Sept. 1999 APPENDICES FEIS
Mamalahoa Highway Bypass RD. Vol. II of II

Volume II of II

MAMALAHOA HIGHWAY BYPASS ROAD
FINAL ENVIRONMENTAL IMPACT STATEMENT
NORTH AND SOUTH KONA
ISLAND OF HAWAII

APPENDICES

SEPTEMBER 1999

Office of Environmental Quality Control
235 S Beretania Street, Rm. 702, Honolulu, HI 96813
586-4185
Return Date

APPENDICES (Volume II)

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Appendix A
January 4, 199(4)5 Department of Public Works Letter

Stephen K. Yamashiro
Mayor

Donna Fay K. Kiyosaki
Chief Engineer
Riley W. Smith
Deputy Chief Engineer

County of Hawaii
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 201 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 969-7138

January 4, 1994

R T "DICK" FRYE
PROJECT MANAGER
OCEANSIDE 1250
74-5620 A PALANI ROAD SUITE 200
KAILUA KONA HI 96740-1625

SUBJECT: PREFERRED MAMALAHOA BYPASS ALIGNMENT

This is in response to your letter of December 6, 1994, requesting the determination of the County's preferred alignment for the Mamalahoa Bypass as required pursuant to Change of Zone Ordinance 94-73. Condition (L) of this Ordinance requires that "Roadway improvements and accesses to the subject project shall meet with the approval of the Department of Public Works."

Based on our review of the testimony provided during and subsequent to the public meeting on the Mamalahoa Bypass hosted by Oceanside 1250 on September 19, 1994, review of the existing County plans for this region, including the General Plan, as well as other available information, we have determined that the Department of Public Works' preferred alignment of the Mamalahoa Bypass would link Alii Highway with the Mamalahoa Highway-Napoopoo Road Intersection. This is identified as the "Yellow" alignment on the attached map (Attachment No. 1).

In reviewing the various potential alignments, we feel this alternative provides the best overall circulation system for this region of Kona in accordance with the General Plan Facilities Map. It provides an alternative traffic corridor to Mauka Kona while at the same time reducing congestion along Kuakini Highway by limiting the number of signalized intersections. It also minimizes impact on existing agricultural and residential areas and will not adversely affect the existing businesses in the area.

We recognize that the "Yellow" alignment is not consistent with Oceanside 1250's original proposed routes as identified in Exhibit C of Ordinance 94-73, "Proposed Bypass Alignment Zone." Accordingly, an amendment to the Change of Zone Ordinance is required for this alternative. In addition, we also recognize that there may be archaeological or other potential environmental issues relating to this alignment, including potential impact to the Kuamo'o Burials Site, which have not been fully reviewed.

Accordingly, the identification of the "Yellow" alignment as the Department of Public Work's preferred alternative is conditioned upon Oceanside 1250's securing the appropriate clearances and approvals for this alignment.

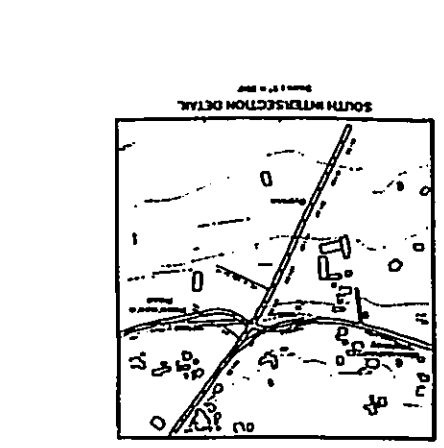
Please call me if you have any questions on the above.

