflora subpeltata Ort.	white passion flower	× ;	t	1	+
PHYTOLACCACEAE (Pokeweed Family) Phytolacca octandra L.	Southern nokehowan	× :	+	+	+
PLANTAGINACEAE (Plantain Family) Plantago lanceolata L.	narrow-leaved -1	×	+	1	ı
PLUMBAGINACEAE (Leadwort Family) Plumbago zeylanica L.	"ilihe'e hilie'	× ,	+	+	1
PORTULACACEAE (Purslane Family) Portulaca oleracea L. Portulaca pilosa L.		т <b>х</b> :	1 1	, +	+ +
PRIMULACEAE (Primrose Family) Anagallis arvensis L.	scarlet pimpernel	× ;	+	1	1
ROSACEAE (Rose Family) Eriobotrya japonica (Thunb.) Lindl. Osteomeles anthyllidifolia (Sm.) Lindl. Rubus sp.	loquat, biwa 'ulei, u'ulei	ч хн	+ 11	1 1+	1 + 1
SAPINDACEAE (Soapberry Family) Dodonaea viscosa Jacq.	'a'ali'i	х н	+ 1	+	+ 1

Scientific name	Common name	Status	Vegeta bwf	Vegetation type by I - C B	:ype
SOLANACEAE (Tomato Family) Solanum linnaeanum Hepper & P. Jaeger	apple of Sodom, popolo	>	4	+	ı
Nicotiana glauca R.C. Graham Physalis peruviana L. Solanum americanum Mill.	tree tobacco poha popolo	txxi	-+ ++	- 1 1 1	1++1
STERCULIACEAE (Cacao Family) Waltheria indica L.	'uhaloa, hi'aloa, kanakaloa	ίΙ	+	+	+
TILIACEAE (Linden Family) Triumfetta semitriloba Jacq.	bur bush	×	+	+	+
VERBENACEAE (Verbena Family) Lantana camara L.	lantana, lakana	×	+	+	+
Stacnytarpheta dichotoma (kuiz œ Pav.) Vahl Verbena litoralis Kunth	owi, oi weed verbena	××	+ +	1 1	+ 1

SURVEY OF THE AVIFAUNA AND FERAL MAMMALS SURVEY OF THE AVIFAUNA AND FERAL MAMMALS AT DEPARTMENT OF HAWAIIAN HOMELANDS - KULA RESIDENTIAL LOTS, UNIT I, KULA, MAUI

Prepared for Munekiyo and Arakawa, Inc. by

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2 November 1994

#### INTRODUCTION

The purpose of this report is to summarize the findings of a three day (29 August, 28, 29 October 1994) bird and mammal field survey of approximately 655 acres at Kula, Maui (Fig. 1). Also included are references to pertinent literature and unpublished reports.

The objectives of the field survey were to:

- 1- Document what bird and mammal species actually or potentially occur on the property.
- 2- Provide some baseline data on the relative abundance of each species.
- 3- Note the presence or likely occurrence of any native fauna particularly those that are listed as "Endangered" or "Threatened".
- 4- Determine if the property contains any special or unique resources that if lost or altered by development might result in a significant impact on the native fauna in this region of the island.

#### SITE DESCRIPTION

This long narrow property extends from 3,000 ft. elevation down to 1,800 ft. The 655 acres contain several habitat types. The higher sections are dominated by Black Wattle. The lower elevation contains Prickly Pear Cactus and Kiawe. Cleared areas along the existing ranch roads and fenceline are in pasture with Kikuyu grass. The topography of this property is steep. No wetland habitat was found on this site.

The weather during the survey was clear and cool. Winds were light. Visual and auditory observation conditions were excellent.

#### STUDY METHODS

The property was surveyed on foot and by vehicle following existing roads and trails which traverse the property. Field observations were made with the aid of binoculars and by listening for vocalizations.

At scattered locations throughout the site, eight minute counts were made of all birds seen or heard. These data provide the basis for the relative abundance estimates given in Table One. Published reports of birds known from similar habitat on Maui were also consulted in order to acquire a better perspective of the

possible fauna that could occur in this region and their potential relative abundance (Pratt et al. 1987, Hawaii Audubon Society 1993). Observations of feral mammals were limited to visual sightings and evidence in the form of scats and tracks. No attempts were made to trap mammals in order to obtain data on their relative abundance and distribution.

Scientific names of birds and mammals used in this report follow those given in Hawaii's Birds (Hawaii Audubon Society 1993); A field guide to the birds of Hawaii and the Tropical Pacific (Pratt et al. 1987) and Mammal Species of the World (Honacki et al. 1982).

#### RESULTS AND DISCUSSION

### Resident Endemic (Native) Birds:

The only endemic native landbird recorded on the survey was the Common Amakihi (Hemignathus virens). This species is not listed as endangered or threatened. They are the most abundant and widespread of the native landbirds. Common Amakihi will utilize habitat with second growth introduced plants as well as native forest. A total of ten Common Amakihi were tallied over the course of the field survey. The Short-eared Owl or Pueo (Asio flammeus sandwichensis) forage in agricultural fields and pastures as well as in forested upland habitats (Hawaii Audubon

Society 1993). They are frequently seen in Kula and upcountry Maui. None were recorded on this survey, however, I have seen them in this region on past occasions. This species is listed by the State of Hawaii as endangered on the island of Oahu but not on Maui. No other native resident landbirds would be expected on this property.

#### Migratory Indigenous (Native) Birds:

Migratory shorebirds winter in Hawaii between the months of August through May. Some juveniles will stay over the summer months as well (Johnson et al. 1981, 1983, 1989). The most abundant shorebird species which winters in Hawaii is the Pacific Golden-Plover (Pluvialis fulva). Plover forage in open areas such as mud flats, lawns, pastures. plowed agricultural fields and roadsides. Plover are extremely site-faithful and most establish winter foraging territories which they defend vigorously. Such behavior makes it possible to accurately census the plover population in a particular area. These populations likewise remain relatively stable over many years (Johnson et al. 1989). A total 36 plover were recorded on the survey. These birds were seen along the ranch roads and in other open habitats on the site. The only other migrant which may occur in this area is the Ruddy Turnstone (Arenaria interpres). Neither the plover nor the turnstone are listed as endangered or threatened.

#### Resident Indigenous (Native) Seabirds:

No seabirds were recorded nor would any be expected at this location. Predators such as dogs, cats and the Small Indian Mongoose (Herpestes auropunctatus), along with human disturbance inhibit seabird nesting at all but a few isolated locations on the main Hawaiian Islands.

#### Resident (Native) Waterbirds:

No wetland habitat was found on this property. No waterbirds would be expected at this site. The endangered Nene or Hawaiian Goose (Neochen sandvicensis) occurs at higher elevation in Haleakala National Park. It would be unusual to find them on this property. Nene have been introduced recently to Kauai were they utilize ranchlands and pastures. On Maui they are normally seen at higher elevation in more alpine and subalpine habitat.

#### Exotic (Introduced) Birds:

A total of 14 species of exotic birds were recorded during the field survey. Table One shows the relative abundance of each. In addition to these species other exotic birds which potentially could occur on the property include: Chukar (Alectoris chukar), Wild Turkey (Meleagris gallopavo), Cattle Egret (Bubulcus ibis), Barn Owl (Tyto alba), Red Avadavat (Amandava amandava) and Redcrested Cardinal (Paroaria coronata) (Pratt et al. 1987; Hawaii

Audubon Society 1993).

#### Feral Mammals:

Small Indian Mongoose were observed on the survey. Cat tracks were also seen. Axis Deer (Axis axis) were sighted throughout the property. Based on the number of sightings and the abundance of their tracks they must be fairly numerous in this region. Records of the endemic and endangered Hawaiian Hoary Bat (Lasiurus cinereus semotus) on Maui are limited (Tomich 1986; Kepler and Scott 1990). One bat was observed at 1800 hours on 28 October. The bat was foraging over the pasture near Highway 37 at the northeast edge of the property. This species is known to roost solitarily in trees and forages for flying insects using echolocation. They have been reported from a variety of habitats including native forest, alpine habitat, agricultural lands, second growth forest, ranchlands, ponds and bays as well as in urban areas. The life history of this species is not well known. Kepler and Scott (1990) suggest that bats occur on Maui only as a "migrant", probably from the Big Island". Others (Duvall and Duvall 1991), report evidence that would suggest there may be a resident breeding population of bats on Maui.

#### CONCLUSION

A short field survey can only provide a limited view of the wildlife that may use the site. The number of species and their relative abundance may vary throughout the year due to resource (food, water) availability and reproductive success. Species which are migratory will only be an important part of the faunal picture at certain times during the year. Exotic species sometimes prosper for a time only to later disappear or become a less significant part of the faunal community (Williams 1987; Moulton 1990). Thus only long term studies can provide a comprehensive view of the bird and mammal populations in a particular area. However, some general conclusions related to bird and mammal activity at this site can be made. Below is a summary of the findings of this survey.

- 1- The site was surveyed by walking and driving the roads and trails which traverse the property. All habitat types found on the property were sampled. Census data on birds were obtained at random locations throughout the property and are reported in Table One.
- 2- The migratory Pacific Golden-Plover was found on the open pasture lands and along roadsides. This is a typical wintering habitat for this species. Plover are not endangered or threatened.

- 3- The only native resident bird found on the survey was the endemic Common Amakihi. This species is the most abundant and widespread of the native forest birds. They are not listed as endangered or threatened. The native owl (Pueo) occurs in this region but was not recorded on this survey. They are not endangered or threatened on Maui. The endangered Hawaiian Goose (Nene) occurs at higher elevation in Haleakala National Park. They would be unlikely to occur on this property.
- 4- The list of exotic birds recorded on the survey (Table 1)
  was typical for this region of Maui. No unexpected sightings
  were obtained. None of these species is listed as endangered
  or threatened.
- 5- Axis Deer, Small Indian Mongoose and cats were recorded at this site. The endangered Hawaiian Hoary Bat was seen foraging above the pasture lands at the NE edge of the property. The occurrence and abundance of this species on Maui has not been extensively studied.
- 6- This property has been significantly altered by introduced vegetation and ranching. Nevertheless, native birds and mammals were recorded. I did not find any unique or special resources on this site. Disturbed second growth forest/ranch land is common in this region of Maui.

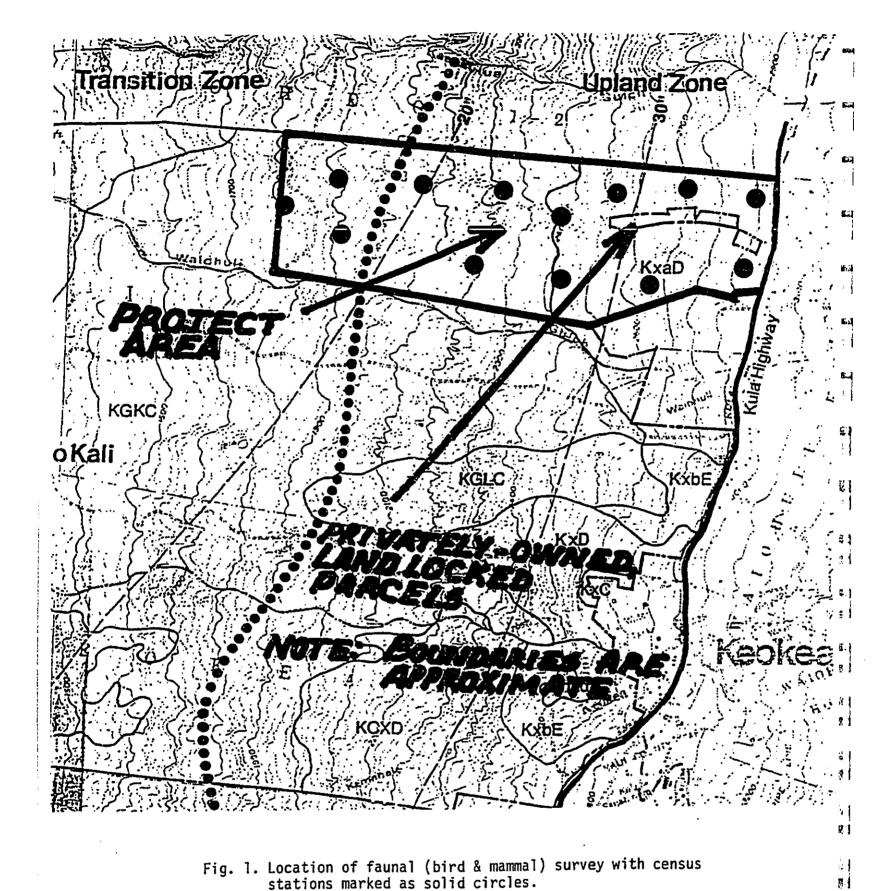


Fig. 1. Location of faunal (bird & mammal) survey with census stations marked as solid circles.

TABLE 1

Exotic species of birds recorded at the Department of Hawaiian Homelands, Kula Residential Lots, Units I, Kula, Maui.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE*
Ring-necked Pheasant	Phasianus colchicus	R = 3
Black Francolin	Francolinus francolinus	R = 3
Gray Francolin	Francolinus pondicerianus	A =12
Spotted Dove	Streptopelia chinensis	C = 7
Zebra Dove	Geopelia striata	A =10
Eurasian Skylark	Alauda arvensis	A =13
Common Myna	Acridotheres tristis	6 = J
Leiothrix	Leiothrix lutea	9 = 3
Northern Cardinal	Cardinalis cardinalis	9 = 0
Northern Mockingbird	Mimus polyglottus	C = 7
Japanese White-eye	Zosterops japonicus	A =10
Nutmeg Mannikin	<u>Lonchura</u> punctulata	9 = 0
Warbling Silverbill	<u>Lonchura</u> malabarica	Ų = 4
House Finch	Carpodácus mexicanus	A =11

\*(see page 11 for key to symbols)

#### KEY TO TABLE 1

Relative abundance = Number of times observed during the survey or frequency on eight minute counts in appropriate habitat.

A = abundant (ave. 10+)

C = common (ave. 5-10)

U = uncommon (less than 5)

R = recorded (seen or heard on one count only or at times other than on 8 min. counts. Number which follows is the total number of individuals seen or heard)

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ARCHAEOLOGICAL INVENTORY SURVEY

# Archaeological Inventory Survey Keokea and Waiohuli Subdivisions

Lands of Keokea and Waiohuli Makawao District, Island of Maui



Paul H. Rosendahl, Ph.D., Inc.

Archaeological · Historical · Cultural Resource Management Studies & Services

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Report 442-050289

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# Archaeological Inventory Survey Keokea and Waiohuli Subdivisions

# Lands of Keokea and Waiohuli Makawao District, Island of Maui

(TMK:2-2-02:55,56)

by

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November 1989



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## **SUMMARY**

At the request of the Department of Hawaiian Home Lands (DHHL), Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey of Keokea and Waiohuli Subdivisions, situated in the Lands of Keokea and Waiohuli, Makawao (Kula) District, Island of Maui (TMK:2-2-02:55,56). The subdivisions are comprised of 1,025 acres (351 in Keokea and 674 in Waiohuli) and range in elevation from 1,800-3,000 feet AMSL (above mean sea level). The survey field work was conducted between January 17, 1989 and March 30, 1989. During the survey, 159 sites consisting of 274 features were formally designated. Sites consisted of both single and multiple features and included a wide range of formal and functional types. Minor agricultural features in the project areas—which number in the hundreds—were not designated nor documented in detail; they were, however, generally described, and their extents and spatial relationships were plotted.

Waiohuli Subdivision has undergone extensive bulldozing. As a result, sites in Waiohuli are in generally poorer condition than those in Keokea Subdivision. Sites in Keokea are, in most instances, intact, and the area contains excellent examples of extensive agricultural and habitation complexes. Significant resources present in the project areas include heiau, human burials, intact dryland agriculture field systems, and residential complexes. These resources could be adversely affected by the proposed development.

Of the total 159 sites identified during the present survey, 108 are in Keokea and 51 are in Waiohuli. Of the 108 Keokea sites, 94 are assessed as significant solely for information content. Eighty-nine of the 94 sites are recommended for further data collection, and five of the 94 sites are recommended for no further work. Four of the remaining 14 sites are assessed as significant for information content, as an excellent example of a site type, and for cultural value. Further data collection and preservation with interpretive development are recommended for these four sites. Three of the remaining 14 sites are assessed as significant for information content and as an excellent example of a site type. For these three sites, further data collection and preservation with interpretive development are recommended. Another three sites are assessed as significant for information content and for cultural value; these three sites are recommended for further data collection and preservation as is. Three other sites are assessed as significant for information content and are tentatively assessed as

significant for cultural value. These three sites are recommended for further data collection and are provisionally recommended for preservation as is. The last site is assessed as significant for information content and as having cultural value. For this site, further data collection is recommended.

Of the 51 sites in Waiohuli Subdivision, 42 are assessed as significant solely for information content. Thirty-three of these 42 sites are recommended for further data collection, and nine of the 42 sites require no further work. Of the remaining nine sites, three are assessed as significant for information content, as excellent examples of a site type, and as culturally significant. Further data collection and preservation with interpretive development are recommended for these three sites. Two of the remaining six sites are assessed as significant for information content and are provisionally assessed as having cultural value. For these two sites, further data collection is recommended and preservation with interpretive development is provisionally recommended. The final four sites are assessed variously and require various recommended treatments (see Table 7 in Conclusions section for specific recommendations).

## CONTENTS

I .	Page
ENTRODUCTION	1
Background	1
Project Area Description	2 2
Summary of Historical Documentary Research	4
and Informant Interviews, by Helen Wong Smith, B.A.  Methods and Procedures	5
FINDINGS	7
Archaeological Sites	7 16
Limited Surface Collections  Limited Test Excavations	16
DATA ANALYSES	18
Chronology Portable Remains	18 18
CONCLUSION	27
Evaluation of Survey Methodology  Discussion	27 27
Suggested Research Questions	27
General Significance Assessments and Recommended General Treatments	
REFERENCES CITED	38
APPENDIX A: Summary of Identified Sites and Features - Waiohuli	A-1
APPENDIX B: Summary of Identified Sites and Features - Keokea	
APPENDIX C: Limited Historical Documentary Research and Informant Interviews, by Helen Wong Smith, B.A.	C-1
APPENDIX D: Site Descriptions - Waiohuli	D-1
APPENDIX E: Site Descriptions - Keokea	
APPENDIX F: Additional Site Information:	F-1

## ILLUSTRATIONS

Figure	, I	Page
•		3
1	Project Area Location Map	12
2	Site Location Map - Waiohuli Subdivision	13
3	Site Location Map - Keokea Subdivision	17
4	Distribution of Agricultural Features	21
5	Age Determination Ranges	
C-1	1938 Map Showing Project Area and LCA Locations	D-4
D-1	Site W-13, Features A and B	D- 7
D-2	Site W-21	D- 8
D-3	Site W-27	D-9
D-4	Site W-27, Cupboard (photograph)	D-10
D-5	Site W-28	D-10 D-12
D-6	Site W-32	D-12
D-7	Site W-36	D-15
D-8	C:- U7 45	בויכו
D-9	C: 37 £7	D-10
D-10	G:_ 117 77	D-10
D-11	Circ 117 77 117-11 with I Torighte (photograph)	TO-00
D-12	Circ W On Enterior to Historic Burial (photograph)	
E-1	Cia V 7 Esperant A and B	• •••
E-2	Cir. V 27 Aurhana (photograph)	LJ
E-3	C: V 20	
E-4	City V 40 Overhood (photograph)	
E-5	Circ V 40 NE Wall of Feature A (photograph)	- L)
E-6	Cita V 49 Cannos B	
E-7	Circ V 50 Ceaning B (photograph)	Aug - An - Y
E-8	C: V CA	₽-20
E-9	Circ V 60 Wall and Waterrank (photograph)	<b>-</b>
E-10	Circ IC 07 Burial Diagram (photograph)	
E-11	Site K-148, Feature B (photograph)	E-4/
5-68-78	TABLES	· · · · · · · · · · · · · · · · · · ·
Table		
1	Correlation of Site Numbers	8
2	Frequencies of Formal Feature Types	. 14
3	Frequencies of Functional Site Types	13
4	Summary of Radiocarbon Age Determinations	17
5	Summary of Portable Artifact Types	. 44
6	Distribution of Ecofactual Remains	. 25
7	Summary of General Significance Assessments	
•	and Recommended General Treatments	. 30
8	Lots Which Appear to Contain Sites	
o	or Portions of Sites Recommended for Preservation	. 36
9	Residence Lots Con'aining Sites	. 37

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## INTRODUCTION

#### **BACKGROUND**

At the request of the Department of Hawaiian Home Lands (DHHL), Paul H. Rosendahl, Ph.D., Inc. (PHRI) conducted an archaeological inventory survey of Keokea and Waiohuli Subdivisions, situated in the Lands of Keokea and Waiohuli, Makawao (Kula) District, Island of Maui (TMK:2-2-02:55,56). The overall objective of the survey was to provide information appropriate to and sufficient for satisfying the requirements of Chapter 6E, Historic Preservation, Hawaii Revised Stantes, as amended. Field investigations were conducted between January 17, 1989 and March 30, 1989 under the supervision of PHRI Supervisory Archaeologist Roderick S. Brown, and under the overall direction of PHRI Senior Archaeologist Dr. Alan E. Haun.

#### **SCOPE OF WORK**

The basic purpose of an inventory survey is to identifyto discover and locate on available maps—sites and features of potential archaeological significance present within a specified project area. Formerly called a reconnaissance survey and more recently referred to as an inventory survey. the survey comprises the initial level of archaeo- logical investigation. It is extensive rather than intensive in scope, and is conducted basically to determine the presence or absence of archaeological resources within a specified project area. It indicates both the general nature and variety of archaeological remains present, and the general distribution and density of such remains. Finally, it permits a general significance assessment of the archaeological resources, and facilitates formulation of realistic recommendations and estimates for such further work as might be necessary or appropriate. Such work could include intensive surveydata collection involving detailed recording of sites and features, and selected test excavations; and possibly subsequent mitigation-data recovery research excavations, construction monitoring, interpretive planning and development, and/or preservation of sites and features with significant scientific research, interpretive, and/or cultural values.

The significance of all archaeological remains identified within the project areas was to be assessed in terms of the National Register criteria contained in the Code of Federal Regulations (36 CFR Part 60.4). These criteria are used by Department of Land and Natural Resources - Historic Sites Section (DLNR-HSS) to evaluate eligibility for both the Hawaii State and National Register of Historic Places.