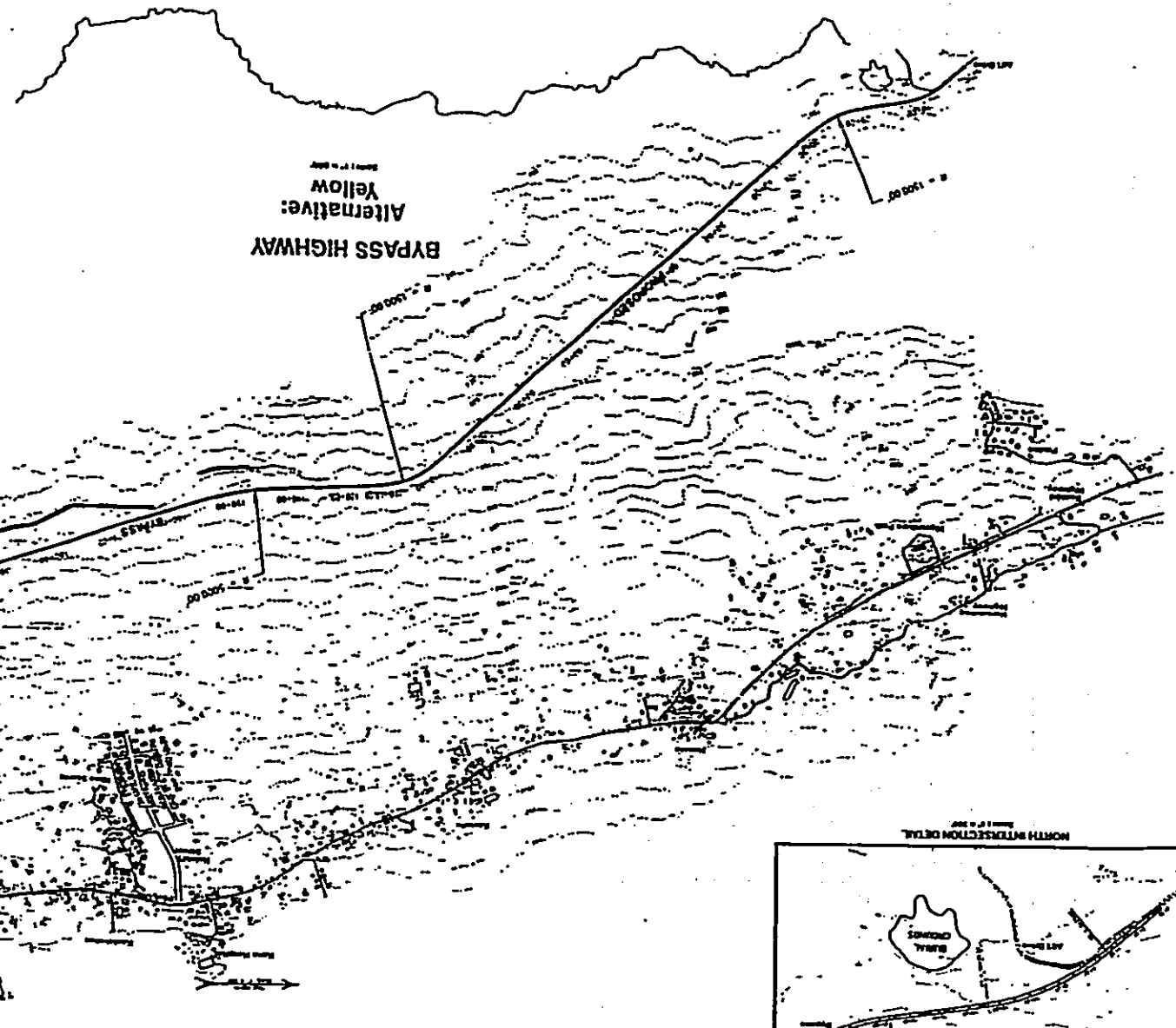
RILEY SMITH
Deputy Chief Engineer

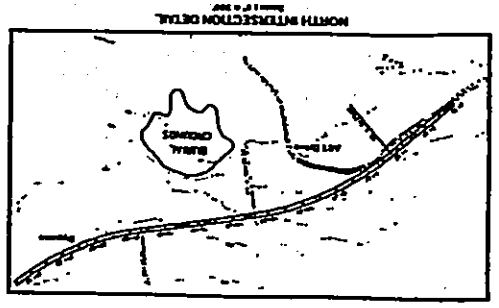
Attachment

cc: Mayor Stephen K. Yamashiro
Planning Department
Deputy Managing Director

APPENDIX A







Appendix B
January 30, 1997 Department of Public Works Letter

Stephen K. Yamashiro
Mayor

Donna Fay K. Kiyosaki
Chief Engineer

Jiro A. Sumada
Deputy Chief Engineer

County of Hawaii
DEPARTMENT OF PUBLIC WORKS
25 Aupuni Street, Room 202 • Hilo, Hawaii 96720-4252
(808) 961-8321 • Fax (808) 961-8630

January 30, 1997

R T "DICK" FRYE
PROJECT MANAGER
OCEANSIDE 1250
74-5620 A PALANI ROAD SUITE 200
KAILUA KONA HI 96740-1625

SUBJECT: Proposed Mamalahoa Highway Bypass
Keauhou to Captain Cook

This is in response to our recent meetings regarding the determination of the County's preferred alignment for the Mamalahoa Bypass as required pursuant to Change of Zone Ordinances 96-7 and 96-8. Conditions (M) and (L) of these Ordinances require that "Roadway improvements and accesses . . . to the subject project shall meet with the approval of the Department of Public Works."

This is also to update our letter of January 4, 1995, at which time the Department of Public Works determined that the preferred alignment of the Mamalahoa Highway Bypass would link Alii Highway in the vicinity of Keauhou with the Mamalahoa Highway-Napoopoo Road intersection at Captain Cook as shown on Attachment No. 1.