The specific tasks for the current inventory survey were as follows:

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- 1. Documentary Historical Research The specific purposes of this work were (a) to locate and summarize readily available relevant documentary resources (books, maps, journals, archival records, and other materials) relating to the <u>ahupuaa</u> and project areas; (b) to integrate and synthesize the findings of this research in order to define prehistoric, early historic, and later historic land use patterns; and (c) to assess the potential for any further research that might be appropriate in connection with subsequent mitigation work required for subdivision development.
- 2. Archaeological Background Research The specific purposes of this work were: (a) to
  locate and review all prior archaeological research
  conducted within the project area ahupuaa; (b) to
  summarize the past research in terms of the extent
  and intensity of survey coverage and in terms of the
  age, function, and distribution of previously identified
  sites; and (c) to prepare a revised summary of past
  land use defined on the basis of historical
  documentary research.
- 3. Oral Historical Research The specific purposes of this work were: (a) to locate and interview knowledgeable local residents to determine their knowledge of past land use patterns and to elicit information concerning the age and function of specific sites; (b) to summarize and integrate the research findings with those from the historical documentary research and archaeological survey; and (c) to assess the potential for any further research that might be appropriate in connection with subsequent mitigation work required for subdivision development.
- 4. Inventory Survey Field Work Inventory survey field work was to consist of the following specific tasks: (a) conduct 100% coverage low-level (c. 30-50 ft altitude) aerial reconnaissance (helicopter) of the entire 1,000-acre project area, with special emphasis upon identifying all sites observed and plotting them on aerial photographs and/or maps, and identifying areas devoid of sites (e.g., mechanically altered lands); (b) conduct 100%

coverage, variable-intensity (30-to 90-ft intervals) ground reconnaissance of the entire project area, with relatively higher intensity coverage being given to undisturbed lands and relatively lower intensity coverage to mechanically altered lands; (c) record identified sites, including preparation of scaled sketch plan maps, completion of standardized PHRI site forms, and photographic recordation; and (d) conduct limited subsurface testing when necessary to accurately determine the extent (spatial and/or temporal) of site in order to assess its significance.

5. Data Analysis and Reports - Both Interim and Final reports were to be prepared. The Interim report was to summarize (a) the relevant project background, (b) field work completed and findings, (c) preliminary interpretation and evaluation of findings, (d) assessment of potential development impacts upon significant remains, and (e) specific recommendations for any further archaeological work that might be appropriate and/or required. The Final Report was to include (a) the full description of project findings, (b) interpretation and evaluation of these findings, and (c) specific recommendations and justifications for any subsequent mitigation work that might be necessary or appropriate.

#### PROJECT AREA DESCRIPTION

Both proposed subdivisions are situated on the western slope of Mt. Haleakala, in Makawao (Kula) District, Island of Maui (Figure 1). The Keokea parcel consists of 351.41 acres (142.22 hectares), and the Waiohuli parcel consists of 673.99 acres (272.76 hectares). Combined, the two parcels total 1,025.40 acres (414.99 hectares). Each subdivision comprises the north-central portion of the ahupuaa which bears its name. The parcels are both bounded on the east by Highway 37. The northern and western boundaries of both parcels are fenced. Waiohuli Gulch more or less marks the southern boundary of the Waiohuli parcel. The southern boundary of the Keokea parcel is delineated by a high, stone cattle wall.

Both parcels are characterized by gentle to moderately steep west-facing dissected alluvial and volcanic slopes. Elevation in the Keokea parcel ranges from 2,225-2,850 ft AMSL, and in the Waiohuli parcel ranges from 1,800-3,000 ft AMSL. Drainages in the Keokea parcel are small and, for the most part, are poorly defined. Three large guiches extending east to west dissect the Waiohuli parcel; the guiches are fed by many smaller channels which drain the intervening slopes. Soils over all of the Keokea parcel and

the eastern majority of the Waiohuli parcel are well-drained, with medium to moderately fine-textured subsoils of the Pu'u Pa-Kula Pane association. The eastern periphery of the Waiohuli parcel is overlaid with well-drained very stony soils and fine- to medium-textured subsoils of the Keawakapu-Makena association (Foote et al 1972). The soils in both parcels are derived from decomposed lava flows and ash of the Kula and Hana Volcanic Series which are, respectively, eight and four hundred thousand years old.

Both parcels are dominated by introduced vegetation including black wante (Acacia decurrens Willd.), Christmasberry (Schinus terebinthifolius L.), lantana (Lantana camara L.), prickly pear or panini (Opuntia megacantha Salm-Dyck), koa-haole (Leucaena glauca L.), kiawe (Prosopis pallida L. Benth), grasses dominated by Kikuyu grass (Pennisetun clandestinum Hochst) and Chinaberry (Melia azedarach L.). Endemic vegetation includes abundant ilima (Sida spp.) and occasional wiliwili (Erythrina sandwicensis Degener).

Black wattle forests dominate the eastern halves of both parcels, probably as a result of the extensive and recurrent ground disturbance associated with recent habitation in higher elevations. Lantana is a dominant plant in the lower western portions of both parcels. Lantana is almost impenetrably dense in western Keokea where it is interspersed by occasional prickly pears. In western Waiohuli, lantana and prickly pear co-dominate and impair movement and visibility.

## PREVIOUS ARCHAEOLOGICAL WORK

The only early previous archaeological work conducted in the project area was by Thrum (1907) and Walker (1931). Thrum included Papakea, Kaumeheiwa, and Molohai heiau on a list of Maui heiau sites he compiled in the early decades of this century. Later, the three heiau were placed on the Hawaii Register of Historic Places. Walker listed and described 26 heiau in the Kula region.

In 1986, DHHL contracted B.P. Bishop Museum to monitor trailblazing for subdivision fences and to conduct an archaeological reconnaissance survey of both of the present proposed subdivisions (Riford 1987). This effort resulted in the discovery of 113 archaeological sites and "more than 252 archaeological features." During the study, the above-mentioned heiau and a diversity of prehistoric and historic agricultural, residential, and ceremonial sites were recorded. The survey focused on areas where residential lot awards are proposed. More than 410 acres of the total c. 1,025 acres comprising the project area were not examined during that survey.

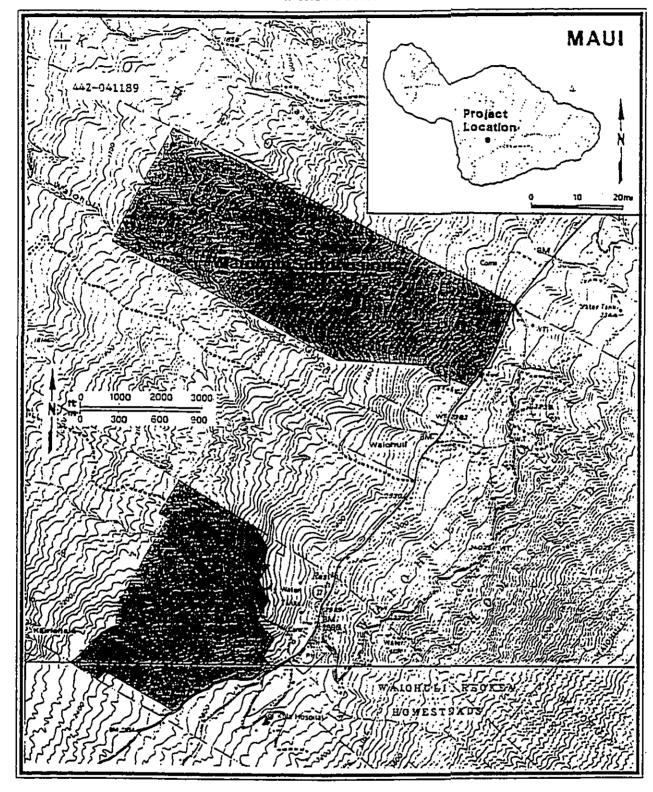


Figure 1. PROJECT AREA LOCATION MAP

Keokea and Waiohuli Subdivisions
Lands of Keokea and Waiohuli, Makawao District, Island of Maui
(TMK:2-2-02:55,56)
PHRI Project No. 88-442 April 1989

21

### SUMMARY OF LIMITED HISTORICAL DOCUMENTARY RESEARCH AND INFORMANT INTERVIEWS

The complete limited historical documentary research for the present project was conducted by PHRI Research Historian Helen Wong Smith, B.A.. Her report includes information obtained from the usual historical sources found in libraries, and information from other sources such as land and tax records, archaeological reports, maps, and various other manuscripts. The information in Wong's report is organized into five sections: Early Historical Accounts, Heiau in the Project Area, Land Commission Award (LCA) Information, Land Use and Tenure Information, and Informant Interviews.

Early accounts concerning the Makawao District generally either describe the area or relate early historical events. Ashdown (n.d.) writes, "kula-o-ka-ma'o-ma'o or Land of Mirages, where lost souls wandered until they could find their way to rest. The rain of Makawao is described by Mrs. Miverva Kalama to Sterling (n.d.) in this way: "ukiu rain = a soft drizzle (the ua Kama'aina of Makawao) when the kiu rain cloud from Makawao meets the Naulu rain cloud from Kula then the rain comes, the typical Makawao rain. Other early accounts, by Fornander and Kamakau, mention Makawao in relation to early historical events.

Three heiau are present in Keokea project area—Molohai, Papakea, and Kaumiumimua heiau. Ashdown (1971:46) mentions other heiau in Keokea and Waiohuli—Ho'ola and Ho'oula Ua heiau in Keokea and Kaimupeelua heiau in Waiohuli. Other heiau mentioned by historic writers in the Makawao district include Kailua heiau (Thrum 1909:44), and Pa'uhu, Mahea, Kaumuopahu (or Kaunuopahu), Po'onahoehoe and Mana heiau. The latter heiau is now part of a modern cemetery (Ashdown 1971:57).

Although there were many small parcels granted in Keokea and Waiohuli, the Indices states that Keokea was Crown Land from the beginning and that Waiohuli was approved as such in 1890 by Kalakaua. The numerous parcels may be a result of an experiment conducted by the Kamehameha III's administration prior the Great Mahele concerning trial fee ownership runs. In a report by Riford (1987), 11 Land Commission Awards (LCA) either within or bordering the Keokea parcel and eight LCAs within the

Waiohuli parcel are listed. The bulk of the parcels are designated as  $\underline{\text{kula}}$  land and houselots (1987).

Concerning land use and tenure, Kula has been used primarily for agriculture throughout history. C. Speakman, in his book entitled <u>MOWEE</u> mentions the fervor of cash-cropping in Kula:

During the gold [potatoes] rush, hundreds of Hawaiians were going into business for themselves on Maui-growing potatoes and hauling them to the port where they were snapped up and shipped to San Francisco. The Maui fields were called Nu Caliponi, or New California; potatoes were gold, and a fortune could be dug out of the ground by one man (1978:116).

In addition to Irish potatoes, the Kula farmers planted corn, beans, onions, Chinese cabbage, round cabbage, sweet potatoes, wheat and other grains, and even cotton. In the early 1970s, 35% of Hawaii's vegetables were grown in Kula, including a large percentage of the state's head lettuce, dry onions, and tomatoes. Much of the remaining land was devoted to livestock breeding by about 20 full and part-time ranchers. Today the cash crops in Kula are vegetables other than corn and potatoes, and flowers.

Wong's report includes information on Kula Sanatorium, and also includes informant interviews. Kula Sanitorium was founded for the care of tuberculosis sufferers. Initially the sanitorium consisted of two tent-houses which accomodated 12 patients. The tent-houses, which included kitchen and dining facilities, was financed by the County and Territory and cost \$500.00. The first permanent ward was built by W.E. Foster, former patient and superintendent. Wong's informant interviews provide information primarily on Kaonoulu Ranch, for which the interviewees once worked.

According to Wong, during this century, the project area has been used primarily for cattle grazing, hence the many archaeological sites obscured by grasses and lantana. If further historical documentary research is conducted for the project area. Wong suggests that a check be made for awards given out during the Kingdom of Hawaii and that the following topics be addressed: prehistoric environment and occupation in the area, as evidenced by historical documents; and local and regional cultural and residential sequences.

<sup>\*</sup> References in summary are listed in Appendix C.

#### METHODS AND PROCEDURES

#### Field Work

The current field work was accomplished in five phases: preliminary field inspection, aerial (helicopter) survey, variable-intensity pedestrian survey, site recording, and limited surface collections and excavations.

Preliminary Field Inspection - PHRI Senior Archaeologist Dr. Alan E. Haun conducted a preliminary field inspection of portions of both Waiohuli and Keokea subdivisions in order to assess the project area terrain and vegetation with regard to logistical problems which might be faced by survey crews. In addition, Dr. Haun visited several previously recorded archaeological sites in each subdivision to evaluate the adequacy of existing archaeological records.

Helicopter Survey - On January 11, 1989, a low-level (30-50 ft. altitude) aerial reconnaissance survey was made of approximately 60% of both subdivisions. The areas surveyed included all portions of the project areas not obscured by black wattle forests (thus, eastern upslope portions were not examined aerially). Thirty-eight archaeological sites and/or features were identified from the air—34 in the Keokea parcel and four in the Waiohuli parcel. Each site/feature was flagged with weighted pink surveyor's tape, was labeled with a temporary aerial survey (AS) number, and was plotted on 1"=200' aerial photographs. A brief and very preliminary description of each site was recorded during the flight; these descriptions were upgraded during the subsequent variable-intensity 100% survey and recording phases of the field work.

Variable - Intensity 100% Coverage Ground Survey - The variable intensity ground survey began on January 17, 1989 and was completed on February 22, 1989. A crew of five archaeologists supervised by PHRI Supervisory Archaeologist Roderick S. Brown swept the entirety of both proposed subdivisions. Transects were spaced at 15-40 meter intervals. Transect spacing was determined exclusively by the surface integrity of the area being transected. In areas where no mechanical or erosional disturbance was evident, the survey interval was maintained at 15 meters. In disturbed areas the interval was increased to as wide as 40 meters. Surveyors were instructed to walk zigzag courses to search first for "islands" of undisturbed ground, and then to search within these "islands" for archaeological sites. The zigzagging resulted in an estimated maximum effective survey interval of 30 meters.

Locational control was maintained by plotting the course of each sweep on aerial photographs and/or 1"=200'scale topographic maps, and by marking each archaeologist's start and end points on each sweep with labeled surveyor's tape. As sites and features were encountered, each was marked with pink-and-blue surveyor's tape on which was labeled the project number (88-442), a temporary site number, and the date and name of the surveyor on whose transect the site was discovered. Each site was described in a field notebook at the time of discovery and was plotted on 1"=200' aerial photographs. Notation was made as to whether the site bore the (sometimes labeled) orange flagging with which some sites were marked by the Bishop Museum survey crew. Also noted were the direction and distance to nearby DHHL lot corner markers (where they existed) and the presence of aerial survey site markers.

Site Recording - Site recording began on February 22, 1989, immediately after the variable-intensity ground survey was completed. To facilitate the recording, two archaeologists were added to the field crew. The crew was divided into two teams of three persons each—one recorder, one mapper, and a rover, who measured, photographed, and described features and marked each site with an aluminum tag and flagging. Sites were recorded on standard PHRI site and feature forms. Scaled sketch maps were prepared of representative features and/or of the overall site configuration. Vegetation hampered visibility of, and even access to, some features, but the majority of features were adequately recorded.

During the pedestrian survey, sites and features were numbered as they were encountered. The numbering systems in each subdivision are independent. Temporary site numbers are prefixed by either "W-" (for Waiohuli) or "K-" (for Keokea). Site features were assigned letter designations (A,B,C,etc.).

During the pedestrian survey some sites of questionable nature were numbered. In some instances, subsequent examination of the questionable sites indicated they were natural or the result of recent ground disturbance; hence, the site was eliminated from site lists. Other sites were preliminarily recorded as separate entities and later were combined with other nearby sites and subsumed under a single site number. When sites were combined, the lowest site number was retained and other numbers were deleted; hence, the gaps in the numbering sequence. During the recording phase, many previously undiscovered sites were identified and were assigned numbers.

## Data Management

Data management, cartography, and report production were computerized. Preliminary site and feature data gathered during the ground survey were entered from the field notebooks into formatted dBASE IV files. Output from these preliminary files included formatted listings of site and feature information and direct electronic input of site location coordinates [easting (X), northing (Y) and elevation (Z)] to the computer-aided drafting program. Output of these data allowed recording crews to return to sites with

printouts containing preliminary site descriptions and with contour maps illustrating the locations of the sites to be recorded.

Soon after the recording of each site and feature, the data were entered into dBASE IV files. These data files were formatted to allow direct output of revised site and feature location maps and the extraction of selected data in tabular format for inclusion in the Interim and Final reports. In addition, report-ready site survey records and site/feature descriptions were generated from the data files.

## **FINDINGS**

#### ARCHAEOLOGICAL SITES

During previous archaeological surveys of Waiohuli and Keokea subdivisions (Riford 1987), 113 sites consisting of 252 component features were identified. Three of the 113 sites, all heiau, were assigned SIHP site numbers—Papakea Heiau (50-50-10-1036), Molohai Heiau (50-50-10-1037) and Kaumeheiwa Heiau (50-50-10-1039). The remaining 110 sites were assigned temporary numbers. As part of the present work, the work on the earlier survey was consulted. It was found that records for 77 of the previously identified sites were incomplete. In addition, when an attempt was made to relocate the earlier sites in the field, definite field identifications were often impaired by unclear locational information in the report and by the lack of site markers in the field.

The present survey resulted in the formal identification of 159 sites consisting of 274 features. During the present survey, 53 previously identified sites were relocated. These sites were reassigned PHRI temporary numbers. Table 1 correlates previously identified sites with PHRI temporary site numbers. Figures 2 and 3 depict the locations of all identified sites. Appendices A and B summarize the sites and their component features. Appendices D and E provide detailed descriptions for each site and feature.

Appendices D and E include for each site:

- Site numbers either State Inventory of Historic Places (SIHP) numbers, Bishop Museum temporary numbers, if previously assigned, or PHRI temporary site numbers. PHRI temporary numbers are one, two, and three-digit numbers prefixed by "K-" or "W-";
- A site type designation provides formal feature type for sites consisting of a single feature, or designates the site as a complex if site includes more than one feature. Also lists total number of features present;

- A description of site topography a brief description of the terrain in the area of the site:
- 4. A listing of site vegetation lists principal components of the vegetation within and in the vicinity of the site;
- A statement of site condition overall state of preservation of the site (poor, fair, good, or excellent);
- An assessment of site integrity degree of historic modification by human agencies (unaltered, partially altered, and completely altered) and nature of modifications, if any;
- A probable age indicates probable/possible age of the site (i.e., historic or prehistoric);
- A functional interpretation probable or possible (\*) functions for each site; or, if function cannot be determined, assigns indeterminate function. For sites with multiple functions, functions separated by "f";
- Feature dimensions maximum length, width, and maximum area. Dimensions immediately followed by a description of feature construction, associated portable remains, and other descriptive information; and
- A site description a brief overall description of the site listing types of constituent features, portable remains present, if any, and other site data.

Appendix F provides UTM coordinates, elevations, and proximity to water for all sites.

<sup>\*</sup> State Inventory of Historic Places (SIHP) site designation system: all four-digit site numbers prefixed by 50-50-10 or 50-50-14 (50=State of Hawaii, 50=Island of Maui, 10 or 14=USGS 7.5' series quad map ["Puu o Kali" or "Makena," respectively]).

Table 1. CORRELATION OF SITE NUMBERS

PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
W1		2344
W- 2	6	2345
W- 3	7	2039
W- 4	8	2346
W- 5		2347
W- 6	_	2348
W- 8	<del>-</del>	2349
W- 10	_	2350
W- 11	5	2040
W- 12		2351
W- 13	-	2352
W- 14	_	2353
W- 15		2354
W- 17	_	2355
W- 18		2356
W-20		2357
W- 21	_	2358
W- 27	36	T039
W- 28		2042
W- 30	110	2359
W- 31		2360
W- 32		2361
W- 35	105	2362
W- 36		2043
W- 37	104	2363
W- 42	75 ·	2364
W- 45	72	2044
W- 46	71	2365
W- 47	107	2366
W- 48	108	2367
<b>W-</b> 49		2368
W- 55	_	2369
W- 57	_	2370
W- 58		2371
W- 59	81	2372
W- 60	<del>-</del>	2373
W- 65	_	2374
W- 67		2375
W- 71	101	2376
W- 73		2377
W- 75	86 <del>-</del> 87	2378
W- 77		2379
W- 80		2380
·· ••	<del></del>	

Table 1. (cont.)

	Table 1. (cont.)	
PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
W- 83		2382
W- 88		2383
W- 90	_	2384
W- 96		2385
W- 97		2386
W- 98	69-70*	2387
W-101		2388
<b>K-</b> 1	15	2046
K- 2	16	2047
K- 3	14	2028
K- 4	19	2048
K- 5		2049
K- 6		2029
K- 7	22	2030
K- 8	_	2050
K- 9	38	2051
K- 10	-	2052
K- 11	39	2053
K- 12		2054
K- 13	<u>-</u> -	2055
K- 14		2056
K- 16		2057
K- 19		2058
K- 20		2059
K- 21		2060
K- 25	_	2061
K- 26	64	2062
K- 27	62	2063
K- 29	63	2064
K- 30		1037
K- 31	13	2065
K- 32		2066
K- 35	<u> </u>	2067
K- 36	_	2032
K- 39		2068
K- 40		2069
K-41		2070
K-42		2071
K- 44	<del></del>	2072
K- 45	60	2073
K- 46	60	2074
K- 48	61-17-58	2033
K- 50		2075
K- 51	_	2076
K- 52	31	2077

Table 1. (cont.)

PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
K- 53		2078
K- 54	30	2079
K- 55	_	2080
K- 57	_	2081
K- 59	_	2082
K- 60	_ _ _	2083
K- 62	_	2084
K- 63	_	2085
K- 64		2034
K- 65		2086
K- 69	37	2087
K- 70	27	2088
K- 71		2089
K- 76		2090
K- 78		2091
K- 79	_	2092
K- 80	46	2093
K- 81		1036
K- 84	55	2095
K- 85	_	2096
K- 87	25	2097
K- 89		2098
K- 90	_	2099
K- 95		2300
K- 96	_	2301
K- 97	— — — —	2302
K- 98		2303
K- 99	3	2304
K-100	_	2305
K-101	24	2306
K-102	<del>-</del>	2307
K-103	56	2308
K-105	_	2035
K-106	_	2310
K-107	_	2311
K-108	_	2312
K-109	49	2313
K-110	48	2314
K-111	<u>.                                    </u>	2036
K-112	43	2315
K-115	42	2316
K-116	41	2317
K-118		2318
K-120	40	2319
K-124	<del></del>	2037
K-127		2320

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Table 1. (cont.)

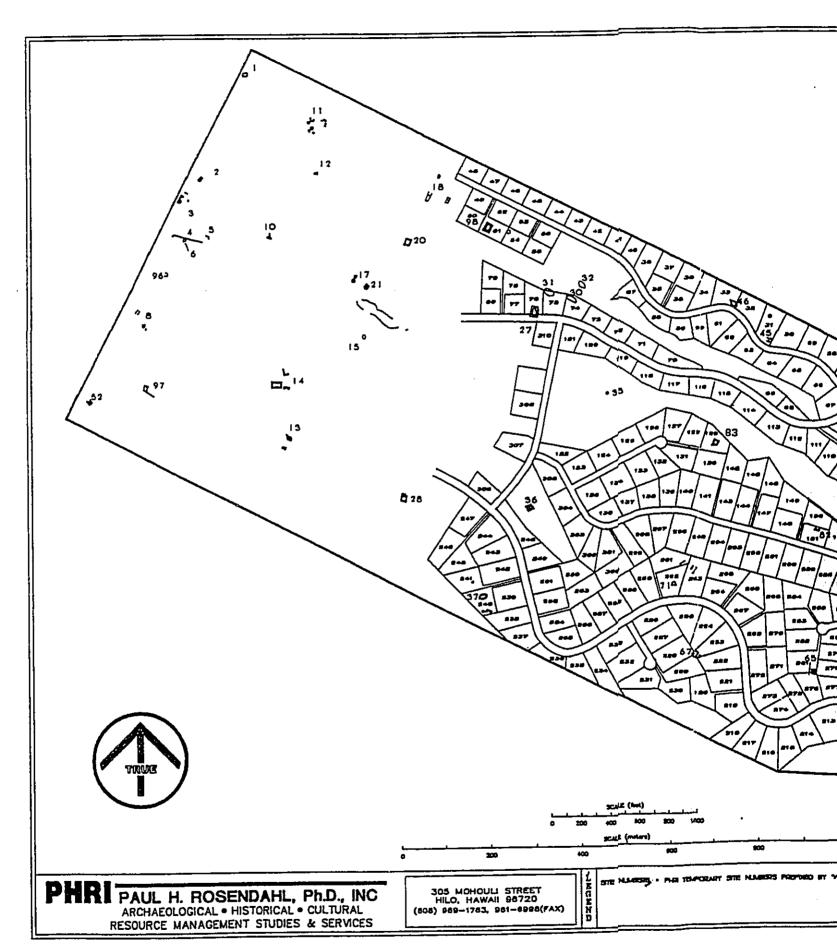
PHRI Temporary Number	BPBM Site Number (T-)	SIHP Site Number
K-130		2038
K-131		2321
K-134	_	2322
K-135	<del>-</del>	2323
K-137		2324
K-140		2325
K-142	<del></del>	2326
K-143		2327
K-146		2328
K-148		2329
K-149	_	2330
K-152	_	2331
K-200	_	2332
K-201	_	2333
K-202	_	2334
K-203	-	2335
K-204		2336
K-205		2337
K-206	I	2338
K-207	45	2339
K-208		2340
K-209		2341
K-210	_	2342
K-211		2343

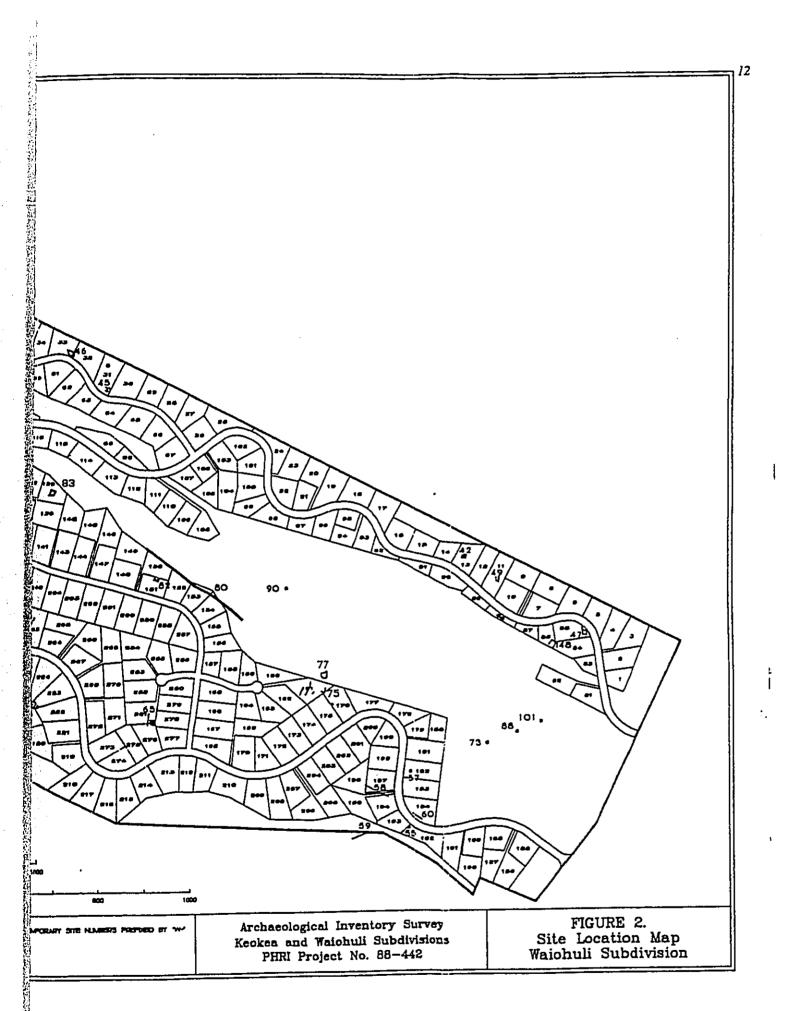
Of the 159 sites identified, 61 were complexes (sites consisting of more than one feature). In Waiohuli, nine complexes comprised of 21 features were identified, and in Keokea 52 complexes comprised of 156 features were identified. Ninety-eight of the identified sites consisted of single features (42 in Waiohuli and 56 in Keokea). Feature types present at sites include: wall, enclosure, terrace, mound, overhang, upright, wall, lithic scatter, alignment, cave, platform, bridge, and burial. Table 2 lists the frequencies of formal feature types recorded.

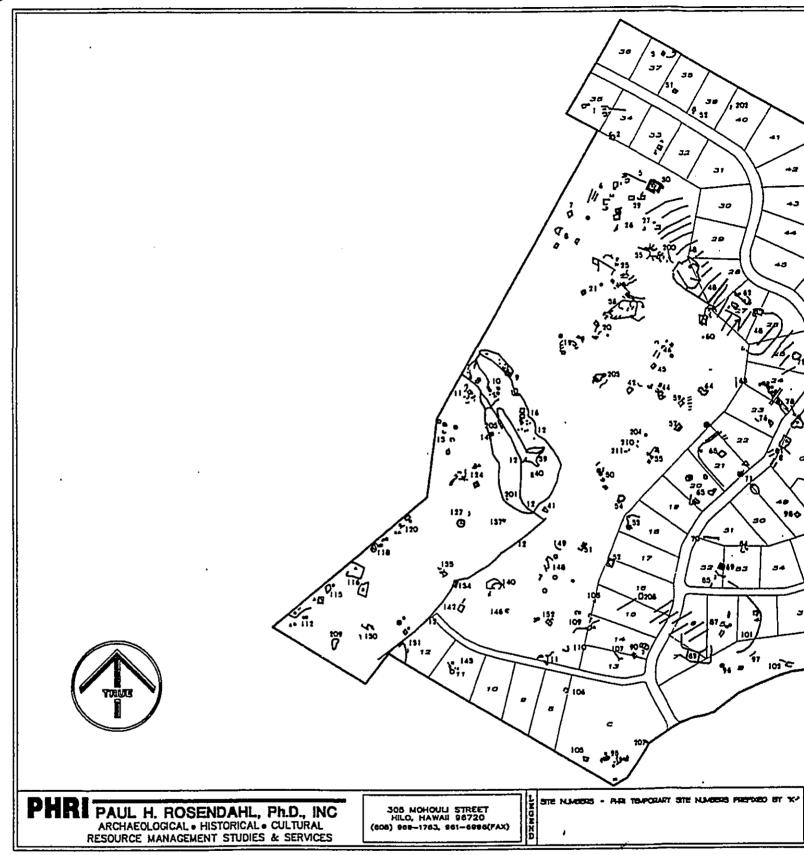
Probable functional interpretations were made for most sites. Site functions included: agricultural, habitation, religious, animal (cattle) control, burial, transportation, storage, roadway, lithic reduction, and indeterminate. The frequencies of functional site types are listed in Table 3.

Sites were interpreted as habitation sites if they appeared to have been permanent or semi-permanent residences. Habitation sites are those which include archaeological features traditionally associated with dwellings. In the project area, habitation features include enclosures, platforms, terraces, and C-, L-, and U-shaped walls. No sites in the project area were interpreted as temporary habitation sites; however, several sites did include features traditionally associated with temporary habitation-such as C-, L-, and U-shaped walls and overhang shelters. Also, no habitation sites in the project area were "open" sites habitation sites not associated with stone architecture. This was because such open sites, if they existed, would have been manifested by surface exposures of midden, artifact scatters, and soil discolorations-none of which were likely to have been seen through the dense vegetative cover which characterizes most of both subdivisions.

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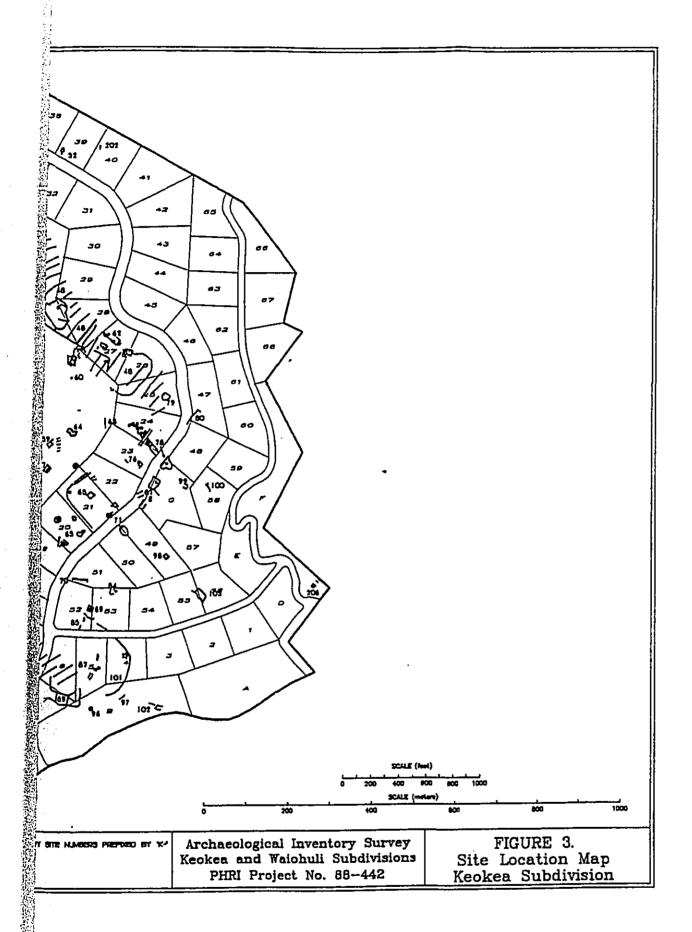


Table 2.
FREQUENCIES OF FORMAL FEATURE TYPES

Formai Type	Number	Percen
	WAIOHULI	
Alignment	1	1.59
Bridge	1	1.59
Human Bone	1	1.59
Cave	1	1.59
Enclosure	30	47.62
Lithic Scatter	1	1.59
Mound	4	6.35
Overhang	3	4.76
Platform	. 1	1.59
Terrace	5 2	7.94
Upright		3.17
Wall	13	20.63
WAIOHULI TOTAL:	63	100.00%
	KEOKEA	
Cairn	1	0.47
Enclosure	139	65.88
Heiau	1	0.47
Lava Tube	2	0.95
Lava Tube Enclosure	1	0.47
Mound	3	1.42
Overhang	21	9.95
Paved Area	1	0.47
Platform	6	2.84
Sink	1	0.47
Stone	1	0.47
Structure	1	0.47
Теттасе	17	8.05
Wall	16	7.58
KEOKEA TOTAL:	211	100.00%

Nine sites were interpreted as religious or possibly religious, and 10 were interpreted as burials or potential burials. These include the previously recorded heiau, notched-rectangular enclosures, features with free-standing uprights and/or coral, large stepped and paved terraces, and features known or suspected to contain human remains. Several sites in the vicinity of Molohai Heiau in Keokea (a likely candidate for interpretation as an ahupuaa-level heiau) include a relatively high density of features tentatively assigned a religious function. Among these are Sites K-2, -3, -6, -29,

and -48. In addition, many large and probably high-status residential features, densely clustered agricultural features, and other features were found proximate to the heiau. For example, nearby Site K-78 consists of a series of stepped, paved terraces extending for more than 120 meters; the site may be a heiau (ili level?). In addition, the land between K-78 and Molohai Heiau—very much like what persists throughout the Keokea subdivision and nearby surrounding lands—is regularly terraced and includes at least six large features.

Table 3.
FREQUENCIES OF FUNCTIONAL SITE TYPES

Formal Type	Number	Percent
	WAIOHULI	
Agriculture	8	15.69
Animal Control	5	9.80
Burial*/Ag.	1	1.96
Habitation/Ag.	23	45.10
Burial		3.92
Indeterminate	2 2	3.92
Lithic Reduction	1	1.96
Religious	i	1.96
Religious*	i	1.96
Religious*/Hab.	3	
Transportation	3	5.88
Habitation	1	5.88
		1.96
WAIHOULI TOTAL:	51	100.00%
	KEOKEA	
Agricultural	5	4.63
Animai Control	6	5.55
Animal Control/Ag.	3	2.78
Burial*/Hab./Ag.	3 3	2.78
Burial	1	0.93
Burial/Habitation	2	1.85
Burial/Ag.	1 .	0.93
Tool Manufacturing	1	0.93
Habitation	22	20.37
Habitation*/Ag.	1	0.93
Habitation/Ag.	48	44.44
Habitation*/An. Cont.	1	0.93
Habitation/Indeterminate	i	0.93
Habitation/Ag/An. Cont.	4	
Indeterminate	2	3.84
Religious*/Ag.	<del></del>	1.85
Religious/Hab./Ag.	I 1	0.93
Religious*/Hab./Ag.	ı.	0.93
Religious	1	0.93
Temp. Habitation	I	0.93
Temp. Hab./Ag.	I	0.93
Water Tank	1	0.93 0.93
KEOKEA TOTAL:	108	100.00%

<sup>\*</sup> Tentative Function

One hundred thirty-nine enclosures were identified in Keokea Subdivision of which 127 were tentatively assigned a habitation function. This is a density of one major habitation feature for every 2.76 acres. Walls were found throughout both subdivisions. These varied in thickness, height, and construction. The historical documentary research for the present project suggests that most walls were built within the last century. Indeed, the majority of the walls appear to have been constructed in historic times to control ranging cattle.

During the present project, two extensive wall complexes of probable historic origin were recorded (W-4 and K-12). Site W-4 consists of a series of walls and wall segments bordering both sides of the northernmost large gulch in Waiohuli; these walls and segments apparently served to keep cattle out of portions of the gulch. Site K-12 consists of a meandering series of long and substantial walls situated in the southwest portion of Keokea subdivision. K-12 includes the long straight wall which marks the southern boundary of the Keokea project area. Aside from barbed wire and occasional posts in and associated with Site W-4, no historic artifacts were found in association with the walls.

Extensively scattered throughout both subdivisions were hundreds of minor agricultural features (mounds and terraces) which were found associated with most of the recorded sites. Most of these features were not formally recorded; instead, their distributions were plotted (Figure 4) and they were referred to in the records of formally recorded sites as being present in the site area. Recorded sites not associated with minor agricultural features were exclusively those found in areas where mechanical ground alteration had almost certainly obliterated them. This is particularly true in Waiohuli where perhaps 50% of the surface of the subdivision has been bulldozed. In the Waiohuli parcel, major residential features may have been bulldozed; this would account for the low density of sites in that subdivision, however, it is clear that the bulldozer operator made occasional attempts to avoid them.

The spatial associations between the various formal and functional feature types in Waiohuli have been so thoroughly obscured by ground disturbance that, aside from

focusing on a few small locales, any attempt to analyze site and feature distributions can be expected to yield very limited and unreliable results. This does not hold true in the Keokea subdivision where recent mechanical disturbance is primarily limited to areas along the eastern subdivision boundary and along the few roads which traverse the subdivision.

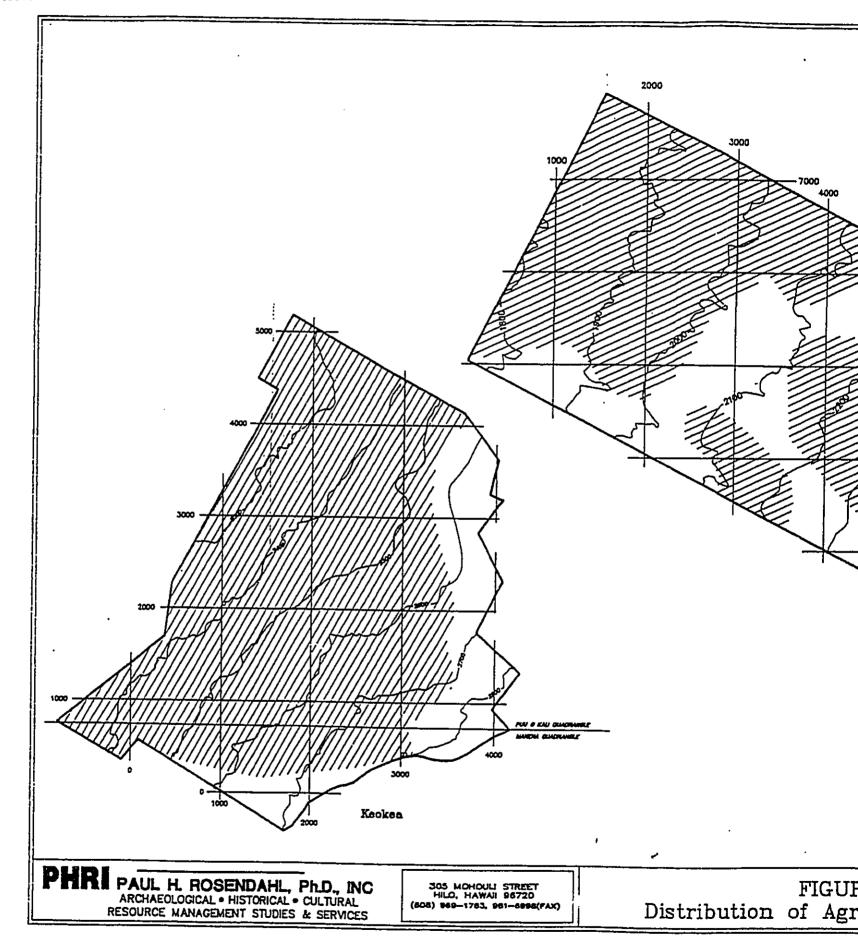
In Keokea, several of the residential features showed signs of having been disassembled in order to use their stones for building materials (Sites K-52 and K-90). In both Keokea (Site K-107) and Waiohuli (Site W-90), there was evidence that stone walls at the entrances to burial caves had been removed.

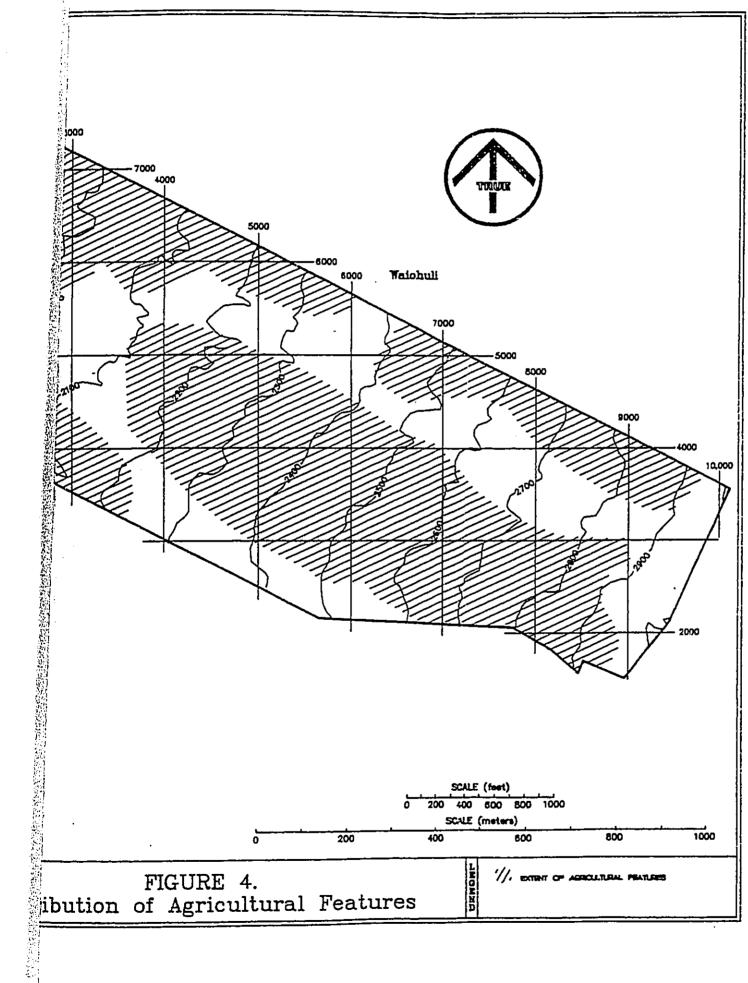
#### LIMITED SURFACE COLLECTIONS

Surface collection was limited to the recovery of four artifacts considered threatened by either collection by amateurs or displacement by natural forces. The artifacts were all indigenous Hawaiian types—a small polished basalt adze, a retouched, utilized basalt core, a retouched basalt flake tool, and a scoria abrader.

#### LIMITED TEST EXCAVATIONS

Limited test excavations were undertaken to recover charcoal for radiocarbon dating and to assess the depth and constituents in cultural strata at selected features. The features excavated included a sample of the major formal feature types present. Nineteen test excavations (12 in Keokea and seven in Waiohuli) were conducted. Each excavation was taken down to a maximum depth of 50 cmbs (centimeters below surface) or to sterile soil. The test excavations yielded ecofactual material and 112 artifacts, including abraders, a flaked lithic tool, and flaked lithic debitage. The ecofacual materials included medium mammal, small mammal bone, fish bone, marine shell, kukui (Aleuriues moluccana [L.] Willd.), gourd, and floral remains. Twelve of the excavation units (at 12 separate features) yielded marine faunal remains. Nine units yielded terrestrial faunal remains. The test units also yielded radiocarbon samples, of which 17 were submitted for dating analysis.





## DATA ANALYSES

#### CHRONOLOGY

Seventeen ash-charcoal samples from 15 sites were submitted to Beta Analytic Laboratories in Coral Gables, Florida for age determination analyses. The samples were collected from subsurface contexts within a number of feature types—including heiau, rectangular and circular enclosures, a paved platform, and a C-shaped wall—and from outside of an overhang shelter. Radiocarbon age determinations are summarized in Table 4 and are graphically illustrated in Figure 5.

One sample (from Site K-7, TP-1, 40-50 cmbs) contained insufficient carbon for dating. A sample from Site W-3 produced a modern (post AD 1950) date. The other 15 date ranges span 1,210 years (AD 680-AD 1890). Site K-7, Feature A, a rectangular enclosure tentatively assigned a permanent habitation function produced the earliest date (680-1060 AD). As insufficient carbon was recovered from the lowest level excavated at Site K-7, Feature A (40-50 cmbs), the dated sample (from 30-40 cmbs) does not represent the oldest strata in the feature. In addition, the lowest level excavated was not taken down to sterile strata. The early date for Feature A-which in structural form is similar to enclosures associated with much later dates—and other data suggests that the area of the feature has been inhabited on a fairly permanent basis for at least a millenium. Questions concerning intensity of occupation at the site and the evolution at the site of adaptive strategies over time will require further data collection and analysis and will require sound chronological determinations.

The remaining 14 date ranges span AD 1270-modern dates. Eight of these ranges were derived from samples taken from sites tentatively assigned religious functions. One of the eight ranges and three other ranges were from sites at which human remains are known to be present, or are suspected (from W-11, K-3, K-111, and K-130). The earliest of these ranges. AD 1270-1490, was derived from Feature A, Site W-11. Feature A is a C-shaped wall; however, it is unlike other C-shapes in that it opens toward the prevailing northeast winds—which indicates it most likely did not serve as a shelter. Feature A is associated with alignments and substantial mounds, some of which are tentatively interpreted as burials. Site K-3 is an enclosure and Sites K-111 and K-130 are overhang shelters.

An excavation at Site W-27 yielded two samples from separate, arbitrary strata (10cm) between 30 and 50 cmbs. The excavation was placed within the paved interior of the structure. Beneath the pavement was what appeared to be domestic midden, suggesting that the dates do not necessarily relate to the construction and use of the heiau itself but perhaps to pre-heiau occupation. This same observation pertains to the other substantial paved structures excavated and/or dated. In every case, once the paving was breached, apparent domestic deposits were encountered. One is led to deduce from this that the features tested were not as elaborate in construction early on; that the structures were either nonexistent during early occupation at their location or that they were less elaborate and were added to or rebuilt over time. The relationships between the dated samples and the form of the structures from which they were taken must await more detailed study.

## PORTABLE REMAINS

One hundred twelve artifacts including abraders, a flaked lithic tool and flaked lithic debitage were recovered from 19 test excavations. Thirty-seven pieces of volcanic glass from nine sites and 60 pieces of flaked basalt from eight sites were recovered during excavations. Three sites yielded polished basalt flakes and one site yielded a shark tooth. Two pieces of coral were recovered from two sites (Table 5). Four artifacts—an abrader, an adze, a flaked lithic tool, and a utilized flake—were collected from the surface of four separate sites.

Marine ecofactual remains included Gastropoda, bivalves, fish, and Echinoidea (Table 6). Terrestrial faunal remains included remains of small, medium, and large mammals, and several pieces of unidentified remains. Floral remains included unidentified charcoal, gourd, and four kukui fragments. The excavated ecofactual remains do not constitute representative site or feature samples. They were collected as a by-product of excavations aimed primarily at collecting datable materials. They are, however, informative in that they demonstrate that a wide range of activities occurred throughout the project area over perhaps 1,200 years.

Table 4.
SUMMARY OF RADIOCARBON AGE DETERMINATIONS

PHRI Lab.No. RC-	Lab. No. BETA-	Provenience	C-14 Age Yrs. B.P. (one sigma)	C-13/ C-12 Ratio	C-13 Adjusted C-14 Age Yrs. B.P.	*Calendric Range Yrs. AD
KEOKEA						
K-3						
513	30811	Fea. A, TU-1 Layer I/II 0-22 cmbs	180 <u>±</u> 50	-24.0	200±50	1640-1890 1910-1955#
K-6						
514	30812	Fea. A, TT-1 Layer II, 17-48 cmbs	260 <u>±</u> 60	-24.1	270 <u>+</u> 60	1470-1680 1739-1805 1935-1955#
K-7						
515	30813	Fea. A, TP-1 Layer I-4 30-40 cmbs	1020±100	-19.3	1110±100	680-1060 1077-1125 1135-1157
530		Fea. A, TP-1 Layer I-5 40-50 cmbs			<del></del>	Insufficient Carbon
15.40						
K-48 518	30815	Fea. B, TP-2 Layer I-4 30-40 cmbs	30 <u>±</u> 70	-15.0	190 <u>±</u> 70	1518-1591
K-64						
517	30814	Fea. A., TP-1 Layer II/III 6-50 cmbs	330 <u>:</u> ±80	<b>-22.9</b>	360±70	1420-1660
K-105						
519	30816	Fea. A. TP-1 Layer III 20-40 cmbs	310±50	-26.3	290±50	1470-1670 1775-1793 1947-1953
K-111						
520	30817	Fea. A, TP-1 Layer II 6-20 cmbs	110 <u>+</u> 70	-23.2	140±70	1640-1955#

<sup>\*</sup>Calibrated according to Stuiver and Pearson (1986). Range at two sigmas.

<sup>#</sup>Denotes influence of bomb C-14.

Table 4. (cont.)

		···	Table 4. (cor	ıt.)		
PHRI Lab.No. RC-	Lab. No. BETA-	Provenience	C-14 Age Yrs. B.P. (one sigma)	C-13/ C-12 Ratio	C-13 Adjusted C-14 Age Yrs. B.P.	*Calendric Range Yrs. AD
K-124 521	30818	Fea. A, TP-1 Layer III 13-57 cmbs	110 <u>±</u> 60	-21.7	160 <u>±</u> 60	1640-1955#
K-130 522	30819	Fea. A, TP-1 Layer II · 4-16 cmbs	100.2 <u>±</u> 0.7% Modern	-10.4	220±50 1859-1861 1921-1955#	1523-1566 1629-1696 1726-1818
WAIOHU	LI					
W-3 523	30820	Fea. A. TP-1 Layer I-1 0-30 cmbs	100.5 <u>+</u> 0.8% Modern	-24.3	100.4±0.8% Modern	****
W-11 524	30821	Fea. A, TP-1 Layer I-1 0-35 cmbs	530 <u>±</u> 90	-24.5	540 <u>+</u> 90	1270-1490
W-27 525	30822	Fea. A, TP-1 Layer I-4 30-40 cmbs	430 <u>±</u> 70	-22.0	480 <u>±</u> 70	1305-1360 1380-1510 1598-1617
526	30823	Fea. A, TP-1 Layer I-5 40-50 cmbs	390 <u>+</u> 90	-21.4	450 <u>+</u> 90	1300-1365 1370-1650
W-28 527	30824	Fea. A. TP-1 Layer I-2/3 10-30 cmbs	430 <u>+</u> 90	-22.5	470 <u>+</u> 90	1290-1640
W-36 528	30825	Fea. A. TP-1 Layer I-5 40-50 cmbs	450 <u>±</u> 50	-23.9 ·	470 <u>±</u> 50	1397-1482
W-45 529	30826	Fea. B, TP-1 Layer II 18-30 cmbs	100±50	-11.1	330 <u>±</u> 50	1450-1660

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Figure 5.
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2000	Leboratory Humber RG VG	514	515	518	517	519	520	521	522	523	524	525 526	527	528	529	
1400 1500 1600 1700 1800 1900	RAKAK KAKKAKAKKAKKAKKAKKAKKAKAKAK	XXX XXXXXXX XXXXXXXXXXXXXXXX		XXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	пипипипипипи и к	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	ши ишин шин или	Hadern	полничини	NINKK HINIKHHINKKI KAN KAN KAN KAN KAN KAN KAN KAN KAN KAN	miniminiminiminimi	XXXXXXX	XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX	
PROVEHIENCE 1200 1300	2028, Fem. A. TU-1, 1/11, 0-22 cmbs	TT-1, II, 17-48 cabs	2031, Fee. A. TP-1, I-4, 30-40 cmbs 680-1157	2033, Fee. B, TP-2, I-4, 30-40 cmbs	2034, Fee. A. TP-1, II/III, 6-50 cabs	2035, Fee. A, TP-1, III, 20-40 cmbs	2036, Pen. A. TU-1, 11, 6-20 cmbs	2037, Fee. A. TP-1, III, 13-57 cmbe	2038, Fee. A. TP-1, II. 4-16 Cabs		TP-1, I-1, 0-35 cabs IIX		ā	2043, Fes. A, TP-1, I-5, 40-50 cmbs	2044, Fea. B, TP-1, II, 18-30 cmbe	

Table 5.

SUMMARY OF PORTABLE ARTIFACT TYPES (SUBSURFACE)

		K-3	3	K-6			K-30	20	}			K-48		
Material	Fea.	, ,	A Total	Fea. A		Fea.			Tot 81		Fea.			Total
	I	TP-1		TP-1		TP-1	17			TP-1				1
	H	H		I	1-2	1-3	1-4	1-5		-	1-1		Total	
INDIGENOUS FLAKED STONE														
Basalt	<b>-</b>	6	10	7	m	ო	7		6	2	-		6	7
Volcanic Glass	<b>—</b>	ı	-	7	ı	7	7	1	4	m	-	٠,	l m	φ
SUBTOTAL FLAKED STONE	2	6	11	4	3	5	4	-	13	5	2	ص ا	5	10
TOOLS				,							}			
Polished basalt														
flakes	-	1	7	ı	t	ı	1	ı	t	ı	ı	ı	ı	İ
Shark tooth	1	1	1	t	1	1	1	1	ı	7	1	1	: :	-
SUBTOTAL TOOLS	1		2					,	,	-		,		,
TOTAL INDIGENOUS	6	01	13	4	3	5	4	-	13	9	2	m	5	11

N-1-1-1	K-64	K-105	K-111	K-124	W-39			H-27	27		
18 Cet 1.81	TP-1	TP-1	TP-1	rea. A	TP-1		قع ا	Fee. A TP-1			Total
	II	II	Ħ	H	1-I	11	I-2	I-3	I-4	1-5	
INDIGENOUS FLAKED STONE											
Basalt	-	ı	1	e	1	<b>~</b>	က		1	t	5
Volcanic Glass	ı	1	ις.	1	ı	1	æ	4	-	-	14
SUBTOTAL FLAKED STONE	-	1	5	9		-	==	5	-	1	19
TOOLS											
Polished basalt											
flakes	ı	1	ı	ı	ı	1	ı	ı	1	1	ı
Shark tooth		1	ı	ı	1	ı	ı	i	ı	1	1
SUBTOTAL TOOLS	,		,	,	,		,	1	1	1	,
TOTAL INDIGENOUS	1		5	3	,	1	=	2	-	-	19
			,				ŀ	i	1	ı	;

Table 5. (Cont.)

		K-28			3	W-36				M-45		
Material	Fes	1. A	Fea. A Total		Fea. A	ļ	Total		Fea. B	1	tai	Grand
	TP-1	-			TP-1				TP-1			Toral
	12	1		I-2	I-2 I-4	I-5		Н	H	III		
INDIGENOUS												
FLAKED STONE Basalt		7	α	a	c	·	•	•	,	•	•	
Volcanic Glass	٠.	- 1	o -	0 1	<b>7</b> 1	7	71	-	m c	7	<b>.</b>	09
	•		-	t	ı	ı	ı	1	**	_	4	37
SUBTOTAL FLAKED STONE	2	7	6	89	2	2	12	1	9	m	10	97
TOOLS												
Polished basalt												
flakea	ı	ı	1	ı	1	ı	ı	ı				•
Shark tooth						l	I	i	1	1	i	77
	I	ı	i	1	1	ı	1	ı	1	t	ı	
SUBTOTAL TOOLS	,	1	,		,	,	,	1	,		,	,
												r
TOTAL INDIGENOUS	7	7	6	8	2	2	12	-	و	3	2	101
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Table 6.

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PIDINIFICATION OF ECOENOTION NATIONS		000
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	K-3		K-6	K-7		K-32		K-36			-	K-48		1
CATEGORY	Fea. A	Fea.	8. A	Fea.	A I	Fea. A	:	Fea.	m   1	1		Fea. B	7-1 6	7
	=	-		1			#	1	7	ı		1	1	H
HARINE INVERTEBRATES														
GASTROPODA	•					1							1	
Strombue meculatue	+	ı		t 1	1	1	ı	ı	:	) 			ı	
Cypraeldae	ı	ı	1	ı +	i	ı	1	:	ı	; i			ı	
Conidae	•	,	ı	1	1	ı	ı			•			1	
Nerita picea	ı	1	ı	+	t	ı	1	t	1	!		1	ı	
BIVALVIA														1
Tellinidae	i	1	ı	1	1	+	1	ı	,	1		1	t	
OTHER											ļ			
Echinoidea	ı	+	1	+	1	1	•	ı	1	+		1	+	
BONE											ļ			1
Fish	ı	+	+	1	1	i	ı	ı	+	+	T	1	1	
Hemmal	+		1	1	+	+	ı	1	+	T	_	1	1	
Large	+	+	ı	1	1	1	ı	ı	1	'		1	ı	
Medium	t	ı	1	1	1	1	ı	ı	1	+	•	1	1	
Small	•	+		+	+	1	+	1	ı	1		1	+	
Unidentified	ı	+	ı	1 	1	ı	t	1	1	1		1	+	
VEGETAL REMAINS						•								}
Charcoal	•	ı	1	1	ı	ı	ı	ı	ı	'		;	1	
Gourd	t	ı	1		I	1.	t		,	, 1		1	ı	
Aleurites moluccans	1	+	ı	·	t	ı	1	ı	•	' '	1	1	1	. '
NON-ECOFACTUAL REMAINS	S													
Coral	<b>.</b>	+	,	ı .	1	1	ı	1	ı	,		1		
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	Fea. A	K-105 Fea. A	K-111 Fee. A	K-124 Fea. A	K-136 Fea. A	W-27 Fea. A	W-28 Fea. A	교립	Fea.	N-45
HARINE INVERTEBRATES GASTROPODA Strombus maculatus Cyprseidae Conidae	1111	1111	1 1 1 1	111		+ 1 1 1	1111	7	1 + 1 1	++::
BIVALVIA Tellinidae	,	. '	1	'		ı	,	1	'	
OTIIER Echinoidea	+	1	1	•	1	1	ı	,	1	1
BONE Fish Hammal Large Hedium Small Unidentified	l fra a a	+ + 1 1 1 1 1	1111++	1111+1	1111+1	1111+	+ 1 1 1 1 +	+		11111
VEGETAL REHAINS Charcoal Gourd Aleurites moluccans	1.1.1	11+	1 1 1	1 1 1	111	111	1 1 1	111	1 1 1	11+
NON-ECOFACTUAL REMAINS Coral	1	1	1	1	1	1	a a		,	1

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## CONCLUSIO

## EVALUATION OF SURVEY METHODOLOGY

The archaeological inventory survey of Waiohuli and Keokea Subdivisions involved low-level aerial survey of approximately 60% of each subdivision and intensive (15-30 m interval) pedestrian survey of 100% of both subdivisions. During both aerial and pedestrian surveys, dense lantana, panini, wattle, ilima, and high grass consistently limited surface visibility to 10-20 percent of the ground surface, effectively eliminating the possibility of finding surface portable remains and minor agricultural features. As a result, the survey was focused on identifying substantial residential and agricultural features.

Even major, large-stacked boulder and cobble residential features were found to be thoroughly overgrown with panini and/or lantana, or were buried under waule deadfalls. Because of this, the sites had to be considerably cleared and wall segments had to be probed for prior to preparing sketch maps. Nevertheless, excepting perhaps features in areas completely obscured by large, impenetrable panini thickets (areas totaling c. one acre), all major archaeological features in both subdivisions were identified during the survey.

#### **DISCUSSION**

The overall data suggests that Keokea Subdivision was intensively expoited in a variety of ways for at least two-thirds of the entirety of Hawaiian prehistory. There is evidence in the project area for change over time, spatial variety, functional (behavioral) variety, and interaction with peoples in other (coastal) areas.

The picture that the overall data for Waiohuli Subdivision presents is less clear due to the extensive historic disturbance in the area, especially in regard to the density of feature types and the temporal ranges of features. The feature types in the area (heiau to agricultural mounds) do, however, reflect a full range of activities. If the low site density in Waiohuli is not due to removal of sites by bulldozing, then prehistoric and historic occupation of the area was very different from nearby Keokea. For example, Kaumeheiwa Heiau in Waiohuli is not as densely surrounded by agricultural, habitation, and religious features as could be expected if it were in Keokea. It exists in relative isolation when compared with Molohai Heiau in Keokea. Agricultural features in Waiohuli are as widespread as those in Keokea, but they are not found in as high densities. The same goes for habitation

and religous features in Waiohuli. There are other "non-archaeological" differences between the two areas. For example, three major gulches and an extensive and well-developed contributary drainage system in Waiohuli may have transported surface water out of the immediate area before much could be absorbed. Keokea has no such drainage system. This could render the Waiohuli area effectively drier than Keokea and make the area less suited for agriculture. In turn, the limited productivity of the land might have substantially limited the population.

Even if the lower feature density in Waiohuli is a direct result of surface bulldozing, it is still possible that subsurface remains are still present and are relatively intact. Unless the presense of subsurface remnants of features is demonstrated in Waiohuli, comparisons between the distributions of sites and features in Keokea and Waiohuli cannot be made with confidence, nor can the distributions within the Waiohuli Subdivision itself be addressed.

The historical documentary research suggests that the Kula region was intensively cultivated during the early historic period. Apparently, this was especially true during the gold rush years in California, when the influx of miners created a demand for food which the potato farmers in Kula in part filled. The historical documentation suggests that the farmers during this period did not make substantial modifications to the land (terraces, etc.) but instead "...followed the natural contour of the land..." Whether Keokea and Waiohuli subdivisions were under intensive cultivation during this period is open to question. The lack of historic period artifacts in association with residential and agricultural features suggests they were not.

## SUGGESTED RESEARCH QUESTIONS

Future research in the Kula area should address, at a minimum, the following questions.

- 1. When was the Kula area and each site and feature first occupied?
- 2. Were the occupations brief, intermittent, continuous, or long-term?
- 3. Which sites and features represent contemporaneous occupation and/or use?
- 4. Do some formal site/feature types appear earlier in the archaeological record than others?

- 5. Are earlier sites functionally different from later sites?
- 6. How are the archaeological resources distributed with regard to environmental factors like elevation, distance from water, soil types, geomorphic features and vegetation communities?
- 7. How are archaeological resources distributed relative to each other? Do particular site and feature types tend to occur together?
- 8. What are the relationships between the archaeological resources in the Kula area and those elsewhere?
- 9. How do the distributions and densities of archaeological sites and features relate to the distribution and density of prehistoric people in the Kula area?
- 10. Can particular behaviors be associated with formal site and feature types—which behaviors with which formal types?
- 11. Do the archaeological data correlate well with the ethnographic and historic records?
- 12. Do the archaeological data from Kula support the interpretations made concerning similar sites and features in similar areas?

# GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS

To facilitate State and County review, general significance assessments and recommended general treatments for all identified sites are summarized in Table 1. Significance categories used in the site evaluation process are based on the National Register criteria for evaluation, outlined in the Code of Federal Regulations (36 CFR Part 60). The Hawaii State Historic Preservation Office (SHPO) uses these criteria for evaluating cultural resources. Sites determined to be potentially significant for information content (Category A. Table 1) fall under Criterion D, which defines significant resources as ones which "have yielded, or may be likely to yield, information important in prehistory or history" (36 CFR Sec. 60.4). Sites potentially significant as representative examples of site types (Category B, Table 1) are evaluated under Criterion C, which defines significant resources as those which "embody the distinctive characteristics of a

type, period, or method of construction...or that represent a significant and distinguishable entity whose components may lack individual distinction." Sites with potential cultural significance (Category C) are evaluated under guidelines prepared by the Advisory Council on Historic Preservation (ACHP) entitled "Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review" (Draft Report, August 1985). The guidelines define cultural value as "...the contribution made by an historic property to an ongoing society or cultural system. A traditional cultural value is a cultural value that has historical depth" (1985:1). The guidelines further specify that "[a] property need not have been in consistent use since antiquity by a cultural system in order to have traditional cultural value" (1985:7).

Of the total 159 sites identified during the present survey, 108 are in Keokea and 51 are in Waiohuli. Of the 108 Keokea sites, 94 are assessed as significant solely for information content. Eighty-nine of the 94 sites are recommended for further data collection, and five of the 94 sites are recommended for no further work. Four of the remaining 14 sites are assessed as significant for information content, as an excellent example of a site type, and for cultural; value. Further data collection and preservation with interpretive development are recommended for these four sites. Three of the remaining 14 sites are assessed as significant for information content and as an excellent example of a site type. For these three sites, further data collection and preservation with interpretive development are recommended. Another three sites are assessed as significant for information content and for cultural value; these three sites are recommended for further data collection and preservation as is. Three other sites are assessed as significant for information content and are tentatively assessed as significant for cultural value. These three sites are recommended for further data collection and are provisionally recommended for preservation as is. The last site is assessed as significant for information content and as having cultural value. For this site, preservation "as is" is recommended.

Of the 51 sites in Waiohuli Subdivision, 42 are assessed as significant solely for information content. Thirty-three of these 42 sites are recommended for further data collection, and nine of the 42 sites require no further work. Of the remaining nine sites, three are assessed as significant for information content, as excellent examples of a site type, and as culturally significant. Further data collection and preservation with interpretive development are recommended for these three sites. Two of the remaining six sites are assessed as significant for information content and are provisionally assessed as having cultural value. For these two sites, further data collection is recommended and

preservation with interpretive development is provisionally recommended. The final four sites are assessed variously and require various recommended treatments (see Table 7 for specific recommendations).

Table 8 lists lots which contain or appear to contain sites or portions of sites that are tentatively recommended for preservation. The uncertainty as to whether lots contain or do not contain sites is due to problems concerning lot boundaries. These problems are due to (a) possible inaccurate boundaries/locations on maps and aerial photographs provided

by DHHL, (b) problems of determining precise boundaries and locations in the field due to vegetation and terrain changes that have occurred since preparation of the photographs and maps, and (c) missing DHHL lot comer markers. In all, 19 lots in Keokea and 5 lots in Waiohuli contain or appear to contain sites recommended for preservation. In order to accurately determine exactly which lots contain sites or portions of sites, the sites must first be individually staked out in the field. Following this, the DHHL will have to restake the boundaries in question.

Table 7. SUMMARY OF GENERAL SIGNIFICANCE ASSESSMENTS AND RECOMMENDED GENERAL TREATMENTS WAIOHULI PARCEL

Site or	<u>s</u>	ignifican	ce Categ	Ory	Rec	ommend	ed Trans	
Feature No.	A	X	В	C	FDC	NFW	PID	PAI
W-1	+							
W-2	÷	_	•	-	+	-	•	_
W-3	<u>.</u>	•	-	•	+	•	-	-
W-5	<u>.</u>	•	-	•	+	-	-	•
W-6	T _	•	-	•	+	-	-	-
W-8	-1	-	•	-	+	-	-	-
W-10	+	•	-	•	+	-	-	
W-12	+	•	-	•	+	-	-	-
W-13	+	-	-	-	+	-	-	
W-14	<u> </u>	•	-	•	+	-	-	
W-15	<b>T</b>	•	-	-	+	-	-	-
W-17	T	•	-	•	+	-	-	-
W-18		•	•	-	+	-	•	
W-20	<b></b>	-	•	-	+	-	-	
W-21	TF	-	•	-	+	-	-	•
W-31	+	•	•	•	+	-	-	
	+	-	•	-	+		_	

## General Significance Categories:

- A = Important for information content, further data collection necessary (PHRI=research value);
- X = Important for information content, no further data collection necessary (PHRI=research value, SHPO=not significant);
- B = Excellent example of site type at local, region, island, State, or National level (PHRI=interpretive value); and
- C = Culturally significant (PHRI=cultural value).

## Recommended General Treatments:

- FDC = Further data collection necessary (further survey and testing, and possibly subsequent data recovery/mitigation excavations);
- NFW = No further work of any kind necessary, sufficient data collected, archaeological clearance recommended, no preservation potential (possible inclusion into landscaping suggested for consideration);
- PID = Preservation with some level of interpretive development recommended (including appropriate related data recovery work); and
- PAI = Preservation "as is," with no further work (and possible inclusion into landscaping), or minimal further data collection necessary.

The second of th

<sup>\*</sup> Provisional assessment; definite assessment pending results of further data collection.

Table 7. (cont.)

## WAIOHULI PARCEL

			Categor		Rec	ommende	d Tream	nent_
Site or Feature No.	A	X	B	c	FDC	NFW	PID	PAI
reaune No.								
W-37	+	•	•	-	+	-	•	-
W-42	+	-	-	-	+	-	-	-
W-46	+	-	-	•	+	-	-	-
W-48	+	-	•	-	+	-	-	-
W-49	+	-	-	•	+	•	•	-
W-55	+	-	-	•	+	-	-	-
W-65	+	-	-	-	+	•	-	-
W-67	+	-	-	-	+	-	-	-
W-71	+	-	-	-	+	-	-	-
W-73	+	-	-	-	+	•	-	•
W-75	+	-	-	-	+	-	•	-
W-77	+	-	-	•	+	•	-	•
W-82	+	-	-	-	+	-	•	-
W-83	+	-	_	-	+	-	-	-
W-96	+	•	-	-	+	-	-	•
W-97	+	•	-	-	+	•	-	-
W-98	+		_	•	+	•	-	-
17-50								
Subtotal: 33	33	-	•	-	33			
W-4	-	+	-	-	•	+	•	-
W-47	•	+	-	-	-	• +	•	•
W-57	-	+	-	•	-	+	•	•
W-58	-	+	-	•	•	+	-	-
W-59	-	+	•		<b>-</b> .	+	•	•
W-60	-	+	-	-	-	+	•	•
W-80	-	+	-	-	-	+	-	-
W-88	-	+	-	•	-	+	•	-
W-101	-	+	-	<u>.</u> .		+		
Subtotal:	9 -	9	•	•		9		
W-27	+	•	+	+	+	-	+	-
W-28	+	-	+	+	+	-	+	•
W-36	+	•	+	+	+	<u> </u>	· +	
Subtotal:	3 3	•	3	3	3		3	•
W-45	+	-	+		+	•	+	
Subtotal:	1 I	•	1		1		1	•

Table 7. (cont.)

## WAIOHULI PARCEL

Site or		Si	mificano	e Catego	orv	Rec	ommend	ed Treatr	nent
Feature No.		A	Х	В	C	FDC	NFW	PID	PAI
W-11		+	-	-	•	+	-		*
Subtotai:	1	1	•	•	1	1	•		1
W-30		+	-	_		+		*	-
W-32		+	-	-	*	+	-		-
Subtotal:	2	2	-	•	2	2	•	2	-
W-90		+	-	-	+	+	-	•	+
Subtotal:	1	1	•	-	1	1		•	1
W-35		+	•	•	+	+		_	-
Subtotal:	1	1	•	•	1	1	•	•	-
Waiohuli Total:	51	42	9	4	8	42	9	6	2

## KEOKEA PARCEL

Site or	Si	gnificano	e Catego	סדע	Rec	ommende	d Tream	nent_
Feature No.	A	Х	В	C	FDC	NFW	PID	PA
K- 1	+	-	_	-	+	•	<b>-</b> , ·	-
K- 2	+	-	-	-	+	•	-	•
K- 4	+	-	-	•	+	-	-	-
K- 5	+	-	-	-	+	-	-	-
K- 7	+	-	-	-	+	-	•	-
K- 8	+	-	-	-	+	-	-	-
K- 10	+	-	-	-	+	-	-	•
K- 11	+	-	-	•	+	-	-	-
K- 13	+	-	-	-	+	-	-	•
K- 14	+	-	-	. <del>-</del>	+	-	-	-
K- 16	+	-	-	-	+	•	-	•
K- 19	+	-	-	•	+	-	-	-
K- 21	+	-	-	•	+	-	•	-
K- 20	+	-	-	•	+	-	-	•
K- 25	+	-	-	-	+	•	•	-
K- 26	+	•	-	-	+	•	-	-
K- 27	+	-	-	-	+	-	-	•
K- 31	+	-	-	-	+	•	-	-
K- 32	+	-	•	-	+	-	•	•

Table 7. (cont.)

#### KEOKEA PARCEL

Site or	Si	gnificano	c Catego	ory	Rec	ommend	ed Tream	ment
Feature No.	A	Х	В	C	FDC	NFW	PID	PA
K- 35	+	-	-	-	+	-	_	_
K-42	+	•	-	-	+	•	•	-
K- 52	+	-	-	-	+	•	-	-
K- 53	+	-	-	-	+	-	-	-
K-203	+ `	-	-	•	+	•	•	-
K- 9	+	-	-	- ,	+	-	•	-
K- 65	+	-	•	•	+	•	-	-
K- 76	+	-	-	-	+		-	-
K- 85	+	•	-	-	+	-	•	_
K-120	+	-	-	-	+	-	-	-
K-124	+	-	•	•	+-	-	•	-
K-140	+	-	-	-	+	-	-	
K-143	+	•	-	-	+		•	_
K- 36	+	•	-	-	+	•	•	_
K- 39	+	-	-	-	+	-	-	
K-41	+	-	•	•	+	-	_	-
K- 44	+	•	_	-	+	-		
K- 45	+	-	-		+			_
K46	+	-	-	-	+		-	
K- 50	+	•	<u>.</u> .		+			
K- 51	+	•	_	_	<u>.</u>			_
K- 54	+	-			4	_	_	_
K- 55	+		_	_	·	_	_	_
K- 57	+	-	-		+	•	_	_
K- 59	+	•	•	_				
K- 64	+		_	_	<u>.</u>	_	_	
K- 69	+		•	-		_	_	
K- 70	+	-	_	_	+	_	-	
K- 79	+		_		<u>.</u>	_	•	
K- 90	+	-	_	_	<u> </u>	_	•	
K- 81	+	-	-	_	4	_		
K- 84	+	•	_	_	+	_		_
K- 89	+	-	_	_	<del>-</del>	_	_	_
K- 95	+		_	_	<b>+</b>	_	_	_
K-96	+		_	_	+	_	_	_
K- 97	+	_	_	_	+	_	-	_
K- 98	+	_	_	_	+	-	_	_
K- 99	+	-	-	-	+	_	-	-
K-101	+	-	<u>-</u>	•		-	-	-
K-102	+	_	-	-	+	•	-	•
K-103	+	_	-	-	+	-	-	• -
K-105	+	_	<u>-</u>	•	+	-	-	-
K-106	· +	_	-	-	+	-	•	-

Table 7. (cont.)

### KEOKEA PARCEL

Site or Feature No.		Significa	ince Cate	gory	Re	commen	ded Treat	ment
remure No.	A	X	В	C	FDC	NFW	PID	PA
K-109	+							
K-110	+	_	-	•	+	•	•	•
K-111	+	_	•	-	+	•	•	•
K-112	+	_	-	-	+	•	-	•
K-116	+	_	-	-	+		-	•
K-118	+	•	-	-	+	-	•	-
K-127	+	•	-	-	+	•	•	•
K-130		•	-	•	+	•	-	_
K-131	+	•	-	•	+	-	-	-
K-135	+	-	-	-	+	•	-	•
K-137	+	•	•	-	+	-	-	_
K-137 K-142	+	-	-	_	+	-	-	_
	+	•	•	•	+	•	_	_
K-146	+	-	•	-	+	_		•
K-148	+	-	•	-	+	_		•
K-149	+	-	-	_	+	_	_	•
K-152	+	-	-	_	+		•	•
K-200	+	-	_		+		•	-
K-201	+	-	-	-	+	-	-	-
K-202	+	-	-		Ξ	•	. •	-
K-204	+		•	_	<b>T</b>	-	•	-
K-205	+	•	•			- '	•	-
K-206	+	-	_	_	<del>*</del>	•	· •	-
K-208	+	_	_	•	+	-	<b>-</b> '	•
K-209	+	_	_	•	+	•	-	-
K-210	+	_	-	•	+	•	-	-
K-211	+		-	-	+	•	· <b>-</b>	•
Subtotal: 89	89		<u> </u>		89		<del>-</del>	
K- 30	+			—— <i>-</i> —			<u> </u>	<u> </u>
K- 62		•	+	+	+	•	+	•
K- 78	+	-	+	+	+	•	+	-
K-115	*	-	+	+	+	-	+	-
	<del></del> -	-	+	+	+	-	+	-
Subtotal: 4	4	•	4	4	4	•	4	
K- 12	-	+						
K- 60	-	+	•		-	+	•	•
K- 63	-	+	•	_	•	+	-	-
K- 80	-	+		_	•	+	•	•
K-100	-	+	-	-	-	+	-	•
Subtotal: 5	0	5				5		

Table 7. (cont.)

### KEOKEA PARCEL

Cian an	Sign	ificance	Categor			mmende	d Treatm	nent
Site or Feature No.	A	X	В	C	FDC	NFW	PID	PAI
							+	
K- 29	+	-	+	•	+	_	+	•
K- 40	+	•	+	-	+	_		•
K- 48	+	•	+	-	<del></del>			
Subtotal: 3	3	-	3	-	3		3	<u>.</u>
K- 87	+		-	+	+	-	-	+
K-107	+	_	-	+	+	-	•	+
K-207	+	•	•	+	+	-	•	+
Subtotal: 3			•	3	3	•	-	3
							_	*
K- 3	+ .	-	-	*	+	-	•	*
K- 6	+	-	•	-	+		-	*
K- 71	+	-	-					
Subtotal: 3	3	•	-	3	3		-	3
K-134	+	_	•	+	· •	-	-	+
Subtotal: 1	1		-	1		-		1
Keokea Totai: 108	103	5	7	11	102	5	7_	7
Waiohuli Total: 51	51	9	4	8	42	9	6	2
Grand Total: 159	154	14	11.	19	144	14	13	9

• •

Table 8.

LOTS WHICH APPEAR TO CONTAIN SITES OR PORTIONS OF SITES RECOMMENDED FOR PRESERVATION\*

I or No	ubdivision	Waiohuli .	Subdivision
Lot No.	Site No.	Lot No.	Site No.
5 13 14 21 22 23 24 25 26 27 28 29 37 48 49 50 58 A	87 107 107 71 71 78 48,78 48,62 48,62 48 48 3 78 71 71 78 78 78	30 31 74 75 76	45 45 30 30 27

<sup>\*</sup> See page 29 for explanation of uncertainty regarding boundaries of lots in relation to sites.

Table 9.

RESIDENCE LOTS CONTAINING SITES

Keokea Su	bdivision	Waiohuli Subd	ivision_
Lot No.	Site No.	Lot No.	Site No.
11	143 A	in .	49
12	12, 131	13	42
12	131, 131 A-C	2-33	46
13-14	90, 107	51-54	98
14	109, 109 A	74	30
15	108	75	31
16	208	76	27
16-17	52, 52 A-B	84-85	47
18	53	84-85-86	48
19-20-21-22	65	129	83
20	65 D-G	149-150-152-153-154	80
21	65 C, 71 B	150-151	82
21-22	65 A-B, 71 A	161-175-176	75
21-49-50	71	182-183	.5 57
23	76, 76 A-B	184	60
23-24	63, 78 A	192	55
23-24-48-49	78	194-196-197	58
24	78 B-E	222-223-224-228-229	67
25 25	76 B-E 79	777-223-224-270-223	07
26-27	79 48 C	240-241	37
20-27 27	48 D	262	71
27-28		202 276-277-278-281	65
29-28	62, 62 A-C		45
29-28 29-28-27-26-25	48 A 48	31	43
	-		
33	4, 4 A-B		
34 24 25	2, 2 A-B		
34-35 36	1 B		
35	1 A		
4	K-101		
5-6-7	K-87, 89		
8	K-106		
20	K-71B		
24	K-48		
37	K-3		
38	K-31		
39	K-32		
40	K-202		
49	K-98		
51	K-70		
52	K-69, 85		
53	K-69, 84		
55-56	K-103		

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t.

# APPENDIX A

# SUMMARY OF IDENTIFIED SITES AND FEATURES - WAIOHULI

*0'							<b></b>	
*Site/ Feature Number		Tentative Functional	_ <u>M</u>		Value		Field V	
		Interpretation	R	Ţ	C	DR	SC	EX
1	Enclosure	Habitation/Ag.	М	L	L	+	+	+
2	Enclosure	Habitation/Ag.	М	L	L	+	+	+
3	Тептасе	Habitation/Ag.	Н	L	L	+	<b>.</b>	+
4	Wall	Animal Control	L	L	L	-		
5	Overhang	Indeterminate	М	L	L		_	+
6	Lithic Scatter	Lithic Reduction	М	L	L	+	+	-
8	Enclosure	Habitation/Ag.	М	L	L	+	+	+
10	Тептасе	Agriculture	М	L	L	+		+
II A B C D E F	Complex (6+) Wall Mound Mounds Mound Platform Mound	Burial**/Ag.	М/Н	L	L/H	+	-	+
12	Terraces	Agriculture	М	L	L	+	·	+
13 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	<b>L</b> .	+	•	+
							_	

<sup>\*</sup> PHRI temporary site numbers.

# Cultural Resource Management - Value Mode Assessment-

Nature:

R = scientific research

I = interpretive

C = cultural

Degree:

H = high

M = moderate

L = low

+ Field Work Tasks:

DR = detailed recording (scaled drawings, photographs, and written descriptions)

SC = surface collections

EX = test excavations

<sup>\*\*</sup>Possible functional interpretation

# SUMMARY OF IDENTIFIED SITES AND FEATURES - WAIOHULI (cont.)

Site/ Feature	and a series	Tentative Functional		RM V		F	ield W Task	
Numbe	Туре	Interpretation	R	I	С	DR	SC	EX
I4 A B C	Complex Enclosure Enclosure Wall,L-shaped	Habitation/Ag.	М	L	L	+	-	+
15	Enclosure	Habitation/Ag.	М	L	L	+		+
17 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	M	L	L	+	-	+
18 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	M	L	L	+	-	+
20	Enclosure	Habitation/Ag.	М	L	L	+	+	+
21	Enclosure	Habitation/Ag.	М	L	L	+		+
27	Enclosure	Relig.(Heiau/Hab.)	н	н	H	+	-	+
28	Enclosure	Religious**/Hab.	Н	н	H	+	-	+
30	Alignment	Religious**	L/H	L/H	L/H	+		+
31	Overhang	Habitation/Ag.	М	L	L	+		+
32	Upright	Religious**	L/H	L/H	L/H	+	+	+
35	Human Bone	Burial	L	·L	Н	+	+	-
36	Enclosure	Religious**/Hab.	н	н	H	+	+	+
37 A B	Complex (2) Enclosure Wall, U-shaped	Habitation/Ag.	М	L	L	<del>,</del>	-	+
42	Enclosure	Habitation/Ag.	M	L	L	+	-	+
45 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	H	н	L	+	-	·+
46	Enclosure	Ḥabitation/Ag.	М	L	L	+	_	+

SUMMARY OF IDENTIFIED SITES AND FEATURES - WAIOHULI (cont.)

Site/ Feature	Formai Site/Feature	Tentative Functional		RM Va		Fi	eld W Tasks	
Number	Туре	Interpretation	R	I	C	DR	SC	EX
47	Enclosure	Animal Control	L	L	L	-	-	•
48	Wall	Agriculture	М	L	L	+	+	+
49	Terraces	Agriculture	М	L	L	+	-	+
55	Overhang	Temp. Habitation	М	L	L	+	+	+
57	Upright Slab	Indeterminate	L	L	L	-		•
58	Wails	Animal Control	L	L	L	-	•	-
59	Wall	Transportation	L	L	L	-	-	
60	Wall	Animal Control	L	L	L	-	-	•
65	Enclosure	Habitation/Ag.	M	L	L	+	•	+
67 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	L .	+	-	+
71	Enclosure	Agriculture	М	L	L	+	-	+
73	Walls	Agriculture	М	L	L	+.	-	+
75	Wall	Habitation/Ag.	М	L	L	+	+	+
77	Enclosure	Agriculture	М	L	L	+	-	+
80	Wall	Animal Control	L	L	L	-	-	
82	Тепасе	Habitation/Ag.	M	L	L	+	-	+
83	Enclosure	Habitation/Ag.	M	L	L	+	-	+
88	Wall	Transportation	L	L	L	-	-	
90	Cave	Burial	н	L/H	н	+	+	+
96	Wall	Agricultural	M	L	L	+	+	+
97	Enclosure	Habitation/Ag.	M	L	L	+	+	+
98	Enclosure	Habitation/Ag.	М	L	L	+	+	+
101	Bridge	Transportation	L	L	L	-	_	-

Section 1. A land to the section of

# APPENDIX B

## SUMMARY OF IDENTIFIED SITES AND FEATURES — KEOKEA

*Site/ Feature	Formal Site/Feature	Tentative Functional		RM V	aine sess.	+Field Work Tasks			
Number	Туре	Interpretation	R	I	C	DR	SC	EX	
1 A B	Complex (2) Platform Terrace	Habitation/Ag	М	L	L	+	-	+	
2 A B	Complex (2) Enclosure Enclosure	Habitation/Ag	М	L	L	+	-	+	
3 A B	Complex (2) Enclosure Enclosure	Burial**/Hab./Ag	<b>M/H</b>	L	L/H	+	•	+	
4 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	M	L	L	+	•	+	
5 A B	Complex (2) Platform Enclosure	Temp. Habitation/ Agriculture	М	L	L	+	•	+	
6 A B C D	Complex (4) Enclosure Mound Enclosure Enclosure	Burial/Hab./Ag.	М/Н	L	L/H	+	•	+	

<sup>\*</sup> PHRI temporary site numbers.

# Cultural Resource Management - Value Mode Assessment-

Nature:

R = scientific research

I = interpretive

C = cuiturai

Degree:

H = high

M = moderate

L = low

+ Field Work Tasks:

DR = detailed recording (scaled drawings, photographs, and written descriptions)

SC = surface collections

EX = test excavations

<sup>\*\*</sup>Possible functional interpretation

Site/ Feature	Formal Site/Feature	Tentative Functional	_	M Val			ld Wo Tasks	<u>.                                    </u>
Number	Туре	Interpretation	R	I	С	DR	SC	EX
7	Complex (2)	Habitation/Ag.	Н	L	L	+	-	+
Α -	Enclosure							
В	Enclosure							
8	Complex (3)	Habitation/Ag.	М	L	L	+	-	+
Α	Enclosure							
В	Enclosure							
С	Enclosure							
9	Complex (3)	Habitation/Ag.	М	L	L	+	-	+
Α	Overhang							
B	Enclosure							
С	Enclosure							
10	Complex (7)	Habitation/Ag.	H	L	L	+	-	+
Α	Enclosure							
В	Enclosure							
С	Enclosure							
D	Enclosure							
E	Enclosure							
F	Enclosure							
G	Platform							
11	Terrace	Habitation/Ag.	M	L	L	+	-	+
12	Wall	Animal Control	L	L	L :	•	-	-
13	Complex (6)	Habitation/Ag.	H	L	L	+	-	+
Α	Enclosure							
В	Enclosure	•						
С	Enclosure							
D	Enclosure							
E F	Enclosure							
F	Enclosure							
14	Enclosure	Habitation	M	L	L	+	-	+
16	Complex (3)	Habitation/Ag.	М	L	L	+	•	+
Α	Enclosure							
В	Enclosure							
С	Enclosure							
19	Complex (4)	Habitation/Ag.	н	L	L	+	+	+
A	Enclosure							
В	Enclosure							
С	Enclosure							

Site/ Feature	Formal Site/Feature	Tentative Functional		M Vai le Ass		Fie	id Wo	<u> </u>
Number	Туре	Interpretation	R	I	C	DR	SC	EX
20 A B . C	Complex (3) Enclosure Terrace Enclosure	Habitation/Ag.	М	L	L	+	•	+
21 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	Н	L	L	+	-	+
25 A B C D E F	Complex (6) Enclosure Wall Enclosure Enclosure Enclosure Wall	Habitation/Ag./ Animal Control	Н	L	L	+		+
26 A B	Complex (2) Enclosure Platform	Habitation/Ag.	М	L	L	+	-	+
27 A B	Complex (2) Overhang Enclosure	Habitation/Ag.	M	M	L	+	•	+
29 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	н	M	M	+	•	+
<b>30</b> ·	Heiau	Religious/Heiau	Н	н	Н	+	-	+
31	Enclosure	Habitation	M	L	L	+	-	+
32	Тептасе	Habitation	M	L	L	+	•	+
35 A B	Complex (2) Enclosure Overhang	Habitation/Ag.	н	L	Ľ	+	•	+
36 A B C D	Complex (5) Enclosure Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	н	L	L	+	•	+

Site/ Feature	Formal Site/Feature	Tentative Functional		M Val		Fie	id Wo	
Number	Туре	Interpretation	R	I	C	DR	SC	EX
39	Overhang	Habitation	М	L	L	+	+	+
40 A B	Complex (2) Enclosure Overhang	Habitation	H	M	L	+	-	+
41	Overhang	Temp. Habitation	М	L	L	+	-	+
42	Enciosure	Habitation	Н	L	L	+	-	+
44 A B C D	Complex (4) Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	H	L	L	+	•	+
45	Enclosure	Habitation/Ag.	М	L	L	+	-	+
46 A B C D	Complex (4) Structure Enclosure Enclosure Enclosure	Habitation/Ag.	<b>M</b>	L	L.	+	•	+
48 A B C D	Complex (4) Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	H	Н	Н	+	•	+
50 A B C	Complex (3) Enclosure Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	+
51	Enclosure	Habitation/Ag.	M	L	L	+	-	+
52 A B	Complex (2) Enclosure Paved Area	Habitation/Ag.	M	L	L	<b>+</b>	•	+
53 A B	Complex (2) Enclosure Terrace	Habitation/Ag.	M	L	L	+	-	+
54	Enclosure	Habitation/Ag.	M	L	L	+	-	+

Site/ Feature	Formal Site/Feature	Tentative Functional	CI	Field WorkTasks				
Number	Туре	Interpretation	R.	de As	C C	DR	SC	EX
55 A B C	Complex (3) Enclosure Overhang Enclosure	Habitation/Ag.	н	L	L	+	•	+
57	Enclosure	Habitation/Ag.	М	L	L	+	-	+
59	Enclosure	Habitation/Ag.	М	L	L	+	-	+
60	Wall	Animal Control	L	L	L	-	-	-
62 A B C	Complex (3) Enclosure Enclosure Enclosure	Relig./Habit. Ag./Burial	Н	Н	Н	+	-	+
63	Wall	Animal Control	L	L	L	-	-	
64	Enclosure	Habitation/Ag.	М	L	L	+	-	+
65 A B C D E F G	Complex (7) Enclosure Walls Enclosure Enclosure Enclosure Enclosures Enclosures	Habitation/Ag.	H	L	L	+	•	+
69	Enclosure	Water Tank	' м	L	L.	. +	+ '	
70	Теттасе	Agricultural	М	L	L	+	+ .	+
71 A B C	Complex (3) Enclosure Enclosure Mound	Burial**/Habit.	М/Н	L	L/H	+	•	+
76 A B	Complex (2) Terrace Wall	Habitation/Ag.	M	L	L	+	-	+

Site/ Feature	Formal Site/Feature	Tentative Functional		Va de Ass		Field Work Tasks			
Number	Туре	Interpretation	R	I	C C	DR	SC	EX	
78 A B	Complex (6) Terraces Terrace	Rel."/Hab./Ag.	Н	н	Н	+	+	+	
C D E F	Platform Complex Enclosure Enclosure								
79	Enclosure	Agriculture	M	L	L	+	-	+	
80	Wail	Animal Control	L	L	L	-	-	-	
81 A B	Complex (2) Enclosure Enclosure	An. Contr./Ag.	M	L	L	+	-	+	
84	Wall	Indeterminate	М	L	L	+	•	+	
85	Walls & Terraces	An. Contr./Ag.	М	L	L	,+	-	+	
87 A B	Complex (2) Platform Mound	Burial	н	L	H		•	<b>, +</b>	
89	Тепасе	Habitation	М	L	L	+	•	+	
90	Enclosure	Habitation	н	L	Ľ	+	-	+	
95 A B C	Complex (3) Enclosure Terrace Wall	Habit/Ag.	M	L	L .	+	•	·· +	
96	Enclosure	Habitation	М	L	L	+	-	+	
97	Wall	Agricultural	M	L	L	+	•	+	
98	Enclosure	Habitation/Ag.	M	L	L	+	•	+	
99	Enclosure	Habitation	M	L	L	+	•	+	
100	Wall	Animal/Control	L	L	L.	-	-	•	

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Site/ Feature	Formal Site/Feature	Tentative Functional Interpretation		CRM Value  Mode Assess.				Field Work			
Number	Туре		R	I	C C	DR	Task SC	EX.			
101	Mounds & Wall	An. Control/Ag.	М	L	L	+	•	+			
102	Terrace & Wall	Habitation/Ag.	М	L	L	+	-	+			
103	Overhang	Habitation/Ag.	М	L	L	+	-	+			
105	Enclosure	Habitation/Ag.	н	L	L	+	-	+			
106	Stone	Tooi Manufac.	М	L	L	+	+	+			
107	Overhang	Burial/Ag.	н	L	н	+	+	+			
108	Enclosure	Habitation	М	L	L	+		+			
109 A B	Complex (2) Overhang Terrace	Agriculture	М	L	L	+	-	+			
110	Wall	Agricultural	М	L	L	+	-	+			
111 A B C	Complex (3) Overhang Terrace Overhang	Habitation	М	L	L	+	•	+			
112 A B C	Complex (3) Overhang Enclosure Wall	Habitation/Ag. Animal Control	М	L	<b>L</b> .	+	<b>-</b>	+			
115 A B	Complex (2) Enclosure Enclosure	Habitation	Н	H	M	+	-	+			
116 A B	Complex (2) Enclosure Enclosure	Animal Control	М	L	L	+	-	+			
118 A B C	Complex (3) Enclosure Enclosure Enclosure	Habitation/Ag. Animal Control	М	L	L	+	•	+			

Site/ Feature Number	Formal Site/Feature Type	Tentative Functional Interpretation		CRM Value Mode Assess.				ork s
			R	I	C	DR	Task: SC	EX
120 A B C	Complex Paved Terrace Lava Tube Enclosure	Habitation/Ag.	М	L	L	+	-	+
124 A B C	Complex (3) Enclosure Overhang Enclosure	Habitation/Ag.	М	L	L	+	-	+
127 A B	Complex (2) Enclosure Overhang	Habitation/Ag.	М	L	L	+	-	+
130	Enclosure	Habitation/Ag.	М	L	L	+	-	+
131 A B C	Complex (3) Overhang Enclosure Enclosure	Habitation/Ag. Animal Control	M	L	L	+	•	+
134	Enclosure	Religious**/ Habitation	н	L	M	+	-	+
135 A B	Complex (2) Lava Tube Waii	Habitation/Ag.	М	L	L	+	<b>-</b> ·	+
137	Enclosure	Habitation/Ag.	M	L	L	<b>.</b> +	-	+
140 A B	Complex (2) Enclosure Enclosure	Habitation/Ag.	М	L	L	+	•	+
142	Enclosure	Habitation/Ag.	Н	L	L	+	-	+
143 A B	Complex (2) Enclosure Overhang	Habitation/Ag.	М	L	L	+	-	+
146	Enclosure	Habitation	М	L	L	+		+
148 A B C D	Complex (4) Enclosure Enclosure Enclosure Enclosure	Habitation/Ag.	М	L	L	+	-	+

Site/			IND PEAT			MEO IX	LA (	cont.)			
Feature	Formai Site/Feature Type	Tentative Functional Interpretation		CRM Value				Field Work			
Number			Mode Asses				Tasks				
			R	I	C	DR	SC	EX			
149	Overhang	Habitation	M	L	L	+	•	+			
152	Complex (2)	Habitation/Ag.	н	L	L	+	_	+			
A B	Platform Enclosure					·		•			
200	Overhang	Habitation	М	L	L	+		+			
201	Enclosure	Habitation	М	L	L	+	-	+			
202	Enclosure	Habitation	М	L	L	+	-	+			
203	Enclosure	Habitation/Ag.	Н	L	L	+		+			
204	Enclosure	Habitation	М	L	L	+	•	+			
205	Overhang	Habitation	M	L	L	+	-	+			
206	Lava Tube Enclosure	Habit.**/Ag.	M	L	L	+	-	+			
207	Sink	Burial/Habitation	н	L	L	+	+	+			
208	Enclosure	Habitation	М	L	L	+,	-	+			
209	Enclosure	Agricultural	M	L	L	+		+			
210	Overhang	Habitation	М	L·	L	+	-	+			
211	Тептасе	Habitation	М	L	L	+		+			

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## APPENDIX C

### LIMITED HISTORICAL DOCUMENTARY RESEARCH KEOKEA AND WAIOHULI SUBDIVISIONS INVENTORY SURVEY by Helen Wong Smith, B.A.

Keokea and Waiohuli Subdivisions are situated in the ahupua'a of Keokea and Waiohuli, Makawao District (Kula), Island of Maui. Makawao can be translated: "Watchful eyes of Wa-o" (timeless or eternity). Sterling (n.d.) notes that "Makawao includes the ancient districts of Hamakualoa and Hamakauapoko..." For this reason, historical citations regarding Hamakuapoko and Hamakualoa are included within this report.

This report includes information obtained from the usual historical sources found in libraries, and information from other sources such as land and tax records, archaeological reports, maps, and various other manuscripts. Much information was obtained from the files of the Maui Historical Society, which houses the personal notes of E. Sterling and I. Ashdown. The information in this report is organized into five sections: Early Historical Accounts, Heiau in the Project Area, Land Commission Award (LCA) Information, Land Use and Tenure Information, and Informant Interviews.

#### EARLY HISTORICAL ACCOUNTS

Early accounts concerning the Makawao District generally either describe the area or relate early historical events. Areal descriptions usually concern the atmosphere or weather. Ashdown (n.d.) writes, "kula-o-ka-ma'o-ma'o or Land of Mirages, where lost souls wandered until they could find their way to rest." The rain of Makawao is described by Mrs. Miverva Kalama to Sterling (n.d.) in this way: "ukiu rain = a soft drizzle (the ua Kama'aina of Makawao) when the kiu rain cloud from Makawao meets the Naulu rain cloud from Kula then the rain comes, the typical Makawao rain."

A passage in Edward G. Beckwith's <u>Journal of a Tour</u> on <u>Maui</u>, also speaks of the unusual Makawao rain (Sterling n.d.):

We noticed a peculiar meteorological phenomen through the whole ride. The trade wind which blows from the ocean across the Northwestern slope of Haleakala, is highly charged with vapor, which is condensed by the cool mountian air, and falls in abundant rains over the region of Makawao. Along the west side of the mountains about half way to the summit, lay a long line of cumulo stratus clouds, and between this and the nimbus there was

but little space. The former lay along side of the mountain, apparently immovable, while the latter would advance and recede, now coming very near and coquertishly scattering its shining rain-drops beneath the very head of immovable—cumulus, and now retreating as though afraid of its more dignified companion. While mentioning this latter peculiarity to a gentleman this evening, he remarked that it was this feature of the clouds which gave the place its name - Makawao, Mako=to be afraid, wao=a cloud (HMCS June 5, 1854). [Sterling notes that this is incorrect, that "afraid translates maka'u and ao is cloud. Pukui et al (1974) indicates the literal translation of Makawao is "forest beginning."

The Sterling and Ashdown manuscripts also provide these two descriptions of Makawao. Sterling's description is somewhat poetic; Ashdown's description is curiously intermixed with what may be a legend:

"O native sons of those sections, the ones who watch for the dancing (haa) of the naked ones (olohe) on the plains of Kama'oma'o, where the iwa birds dwell in the ukiuku rain of Makawao..." S. W. Nailiili "E noho ana oe e oe ehoolono iki mai ana" Ke Au Okoa, Nov. 6, 1865. Hamakuapoko and Hamakualoa (Sterling n.d.).

In the area of Wahine'oma'o (now called the "Baseball Park" above the modern Poli-Poli camp) and nearby Lua-ma-ma-ne, was a structure said to be for bird catching ceremonies because that region was full of birds. The 'Oma'o bird is known as the Hawaiian Thrush, and they were plentiful and provided green feathers. The Woman of 'Omao' dwelt at Mamane and she was called Mamao because she was of such very high rank. She was so sacred that others must keep their distance. A handsome lesser chief fell in love with her beauty and tried to win her. Of course this was kapu. Her heart was heavy with the knowledge that because he came near to her shadow he had to be punished. A high priest conducted ceremonies of purification at the temple there and revived happiness. Today the Mamane trees are stunted and soon the foreign trees such as California Redwood, Norfolk Pines and others will be replacing the former green verdure (Ashdown 1971:46).

In 1873, Isabella Bird toured the Hawaiian Islands and wrote of her experiences to her sister back home in Edinburgh. These are her impressions of Makawao:

It is very pretty here, and I wish all invalids could revel in the sweet, changeless air. The name signifies "ripe bread-fruit of the gods." The plantation is 2000' above the sea, and is one of the finest on the islands; and owing to the slow maturity of the cane at so great a height, the yield is from 5 to 6 tons an acre. Water is very scarce; all that is used in the boiling-house and elsewhere has been carefully led into concrete tanks for storage, and even the walks in the proprietor's beautiful garden are laid with cement for the same purpose. He has planted many thousand Australian eucalyptus trees on the hillside in the hope of procuring a larger rainfall, so that the neighbourhood has quite an exotic appearance. Below, the coast is black and volcaniclooking jutting into the sea in naked lava promontories, which nature has done nothing to drape (Bird 1974:228).

Early accounts which mention Makawao in relation to early historical events include those by historians Kamakau and Fornander:

When Kekaulike heard that Alapa'i, the ruling chief of Hawaii was at Kohala on his way to war against Maui, he was afraid and fled to Wailuku in his double war canoe named Ke-aka-milo. He sailed with his wives and children..., his officers, war leaders, chiefs, and fighting men, including warriors, spearmen, and counselors. Some went by canoe and some overload, and the fleet landed at Kapa'ahu at the pit of 'Aihako'ko in Kula [old name for Makawao]. Here on the shore the chiefs prepared a litter for Kekaulike and bore him upland to Haleki'i in Kukahua (Kamakau 1961:69).

Ke-a-ulu-moku was another celebrated man of Kalaniopu'u's day. His father was the great chief Kau-ua-kahi-akua-nui, son of Lono-maka'i-honua and Kaha-po'ohiwi, but his mother belonged to Naohaku in Kohala. He was celebrated as a composer of war chants, chants of praise, love chants, prophetic chants, and genealogical chants. When he went back to Hawaii with Kalaniopu'u he was homesick for the two Hamakua districts of Maui [Hamakua is within Makawao District] here

he had lived with Kamehameha-nui and Kahekili. His love for the place found expression in a chant he composed, of which the following is an excerpt:

Affectionate longing, ibid Aloha, Aloha Aloha wale o'u Affection for my maku-a la (foster) parents, e o'u makua. my parents, Aloha wale o'u Affection for my makua parents Mai na 'aina Who belong to Hamakua, Hamakua, The two districts of He mau 'aina Hamakua elua, Hamakua No'u mua kaikua'ana Where my elder brothers live.

i naho ai.

He ala pali na'u he My hillside trails are theirs mau ali'i ia to rule (Kamakau 1961:112).

During the fleeing of Kekaulike, Kahekili was carrying on the war on Oahu and suppressing the revolt of the Oahu chiefs, (Kamakau dates this 1785) a serious disturbance on Maui had occurred which gave him much uneasiness. It appears that he had given the charge of his herds of hogs that were running in the Kula district and on the slopes of Haleakala to a petty chief named Kukeawe. This gentleman, not satisfied with whatever he could embezzle from his master's herds, made raids upon the farmers and country people of Kula, Honuaula, Kahikinui, and even as far as Kaupo, robbing them of their hogs, under pretext that they belonged to Kahekili. Indignant at this tyranny and oppression, the country people rose in arms and a civil war commenced. Kukeawe called the military forces left by Kahekili at Wailuku to his assistance; a series of battles were fought, and finally Kukeawe was killed at Kamaole-i-kai, near Palauea, and the revolted farmers remained masters of the situation (Fornander 1969:228).

This uprising of the country people was called the "Battle of the pig-eating Ku-keawe" ('Aipua'aa-Ku-keawe) (Kamakau 1961:142).

#### HEAIU IN THE PROJECT AREA

Three heiau are present in Keokea project area—Molohai, Papakea, and Kaumiumimua heiau. Molohai heiau, situated at an elevation of 2,275 feet above sea level, was initially described by Walker (n.d.), who described 26 heiau in the Kula region of which Molohai is the fourth

largest. Walker about 1930 listed Molohai heiau as being 65 by 90 ft and constructed of rough a'a. Walker surmised that the heiau was probably originally L-shaped; however, this could not be determined definitely, as the heiau had deteriorated and portions of it had been rebuilt as a modern wall. According to Walker, the front of the heiau was double terraced, and within it were a large court and a platform, set off by a low wall. In 1973, the Historic Sites office recorded the heiau as including narrow, terraced platform steps along the walls, three stone mounds, an alignment of stones, and a rectangular platform. Due to its size and good condition, Molohai heiau has been placed on the State Register of Historic Places.

Papakea heiau is situated mauka of Molohai at an elevation of 2,300 ft above sea level. Walker (1931) describes the heiau as "an open platform of a a construction 45'x88'...the front double-terraced to a height of 4'...some coral seen but no pebbles." While surveying the heiau in 1973, a Historic Sites office archaeologist was told by a local informant that a house and cistern once stood on the site. The archaeologist and informant surmised that rocks from the heiau were utilized in constructing the cistern and that Walker's measurement of the heiau excluded the property line of the house. Ashdown (1971:46) cites this heiau as a fishing shrine.

Kaumiumimua hejau, according to M. Riford (1987), is situated makai of Papakea, on a large gully overlooking Ma'alaea Bay. In 1931, Walker commented that the hejau had been much disturbed and that the remains of a platform were present in the northern corner and near the entrance. A survey of the hejau by the Historic Sites office in 1973 indicated that the east and south walls evidence two and possibly three separate construction periods.

Ashdown (1971:46) mentions other heiau in Keokea and Waiohuli—Ho'ola and Ho'oula Ua heiau in Keokea and Kaimupeelua heiau in Waiohuli. Ho'ola heiau (Health temple) is sinated just behind the Kula Sanarorium. Ashdown writes, "Ho'oula Ua heiau," a place for praying and offering gifts to bring rain." She also writes, "long before the forest was denuded...near Polipoli Spring area, there was farm where 'awa was cultivated and there stood a temple to Lono." Kaimupeelua heiau is located in the Waiohuli project area. Although the heiau originally measured 17 by 25 meters, much of it has been reduced to rubble by cattle (Historic Sites Register 1973).

Other heiau mentioned by historic writers in the Makawao district include Kailua heiau (Thrum 1909:44), and Pa'uhu, Mahea, Kaumuopahu (or Kaunuopahu). Po'onahoehoe and Mana heiau. The latter heiau is now part of a modern cemetery (Ashdown 1971:57).

#### LAND COMMISSION AWARDS

Although there were many small parcels granted in Keokea and Waiohuli, the Indices states that Keokea was Crown Land from the beginning and that Waiohuli was approved as such in 1890 by Kalakaua. The numerous parcels may be a result of an experiment conducted by the Kamehameha III's administration prior the Greaty Mahele concerning trial fee ownership runs. Kuykendall (1968:283) recounts the reasons for such trial fee ownership runs:

It will be remembered that the year 1845, during which the new land law was written and in part enacted, was disturbed by an anti-foreign agitation, accompanied by a rather pointed suggestion that lands be given or sold to the common people and that the legislative committee, in its reply to the petitions of the people, approved the idea of selling land to Hawaiian subjects. This was directly in line with suggestions contained in Dr. Judd's report as minister of the interior, and there were frequent allusions to the subject in the proceedings of the legislature. The agiration among the people probably hastened the decision of the government to make an experimental beginning without waiting for the new law to go into operation. The places selected for the experiment were the Makawao district of Maui and Manoa valley on Oahu.

During the King's tour of Maui in December, 1845, and January 1846, the party visited Makawao and it was announced that the entire district, with the exception of McLane's plantation, was to be offered for sale to the people in fee simple. Rev. J.S. Green, pastor of the Hawaiian church at Makawao, undertook to manage the business of selling the land. In afterwards relating his experience in connection with the project, Green said he called the people together, showed them his instructions from the government, and explained the plan to them

A few of them purchased at once, others had less confidence that lands thus purchased would be secure, but soon abandoned their scruples, while others still could not for a long time, be persuaded that there was not some catch about it—some design to enrich the chiefs at their expense. But nearly all of these were finally talked out of their suspicions & took up each a small piece of land.

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<sup>\*</sup> Letter in Polynesian, July 14, 1849.

Another missionary, Rev. Richard Armstrong, assisted the enterprise by making surveys. The land was sold at \$1 per acre, and nearly a 100 parcels were taken up, most of them ranging from 5 to 10 acres. Altogether about 900 acres were purchased by the people of the district.

In a report by Riford (1987), 11 Land Commission Awards (LCA) either within or bordering the Keokea parcel and eight LCAs within the Waiohuli parcel are listed. The bulk of the parcels is designated as kula land and houselots (1987). Kula land is described by Handy and Handy (1972:510) as "open country, or plain, as distinct from valley...and has often been used as a term to distinguish between dry, or 'kula land' and 'wet-taro land'". As indicated in Kuykendall's account, kula plots were cultivated for personal use, but many tenants were involved in ranching and cash crops. A map of the project area showing LCA locations was obtained from the Tax Map Bureau in Honolulu (Figure A-1: "Portion of Kula, Makawao, Maui TMK 2-2-02"). The map shows nine LCAs within or abutting Keokea and Waiohuli. LCA 8452:19, in the ahunuaa of Koheo I and 2, abuts the Waiohuli project area on the northern side.

#### LAND USE AND TENURE

In their discussion of Hawaiian sweet potato planting techniques, Handy and Handy (1972) mention the Kula area of Maui and describe it as "[w]here potatoes are planted in crumbling lava with humus, as on eastern Maui and in Kona, [in] Hawaii the soil is softened and heaped carelessly in little pockets and patches using favorable spots on slopes...[r]ocky lands in the olden days were walled up all around with the big and small stones of the patch until there was wall (knaiwi) about 2' high" (Handy and Handy 1972:131).

Handy (1940:161) also mentions Kula in his early work entitled The Hawaiian Planter:

KULA was always an arid region, throughout its long, low seashore vast stony kula lands, and broad uplands. Both on the coast, where fishing was good, and on the lower westward slopes of Haleakala a considerable population existed. So far as I can learn Kula supported no Hawaiian taro, and the fisherman in this section must have depended for vegetable food mainly on poi brought from Waikapu and Wailuku across the plain to supplement their sweet potato staple diet.

Kuykendall (1968:313) writes of the time when Kula crops turned from subsistence crops to commodities:

... Before that time the whalers had created a limited market for fresh vegetables, fresh meat, and fruit; the great increase in the number of whaleships after 1840 caused a corresponding increase in the demand for such products of the soil. In bulk and value, potatoes (sweet and Irish) ranked first in this traffic. In the early days only sweet potatoes had been obtainable at the islands, but after 1830, if not sooner, cultivation of the Irish potato was taken up and during the 1840s and 1850s became of great importance. It was shortly before 1840 that Irish potatoes were first raised in the Kula district, which proved to be so well adapted to them that it soon came to be called the "potato district." Jarves describes the region as it appeared to him in July 1846.

It ranges along the mountain (Haleakala) between 2000 and 5000 feet elevation, for the distance of 12 miles. The forest is but partially cleared, and the seed put into the rich virgin soil. The crop now in the ground is immense. The fields being all in blossom have a fine appearance, spreading as they do, over the broad surface of the mountain.

From this upland region the potatoes were carried down to the shore and taken to Lahaina or were sold directly to ships which called at Kalepolepo. In the spring of 1847 it was estimated that the crop would amount to 20,000 barrels...In 1854, G.D. Gilman estimated that the local Hawaiian market, including whaleships, could be depended on to consume about 20,000 barrels of Irish potatoes.

The influx of gold seekers together with the comparative neglect of agriculture in California created a demand for potatoes and other vegetables, as well as for sugar, molasses, and coffee, which began to be felt strongly in 1847, but the potato "boom" commenced in the fall of 1849. At the beginning of November a correspondent wrote from Maui to the Polynesian:

The call for [potatoes] is loud and pressing, as some vessels bound for California have taken as many as 1,000 barrels each. The price is high, and the probablity is that the market can not be supplied this autumn. Kula, however, is full of people. Strangers from Wailuku, Hakamakua, and Lahaina are there

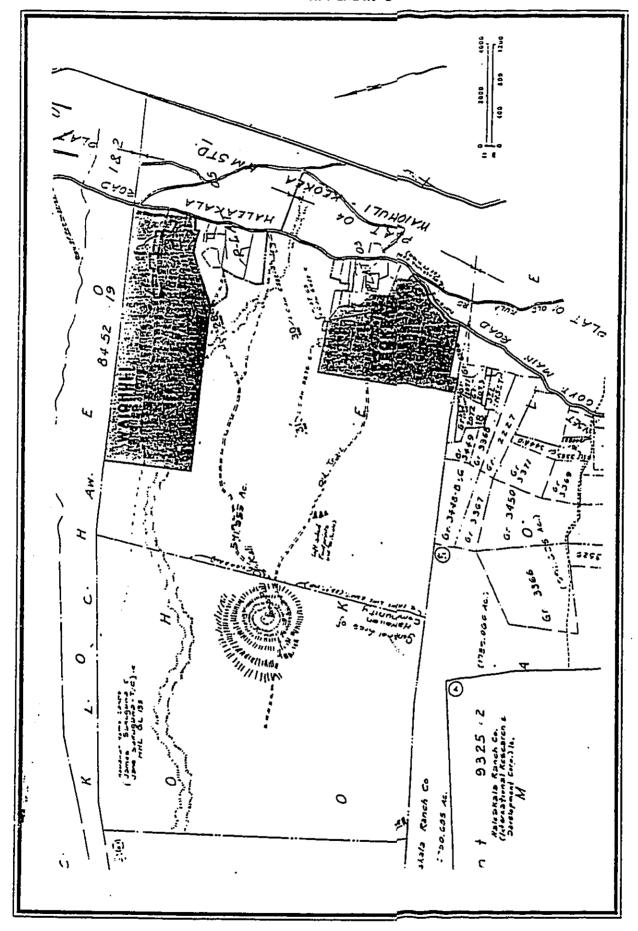


Figure C-1. 1938 MAP SHOWING PROJECT AREA AND LCA LOCATIONS

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preparing the ground and planting, so that if the demand from California shall be as urgent next spring as it is now the people will reap a rich harvest... They often repeat the saying of a foreigner, who after visiting the mines of California, came back to Maui quite satisfied, and said to his neighbors at Waikapu, "California is yonder in Kula. There is the gold without the fatigue and sickness of the mining country."

The foreigner's remark caught the fancy of the Hawaiians and they were soon referring to Kula as "Kalifonia" or "Nu Kalifonia" and working with great diligence to extract the wealth from the rich pay dirt on the slopes of Haleakala. To encourage the spirit of enterprise which had been thus awakened among the native people, the privy council voted to have the government lands in Kula surveyed and divided into small lots of from 1 to 10 acres and offered for sale to the natives at a price of \$3/acre (see page 5 of this report) (1968:321)."

C. Speakman, in his book entitled MOWEE also mentions the fervor of cash-cropping:

During the gold rush, hundreds of Hawaiians were going into business for themselves on Mauigrowing potatoes and hauling them to the port where they were snapped up and shipped to San Francisco. The Maui fields were called Nu Caliponi, or New California; potatoes were gold, and a fortune could be dug out of the ground by one man. The potato boom was short lived, and, when the prices dropped, the Hawaiians lost interest. Perhaps the problem was that Hawaiians did not share the white man's concept of time (1978:116).

The Chinese were among those who took advantage of this agricultural opportunity. During the 1840s, Chinese farmers leased lands in Kula. Their initial success motivated many Chinese to move to that region and lease land for farming. They moved from places such as Makawao, Paia, and Wailuku on Maui, Kohala on the Big Isle, and from Honolulu. Some went to Kula directly from China. The vast majority of Chinese, about 95%, were Hakkas from Kwangung Province. During the 1840s, most Kula Chinese acquired their farmland by lease or deed from the haole ranchers or Hawaiian homesteaders. Much of this land was owned by the Hawaiian govenment, which leased it to the ranchers, who in turn subleased it to the Chinese. In some cases, the farmers made their lease payments in farm produce, in lieu of monetary transaction. One family which leased land

from Ulupalakua Ranch paid five bags of corn for every acre of land they farmed (Interview, Willie Fong IN Mark 1975). Although by the mid-1850s, the demand for Kula potatoes had diminished, the Chinese population continued to grow. By between 1880 and 1910 approximately 80 Chinese families had moved to Kula; by 1900 there were some 700 Chinese living there. For a period of 30 to 40 years, Kula supported a thriving community which included Chinese and English schools, Christian churches, a Hung Men society, gambling joints and opium dens, general stores, and dozens of operating farms and cattle ranches (Mark 1975).

In addition to Irish potatoes, the Kula farmers planted corn, beans, onions, Chinese cabbage, round cabbage, sweet potatoes, wheat and other grains, and even cotton. When the Hawaiian market showed no demand for corn, the farmers used the corn to raise pigs, ducks and chickens, and marketed the animals instead. When the corn, potatoes, and other crops were harvested, they were packed and transported on mule teams or wagons to Kahului and Makena harbors, and were then shipped to Honolulu. Those who lived in the southern districts of Keokea and Kamaole usually brought their produce to the Makena landing. Most of Kula's produce, poultry, and beef was sent to two or three markets in Honolulu Chinatown, including Wing Hong Yuen and Sing Loy. The two stores, in turn, supplied Kula's general stores with Chinese dry goods and staples such as rice, flour, sugar, and canned milk (Mark 1975).

Early farming in Kula was adapted to the topography. In planting crops, rather than terracing the land, the farmers followed the natural contour of the land and depended on moist air and rainfall rather than irrigation. Until 1905, there was little water piped into the area, and during droughts—which occurred every several years—the farmers had to pack barrels of water on mules from Polipoli Springs, or from the beach or Olinda, both about 8 miles away (Mark 1975). An article in newspaper The Honolulu Advertiser points out the changes in the topography in Kula and its affect on the water supply:

Before 1850 Kula was supplied with moisture naturally through the existence of a large forest. "That forest was cut down when land was cleared in Kula to open farm plots in 1850. This was in answer to the demand for food in California during the gold rush....by ranchers clearing for pasture." Secondary result of clearing forests was destruction of existing fresh water ponds in Kihei on the Maaloaea (sic) Bay coast below Kula. When forest was cleared, water was free to rush down the mountains carrying soil from Kula and filling with

mud, the ponds for which Kihei was once famous. Meanwhile Kula is dependent on pipe from Waikamoi watershed (Korte 1962 A:15).

In 1905 the Kula Pipeline was built during perhaps the worst drought in Kula history. The water source for the pipeline was discovered in Olinda, northeast of Kula. The contractor who built the pipeline was a prominent Kula resident named Shim Mook, and labor was supplied by the men and women of the area (Mark 1975).

In 1911 the Hawaiian government released a large amount of public land, and it became possible for citizens to purchase property in Kula. The sale of the land was advertised in English and Hawaiian newspapers, but word was somehow not communicated to the Chinese, whose lives these land sales would most affect. According to the Hawaiian Church Chronicle (Oct. 1911:12), the Kula Chinese were not aware of what was taking place until the land was sold and the Hawaiians came and told them that the property belonged to them. They (Chinese) had relied on the information which they had received that the disposal of the land would not take place for a considerable time." Faced with eviction. the Kula Chinese decided determinately to remain on the land and organize themselves. Ninety-eight young residents signed a petition expressing the desire of the Chinese to be allowed to reside on certain lots their families had farmed for many years. In a letter to the Commissioner of Public Lands dated September 27, 1911, Governor Frear suggested that leases be made to occupants of unsold lots for approximately 10 years, subject to withdrawal for homestead purposes. Then, as the older children of those families reached 18 years of age, they would be able to apply for the lots as homesteads. In October 1911 the Hawaiian Church Chronicle reported that the government had promised to do so under these terms. Chinese who applied for homesteads and were granted them were given three years to improve their lot ... after that period, they could apply for a "right of purchase" lease, and then buy the land outright from the government. Before this special arrangment was arrived at. however, a number of Kula farmers saw their land divided into homesteads and leased to others. These farmers, with the loss of their farmland, were forced to move out of Kula and change their livelihoods.

During the 1910s and 1920s many families left Kula for various reasons: severe drought which ruined crops and killed livestock, soil which was reaching depletion level after years of harvesting and tilling, lack of educational opportunities for children, and loss of land due to parceling homesteads. In 1918 another mass exodus occurred—some 40 families left Kula because the land they were leasing was sold to a man named Harold Rice, who intended to use the

land for ranching. In the book <u>Mowee</u>, the author writes regarding the sale of farms to Rice: "The leases to the land had not expired, but the farmers were unaware of their right to challenge the eviction" (Speakman 1978:143). It is some of this land that Rice acquired from the farmers that made up Kaonoulu Ranch, in which the project area resides.

In the early 1970s, 35% of Hawaii's vegetables were grown in Kula, including a large percentage of the state's head lettuce, dry onions, and tomatoes. Much of the remaining land was devoted to livestock breeding by about 20 full and part-time ranchers (Project Measure Work Plan - Lower Kula Irrigation Project," Board of Water Supply, Maui County, Sept. 1971) The cash crops in Kula were no longer corn and potatoes, but a variety of vegetable and flowers produced by some 35 family-operated farms ranging in size from five to 50 acres. As of 1975, the agricultural yield of the irrigated soil was still very high (Mark 1975).

Sugar cultivation has played a major role in Honuaula and Makawao. In the spring of 1846 there were six establishments on the western slope of Mt. Haleakala manufacturing sugar and molasses (Kukendall 1968:316). Since the general vicinity of the present project area has been used historically for small farms and ranching, Kula sugar cultivation will not be discussed here.

A report on Kula would not be complete without some mention of Kula Sanatorium, founded for the care of tuberculosis sufferers. The sanitorium is located mauka of the project area at an elevation of 3,000 feet (The Honolulu Advertiser 9/20/85 B:3). Land for the sanatorium was requested by Bill Pogue in 1909. Initially the sanitorium consisted of two tent-houses which accomodated 12 patients. The tent-houses, which included kitchen and dining facilities, was financed by the County and Territory and cost \$500.00. The first permanent ward was built by W.E. Foster, former patient and Superintendent. Around 1932, the Hawaiian Homes Commission granted 100 acres to the sanitorium, and in 1937 a new sanatorium was constructed (Jones 1940).

The following general information relevant to Keokea and Waiohuli ahupua'a is from The Maui News:

3-26-04 - P. Cockett has been appointed manager of Waiohuli Cattle Ranch.

4-27-07 - On last Sunday morning, J.P. Inaina was installed pastor of the Keokea Hawaiian church in Kula. A large audience was present. Rev. I. D. Iaea preached the sermon and Rev. M. Lutero gave the right hand of fellowship. The charge to people and pastor was given by Rev. R.B. Dodge, Rev. D.N. Opunui offered the installing prayer.

12-16-32 - Formal approval of the newly acquired land in Keokea which is now being turned into a baseball park for the people of Kula, was given by the Board of Supervisors on Thursday. A resolution requesting the Commissioner of Public Lands to effect the exchange of lands between the territory and the owner was adopted by the Board. Slightly over two acres are involved in the transaction.

#### INFORMANT INTERVIEWS

On April 20, 1989 the author, accompanied by Mr. Dan Auwai, Department of Hawaiian Homes Lands - Maui Manager, conducted oral history interviews with two former employees of Kaonoulu Ranch-William Poepoe and Henry Kekiwi. William Poepoe was employed by the ranch for some 46 years and retired in 1983. Mr. Poepoe was born on Ulapalakua Ranch and started working for Kaonoulu Ranch at the age of nine, at which age he planted molasses grass (scattering seeds) for the cattle to feed on. By age 11, he was working full-time for Kaonoulu Ranch. Mr. Pcepoe said that Harold W. Rice, the founder of the ranch, owned, in addition to lands leased, over 18,000 acres. After Mr. Rice's death, his son, Oskie Rice, took over. Oskie Rick employed 15 full-time ranch hands. Mr. Poepoe said that the cattle raised on the ranch were taken to Makawao for slaughter. In addition to beef cattle, there were also dairy cattle.

Mr. Poepoe also provided additional information on the general Kula area. According to him, near Pu'u Kali (Red Hill) they grew corn, and within the caldera of Pu'u Kali is a fence that the Army erected during WWII for target practice. On the Kamaole-Keokea border there was once a Hawaiian settlement. Mr. Poepoe said there were paved sidewalks and gravesites there. He once took a tombstone from there, until the foreman asked where he got it and pointed out what it was. He then returned it.

Mr. Henry Kekiwi was the last foreman for Kanoulu Ranch (under Rice ownership). He presently lives in the Foreman's house, which the ranch provided along with five other houses for ranch hands. According to Mr. Kekiwi, when he retired after 42 years with the ranch, the ranch had 2,500 head of canle. Mr. Kekiwi provided general information on the area of the ranch. According to him, stone walls throughout the ahupua'a were built in the 1800s. On ranching practices, Mr. Kekiwi said that the cattle would graze in the lower lands near Pu'u Kali during the winter months, then around June, they would be taken mauka. Mr. Kekiwi noted that Hawaiian Homes Land wraps around the land of a Mr. George Tanji, who has lived on the land many

years growing cabbages and pigs. Mr. Kekiwi also noted that Rice sold kuleana land in the area to a Dupont and that Hawaiians and Chinese would move from Pu'u Kali area to further up Keokea during summer. Mr. Dan Auwai said the name Kaonoulu is derived from Cornwell who originally owned the land. A check with the Hawaii State Archives, however, shows Kaonoulu listed as an 'ili, so the name is most likely traditional.

Driving down the old Haleakala Road starting at Keokea gate, where the agricultural parcels that Hawaiian Homes is allocating are located, Mr. Kekiwi noted that the heiau from second gate left of Haleakala Road had ti leaves growing on its side, which indicates a fresh water supply in the area. He also pointed out many heiau in the general vicinity of Molohai and Papakea in Keokea, and in Waiohuli. He was not privy to the names of any of them nor was he aware of any stories about them. Mr. Kekiwi pointed out that when ranching, one is busy looking for cattle, not for heiau. Along Haleakala Trail, which was used by Kaonoulu Ranch extensively during its ownership by the Rice family, he pointed out "footprints" imprinted in the lava rock. These footprints are outside the project area, on the way to Pu'u o Kali, also known as Red Hill (see Figure A-1 for location of footprints and locations of other sites mentioned in the interviews). The footprints numbered three, were of various sizes, and were all of the left foot. During an interview with William Poepoe, he said the right sides to the footprints were somewhere on Molokai. Mr. Kekiwi noted that before the ranch, the land was (probably) inhabited by Chinese; the Chinese used the walls but they were not necessarily built by them. Mr. Kekiwi said that the barbed wire fences along the walls were put up by the ranch hands, especially when parts of a wall would fall off, to prevent the cattle from crossing over. When asked by Mr. Auwai about a barbed wire fence that surrounded a small area outside the project area, Mr. Kekiwi said that it was probably put up by pakalolo growers and not the ranch hands.

### CONCLUSION

During this century, the project area has been used primarily for cattle grazing, hence the many archaeological sites obscured by grasses and lantana. For the purposes of this report, a general overview of agricultural activities was given. If further historical documentary research is conducted for the project area, it is suggested that a check be made for awards given out during the Kingdom of Hawaii and that the following topics be addressed: prehistoric environment and occupation in the area, as evidenced by historical documents; local and regional cultural (including residential sequences.

1978

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### APPENDIX D

### WAIOHULI SITE AND FEATURE DESCRIPTIONS

SITE NOS.: STATE: 2344 PHRI: W-1 BPBM:—

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

TO THE PROPERTY OF THE PROPERT

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

**DIMENSIONS:** 7.8 m long by 10.0 m wide; c. 78 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This feature is a rectangular enclosure. Facing in places on both the inside and outside of the walls. Upright facing stones are present in the northeast and southwest corners. North wall is an alignment. All walls curve outwards. Walls range in height from 10 to 90 cm. Agricultural features, mounds and crude terraces surround the enclosure.

SITE NOS.: STATE: 2345 PHRI: W-2 BPBM: T-6

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 3.6 m wide; c. 29 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This is a long, narrow enclosure. The walls show no signs of having been faced. Near the center of the west wall a short wall segment extends westward for 1.5 meters. Scattered mounds, modified outcrops, and crude terraces surround the feature.

SITE NOS.: STATE: 2039 PHRI: W-3 BPBM: T-7

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, kiawe and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 19.6 m long by 10 m wide; c. 196 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This is a complex, rectangular paved terrace with a 1.0 m high faced wall on the northwest. The west wall extends southward beyond the terrace and retains a lower earthen terrace. The paved surface of the terrace overlies 25 cm thick cultural deposit. Alignments border the south and east sides of the earthen terrace. Agricultural

features; crude terraces, mounds and modified outcrops are scattered around the site.

SITE NOS.: STATE: 2346 PHRI: W-4 BPBM: T-8

FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 78.0 m long by 1.0 m wide; c. 78 sq m

PROBABLE AGE: Historic

FUNCTIONAL INTERPRETATION: Animal Control DESCRIPTION: This site is part of a complex of historic stone walls all of which are associated with a major eastwest drainage. The wall is constructed of stacked boulders and cobbles. It follows the bottom of a narrow drainage. A barbed wire fence begins at the east end of the wall.

SITE NOS.: STATE: 2347 PHRI: W-5 BPBM: --

FORMAL TYPE: Overhang

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.0 m long by 3.8 m wide; c. 11 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Indeterminate DESCRIPTION: This overhang was possibly utilized. The evidence for use consists of a single boulder which

appears to have been placed on the dripline in the center of the entrance. The interior is 1.0 m high.

SITE NOS.: STATE: 2348 PHRI: W-6 BPBM: —

FORMAL TYPE: Lithic Scatter

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.3 m long by 2.8 m wide; c. 20 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Lithic Reduction DESCRIPTION: Basalt flakes are on a small bedrock outcrop. The bedrock has scars on it which suggest that a

cobble was smashed against it. There are c. 12 flakes (5-10 cm) and numerous smaller flakes on the bedrock.

SITE NOS.: STATE: 2349 PHRI: W-8 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, kiawe, and grasses

CONDITION: Fair INTEGRITY: Altered

DIMENSIONS: 5.5 m long by 8.1 m wide; c. 45 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Semi-rectangular structure with some internal facing on the east wall. The walls of the enclosure are collapsed and have been altered both by cattle and bulldozer cuts on the south and SE sides. A wing wall extends SW 2.8 m from the SW corner. The structure walls are compiled of stacked boulders and cobbles up to 70 cm in height. Mounds and modified outcrops are present south of the site.

SITE NOS.: STATE: 2350 PHRI: W-10 BPBM: —

FORMAL TYPE: Terrace

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini. 'ilima, kiawe and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 6.6 m long by 5.3 m wide; c. 35 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Agriculture

DESCRIPTION: T-shaped terrace; at the SW corner of the terrace is an outcrop. The terrace wall is composed of stacked boulders, cobbles and pebbles. It retains a c. 10 sq m area of soil.

SITE NOS.: STATE: 2040 PHRI: W-11 BPBM: T-5

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 23.0 m long by 18.0 m wide; c. 414 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Burial\*/Agriculture DESCRIPTION: This complex includes a C-shaped enclosure, a wall, mounds, and a platform. Some mounds are possible burials; the largest (Feature E) is faced on one side. The C-shaped enclosure is unusual in that it opens to the northeast. Rough terraces, small mounds and modified outcrops, all probable agricultural features, surround the site.

FEATURE: A

FORMAL TYPE: C-shaped enclosure TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, kiawe and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 3.6 m long by by 2.4 m wide; c. 9 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped enclosure open to the NE. Feature is comprised of stacked cobbles up to 40 cm high. A test pit in this feature produced only a few scattered pieces of charcoal, potentially indicating it is not a habitation feature as it's orientation also suggests. The charcoal produced a calendric age range of AD 1270-1490.

FEATURE: B

FORMAL TYPE: Mound

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 2.0 m long by 1.2 m wide; c. 2 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Mound is roughly circular and rounded in profile. It is comprised of basalt cobbles and boulders stacked 40 cm high. The feature is more substantial than most of the agricultural mounds in the vicinity.

FEATURE: C

FORMAL TYPE: Mounds

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, kiawe

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 8.0 m long by 6.6 m wide; c. 53 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Four small mounds and one associated rubble wall. This portion of the site appears to be agricultural in nature. The mounds are too small for burials, and the wall appears to be a portion of a collapsed terrace situated along the edge of the drainage. The mounds average 6.5 cm in diameter and 40 cm in height.

FEATURE: D

FORMAL TYPE: Mound

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, grasses, panini, kiawe

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 1.9 m long by 1.9 m wide; c. 4 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: This is a large mound comprised of stacked basalt cobbles and boulders. It is roughly rectangular in plan and rounded in profile. The mound is 60 cm in height. It is more substantial than most of the agricultural mounds in the vicinity.

<sup>\*</sup> Tentative, temporary, or provisional.

INTEGRITY: Altered

FEATURE: E PROBABLE AGE: Prehistoric FORMAL TYPE: Platform FUNCTIONAL INTERPRETATION: Habitation/ TOPOGRAPHY: Dissected alluvial slope Agriculture VEGETATION: Lantana, panini, 'ilima, and grasses DESCRIPTION: Two enclosures; one square and the other **CONDITION: Fair** trapezoidal. Associated agricultural mounds and terraces INTEGRITY: Unaitered surround these features and extend c. 40 m to the northeast. DIMENSIONS: 3.0 m long by 3.0 m wide; c. 9 sq m PROBABLE AGE: Prehistoric FEATURE: A (Figure D-1) DESCRIPTION: This feature appears to be a mostly FORMAL TYPE: Enclosure collapsed platform which probably contains a burial. The TOPOGRAPHY: Dissected alluvial slope 90 cm high structure is comprised of stacked boulders and VEGETATION: Lantana, panini, 'ilima, and grasses cobbles. A c. 2 m long segment of the exterior facing CONDITION: Good remains intact along the west side. The remaining sides are INTEGRITY: Altered collapsed. A small piece of decomposing coral is present on DIMENSIONS: 8.0 m long by 6.0 m wide; c, 48 sq m the surface of the feature. PROBABLE AGE: Prehistoric DESCRIPTION: Trapezoidal enclosure; possible wall FEATURE: F extension off NW corner. Small terrace at NW corner. Most FORMAL TYPE: Mound of the west wall is collapsed. The SE corner is faced TOPOGRAPHY: Dissected alluvial slope externally. The walls average 40 cm in height, are core-VEGETATION: Lantana, grasses, panini, kiawe filled (filled portion is narrow), and are comprised of CONDITION: Good stacked boulders and cobbles. INTEGRITY: Unaltered DIMENSIONS: 1.8 m long by 1.4 m wide; c. 3 sq m FEATURE: B (Figure D-1) PROBABLE AGE: Prehistoric FORMAL TYPE: Enclosure DESCRIPTION: The is a large mound comprised of TOPOGRAPHY: Dissected alluvial slope stacked basalt cobbles and boulders. It is roughly rectangular VEGETATION: Lantana, panini, 'ilima, and grasses in plan and rounded in profile. The mound is 60 cm in CONDITION: Good height. It is more substantial than most agricultural mounds INTEGRITY: Unaltered in the vicinity. DIMENSIONS: 6.1 m long by 6.0 m wide; c. 37 sq m PROBABLE AGE: Prehistoric SITE NOS.: STATE: 2351 PHRI: W-12 BPBM: — **DESCRIPTION:** Square enclosure with core-filled walls. FORMAL TYPE: Terraces The southwest wall consists of a ridge of bedrock. The wails TOPOGRAPHY: Dissected alluvial slope average 40 cm in height. The wall faces are comprised of VEGETATION: Panini, lantana and 'ilima stacked basalt cobbles and boulders. The core-fill is comprised CONDITION: Fair of cobbles. INTEGRITY: Unaltered DIMENSIONS: 7.0 m long by 13.2 m wide; c. 92 sq m SITE NOS.: STATE: 2353 PHRI: W-14 BPBM: — PROBABLE AGE: Prehistoric FORMAL TYPE: Complex FUNCTIONAL INTERPRETATION: Agriculture TOPOGRAPHY: Dissected alluvial slope DESCRIPTION: Three rock-retained terraces arranged in VEGETATION: Lantana, panini, 'ilima, and grasses a stepped series. The terraces average 0.4 m in height, 7.0 **CONDITION:** Fair m long by and 4.6 m wide. Terrace walls incorporate **INTEGRITY:** Unaltered bedrock outcrops. Additional agricultural features, mostly DIMENSIONS: 42.0 m long by 28.0 m wide; c. 1176 sq m mounds and modified outcrops are present to the southeast. PROBABLE AGE: Prehistoric FUNCTIONAL INTERPRETATION: Habitation/ SITE NOS.: STATE: 2352 PHRI: W-13 BPBM: — (Figure D-1) DESCRIPTION: This site includes two enclosures, an L-FORMAL TYPE: Complex shaped wall, and associated agricultural features. TOPOGRAPHY: Dissected alluvial slope VEGETATION: Lantana, wiliwili, 'ilima, kiawe and grasses FEATURE: A CONDITION: Good FORMAL TYPE: Enclosure

DIMENSIONS: 25.0 m long by 20.0 m wide; c. 500 sq m VEGETATION: Lantana, panini, 'ilima, and grasses

TOPOGRAPHY: Dissected alluvial slope

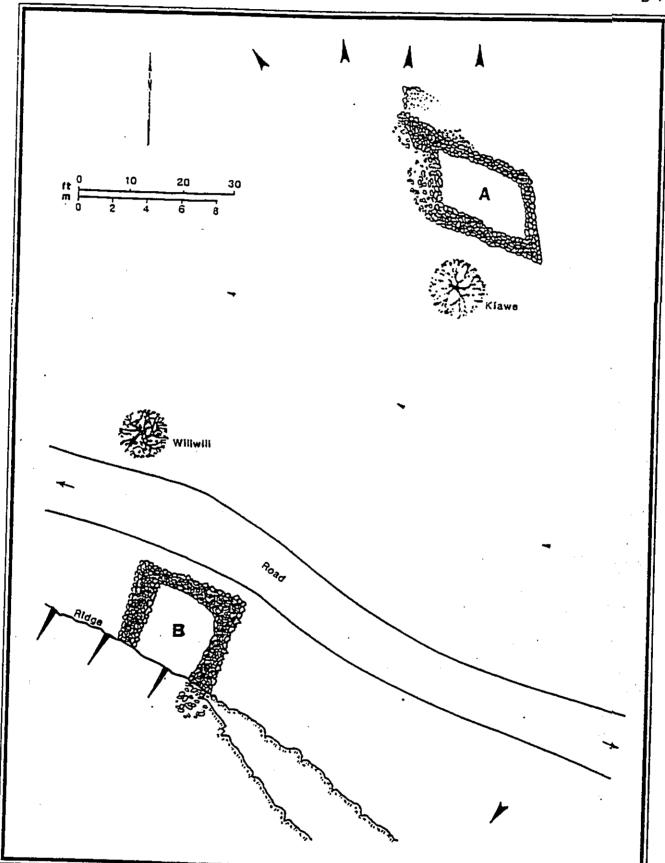


Figure D-1. SITE W-13, FEATURES A AND B.

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 8.1 m long by 6.0 m wide; c. 49 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Rectangular enclosure with internal facing on the NE corner. Two large flat slabs located atop walls of structure. Internal wall extends off south wall. The walls range from 20 to 60 cm in height and are comprised of stacked basalt boulders and cobbles.

FEATURE: B

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 3.0 m long by 2.5 m wide; c. 8 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: C-shaped; very crude. One end of the structure sits on bedrock. Feature is open to the south. It is comprised of basalt boulders and cobbles stacked/piled up to 50 cm in height. Feature probably is agricultural in function.

FEATURE: C FORMAL TYPE: Wall

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION: Fair** INTEGRITY: Unaltered

DIMENSIONS: 10.0 m long by 9.0 m wide; c. 90 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: L-shaped; west portion of feature consists of an alignment of boulders and cobbles; south wall consists of stacked boulders and cobbies. The walls border a roughly rectangular area of level soil.

SITE NOS.: STATE: 2354 PHRI: W-15 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION: Poor** INTEGRITY: Unaltered

DIMENSIONS: 5.0 m long by 4.8 m wide; c. 24 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This is an oval enclosure constructed of large stones (averaging 60 cm in diameter). The inside of the NE wall is faced. Agricultural features, mounds and modified outcrops, are present to the southeast.

SITE NOS.: STATE: 2355 PHRI: W-17 BPBM: —

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 13.0 m long by 9.0 m wide; c. 117 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

DESCRIPTION: Consists of a two-chambered enclosure and an oval enclosure; both are small and incorporate bedrock in their construction. Scattered agricultural features surround the site.

FEATURE: A

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

**CONDITION:** Fair INTEGRITY: Unaltered

DIMENSIONS: 6.0 m long by 4.0 m wide; c. 24 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Two chambered enclosure; incorporates bedrock on south side. The north wall is faced on both the inside and the outside up to 60 cm in height. Walls are comprised of stacked boulders and cobbles. A cowrie shell fragment is present on the surface inside the feature.

FEATURE: B

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.2 m long by 4.2 m wide; c. 18 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Circular enclosure with the walls well faced on the inside. The southern wall is 1.0 m high and the north wall is 0.7 m high. The walls are comprised of stacked

basait boulders and cobbles.

SITE NOS.: STATE: 2356 PHRI: W-18 BPBM: —

FORMAL TYPE: Complex

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 100.0 m long by 80.0 m wide;

c. 8,000 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Red

Agriculture

**DESCRIPTION:** This site includes one rectangular enclosure, one irregular enclosure, and numerous agricultural terraces and mounds.

FEATURE: A

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, wattle, kiawe, and grasses

CONDITION: Fair INTEGRITY: Unaltered

DIMENSIONS: 6.3 m long by 5.4 m wide; c. 34 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Medium-sized rectangular enclosure which appears to have a doorway on the northwest corner. The walls are comprised of stacked basalt boulders and cobbles and range from 15 to 50 cm in height.

FEATURE: B

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.0 m long by 11.0 m wide; c. 132 sq m

PROBABLE AGE: Prehistoric

DESCRIPTION: Complex irregular enclosure. The larger (southern) enclosed area is large (9 x 7.5 cm) and U-shaped. The northern enclosed area consists of an attached C-shape. The larger enclosed area opens to the west portion of the U-shaped area. The walls are comprised of stacked basalt boulders and cobbles. The walls range in height from 30 to 40 cm.

SITE NOS.: STATE: 2357 PHRI: W-20 BPBM: —

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 7.1 m long by 6.9 m wide; c. 49 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Rectangular enclosure; upslope walls retain a terrace. The west wall consists of an alignment on an outcrop. The walls are comprised of basalt boulders and cobbles stacked up to 70 cm in height. A probable hammerstone is present on the surface. Scattered agricultural features surround the site.

SITE NOS.: STATE: 2358 PHRI: W-21 BPBM: — (Figure D-2)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 9.9 m long by 9.2 m wide; c. 91 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: This is a rectangular enclosure open to the NW which is situated on a partially paved terrace. The walls of the enclosure are faced on both sides. The enclosure is 5 m long by 4.5 wide by 1.2 m high. Both the terrace and enclosure are comprised of stacked basalt cobble and boulders. Scattered agricultural features surround the site.

SITE NOS.: STATE: 2041 PHRI: W-27 BPBM: T-36 (Figures D-3, D-4)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 22.0 m long by 12.5 m wide; c. 275 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious/

Habitation

DESCRIPTION: May be Kaumeheiwa Heiau. L-shaped enclosure; includes an internal platform or wall segment, paving, and cupboard and step along the inner north wall. The northeast corner is notched. The south wall is paved with flat well-rounded boulders. The walls are well-faced and average 1.2 to 2 m in thickness and 90 cm in height. A test unit excavated in the interior of the enclosure revealed a subsurface cultural deposit containing charcoal, basalt and volcanic glass flakes, coral, marine shell and bone. A radiocarbon sample from the deposit yielded three possible age ranges between AD 1305 and 1617.

SITE NOS.: STATE: 2042 PHRI: W-28 BPBM: —
(Figure D-5)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 12.1 m long by 11.1 m wide; c. 134 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*

/Habitation

DESCRIPTION: This is a notched, paved enclosure. The paving lies over a rich cultural (habitation) layer. This feature may be a hejau or high status residence. Formally it resembles site 27. The walls average 2m in thickness and are up to 90 cm in height. The walls are faced on the interior and exterior. The walls are constructed of stacked boulders

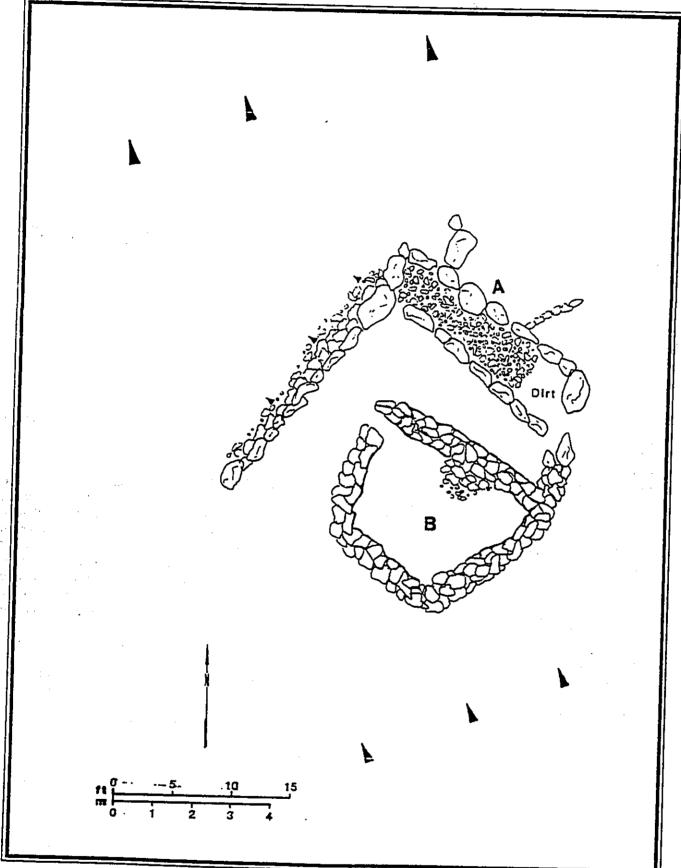


Figure D-2. SITE W-21

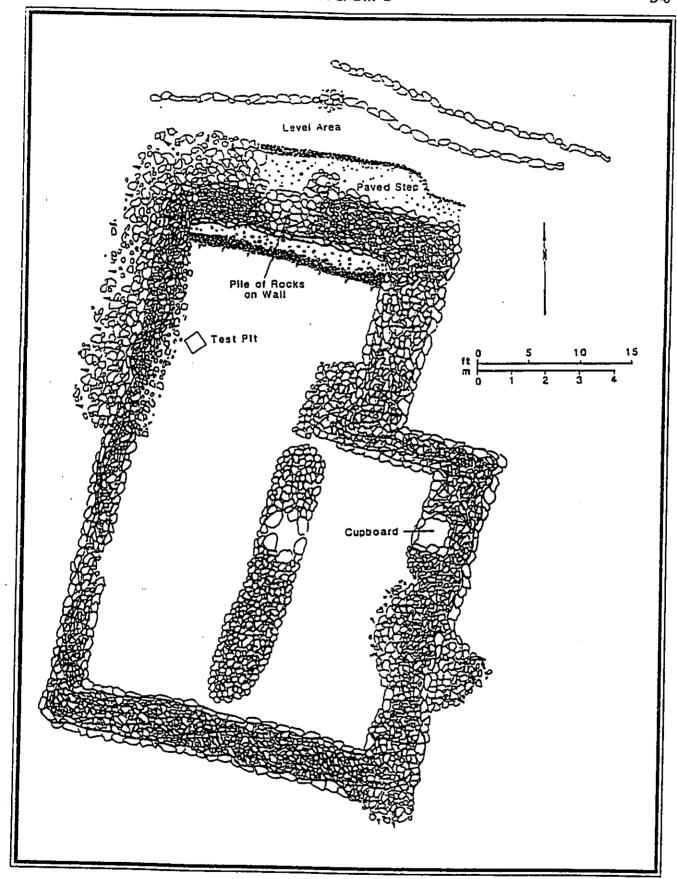


Figure D-3. SITE W-27

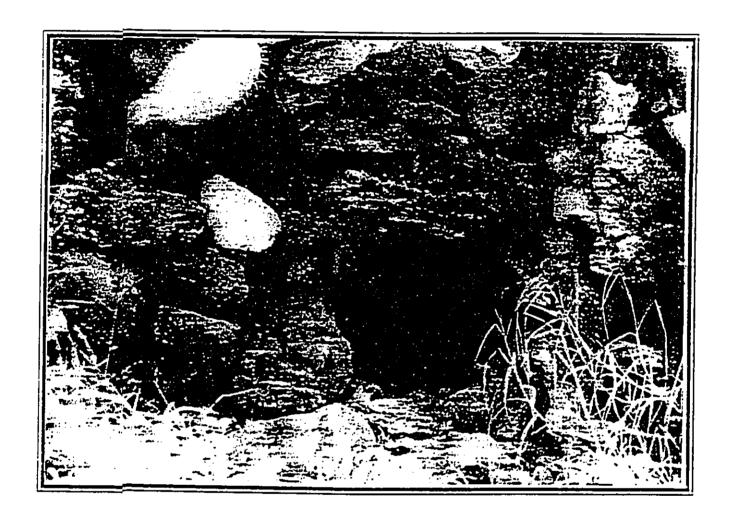


Figure D-4. SITE W-27, CUPBOARD.
VIEW TO EAST-SOUTHEAST
(PHRI Neg. 1143-3)

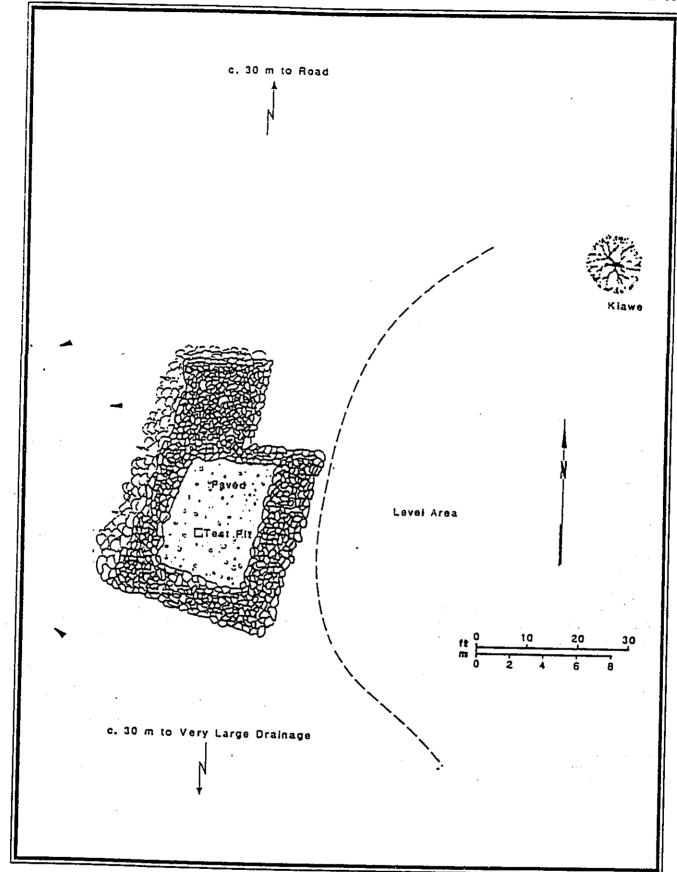


Figure D-5. SITE W-28

and cobbles. A test unit in the interior of the enclosure revealed a subsurface cultural deposit containing coral. basalt and volcanic glass flakes, bone and charcoal. The deposit was capped by a pavement of basalt pebbles and cobbles. A radiocarbon sample obtained from the deposit yielded a age range of AD 1290- 1640.

SITE NOS.: STATE: 2359 PHRI: W-30 BPBM: T-110

FORMAL TYPE: Alignment

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 23.0 m long by 1.0 m wide; c. 23 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*

DESCRIPTION: Alignment of uprights and boulders situated on the edge of a basalt outcrop overlooking a guich and another possible ceremonial site (W-32). Site W-27 lies c. 75.0 m to the southwest. The site's proximity to at least one religious/ceremonial site and its form suggest a possible religious function.

SITE NOS.: STATE: 2360 PHRI: W-31 BPBM: —

FORMAL TYPE: Overhangs

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaitered

DIMENSIONS: 13.0 m long by 3.0 m wide; c. 39 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Habitation/

Agriculture

DESCRIPTION: Two overhangs; includes a bedrock outcrop and a free standing wall. The wall connects with the outcrop c. 5.5 m east of the easternmost overhang and extends west for about 7.0 m. The overhangs are each c. 1.0 m deep by 3.0 m wide by 2.0 m high. Agricultural features surround the site.

SITE NOS.: STATE: 2361 PHRI: W-32 BPBM: — (Figure D-6)

FORMAL TYPE: Upright

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Fair

INTEGRITY: Unaltered

DIMENSIONS: 6.2 m long by 6.0 m wide; c. 55 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*

DESCRIPTION: Natural upright with oritice. The upright is part of an outcrop. The upright projects well above the outcrop and is 2m high measured from the surface of the

rough terrace. The orifice is .15 m in diameter and .55 m deep. Beneath the boulder wall is a crude terrace retained by a single-course of rocks. This unusual, and apparently modified natural upright is interpreted as a possible shrine: however, excavation of the terrace would be necessary to confirm this interpretation.

SITE NOS.: STATE: 2362 PHRI: W-35 BPBM: T-105\*

FORMAL TYPE: Human bone

TOPOGRAPHY: Dissected alluvial slope VEGETATION: Wattle, lantana, and 'ilima

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 4.8 m long by 4.5 m wide; c. 22 sq m

PROBABLE AGE: Unknown

FUNCTIONAL INTERPRETATION: Burial

DESCRIPTION: A slightly waterworn human skull fragment was discovered in the bottom of a guich. Anterior portions of the occipital and both parietals were still articulated. The isolated fragment probably originated from an eroded burial situated somewhere upslope.

SITE NOS.: STATE: 2043 PHRI: W-36 BPBM: -(Figure D-7)

FORMAL TYPE: Enclosure

TOPOGRAPHY: Dissected alluvial slope

VEGETATION: Lantana, panini, 'ilima, and grasses

CONDITION: Good INTEGRITY: Unaltered

DIMENSIONS: 15.6 m long by 7.6 m wide; c. 119 sq m

PROBABLE AGE: Prehistoric

FUNCTIONAL INTERPRETATION: Religious\*

/Habitation

DESCRIPTION: A complex, paved rectangular enclosure with internal features. In the northeast corner is a slightly elevated paved platform. A fallen upright is present at the interior edge of the platform. One decomposing piece of coral is present near the platform. Overall the feature appears to be divided longitudinally into an upper paved half which has the platform and a lower half which has a soil covered surface. The walls of the feature are well-faced along much of their extent. The walls are comprised of basalt cobbles and boulders stacked up to 1.0 cm in height. The walls average 2 m in thickness. A test unit excavated in the lower soil-covered half of the feature revealed a pavement of large flat stones beneath which is a subsurface cultural deposit containing charcoal, coral, basalt flakes and numberous pebbles and cobbles, many of which are waterwon. A radiocarbon sample from the deposit yielded a calendric age range from AD 1397-1482.

SITE NOS.: STATE: 2363 PHRI: W-37 BPBM: T-104\* FORMAL TYPE: Complex