Since that time, it is our understanding that Oceanside 1250 has been working with the impacted landowners to identify acceptable routes through their respective properties. In addition, a preliminary archaeological "walk-through" was conducted to identify potential issues related to historic sites. Based on these efforts, the adjustments to the approved alignment have been requested by Oceanside 1250 as shown in Attachment No. 2.

In reviewing these adjustments, we have determined that they are consistent with the original finding that the preferred alignment of the Mamalahoa Highway Bypass link Alii Highway with the Mamalahoa Highway-Napoopoo Road intersection. Furthermore, we find that the adjusted alignment shown in Attachment No. 2 reflects necessary refinements undertaken during the normal course of highway design and engineering. Accordingly, we have determined that the adjusted alignment as shown in Attachment No 2 is an acceptable alignment for the Mamalahoa Highway Bypass between the approximate vicinity of Keauhou and Captain Cook provided that the maximum grade is limited to 8% with the exception that Sta. 245± to Sta. 275± may be 11% with a truck-climbing lane.

Please call me if you have any questions on this matter.

DONNA FAY K. KIYOSAKI, P.E.
Chief Engineer

WM/TWP:nt

attachments

cc: Planning Director (w/attachments)
ENG (w/attachments)
ENG-KON (w/attachments)
Wm. Moore Planning (w/attachments)

APPENDIX B

Appendix C1
Ordinance 96-7

COUNTY OF HAWAII STATE OF HAWAII

BILL NO. 158
(Draft 5)

ORDINANCE NO. 96 7

AN ORDINANCE AMENDING SECTION 25-87 (NORTH KONA ZONE MAP), AND SECTION 25-98 (SOUTH KONA ZONE MAP), ARTICLE 3, CHAPTER 25 (ZONING CODE) OF THE HAWAII COUNTY CODE, BY CHANGING THE DISTRICT CLASSIFICATION FROM UNPLANNED (U) TO AGRICULTURAL (A-1a) AT HONUAINO 3RD AND 4TH, HOKUKANO 1ST AND 2ND, HALEKII, KEEKEE 1ST AND 2ND, ILIKAHI, KANAKAU 1ST AND 2ND, KALUKALU 1ST, 2ND AND 3RD AND ONOULI 1ST, NORTH AND SOUTH KONA, HAWAII, COVERED BY TAX MAP KEY 7-9-12:4, 11 AND PORTION OF 3 AND 8-1-4:PORTION OF 3.

BE IT ORDAINED BY THE COUNCIL OF THE COUNTY OF HAWAII:

SECTION 1. Section 25-87, Article 3, Chapter 25 (Zoning Code) of the Hawaii County Code, is amended to change the district classification of property described hereinafter as follows:

The district classification of the following area situated at Honuaino 3rd and 4th, Hokukano 1st and 2nd and Kanueue 1st and 2nd, North Kona, Hawaii shall be Agricultural (A-1a):

PARCEL 1:

Beginning at the Northeasterly corner of this parcel of land, being also an angle point on the Southerly boundary of Royal Patent 1098, Land Commission Award 614 to Charles Hall, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OHAU", being 5,408.20 feet North and 934.23 feet East and running by azimuths measured clockwise from True South:

1. 345° 15' 189.91 feet along Grant 2029 to S. W. Makahiki to a point:

Thence, following along the remainder of Grant 2029 to S. W. Makahiki on a curve to the right with a radius of 470.00 feet, the chord azimuth and distance being:

2. 316° 23' 15" 424.98 feet to a point;

3. 343° 16' 839.35 feet along the remainders of Grant 2029 to S. W. Makahiki, Grant 1453 to John Cavanah and Grant 1463 to Keawe to a point;

Thence, following along the remainder of Grant 1463 to Keawe on a curve to the left with a radius of 1030.00 feet, the chord azimuth and distance being:

4. 329° 59' 30" 473.03 feet to a point;

5. 316° 43' 68.92 feet along the remainder of Grant 1463 to Keawe to a point;

Thence, following along the remainder of Grant 1463 to Keawe and Grant 1587 to John Peters on a curve to the right with a radius of 1270.00 feet, the chord azimuth and distance being:

6. 345° 33' 1224.95 feet to a point;

7. 14° 23' 350.20 feet along the remainder of Grant 1587 to John Peters to a point;

Thence, following along the remainder of Grant 1587 to John Peters on a curve to the left with a radius of 1030.00 feet, the chord azimuth and distance being:

8. 354° 32' 30" 699.21 feet to a point;

9. 334° 42' 918.92 feet along the remainder of Grant 1587 to John Peters to a point;

Thence, for the next three (3) courses following along Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to the American Board of Commissioners for Foreign Missions:

10. 66° 00' 770.00 feet to a point;

11. 74° 30' 930.00 feet to a point;

12. 67° 00' 285.65 feet to a point;

Thence, for the next twenty-one (21) courses following along the remainder of Grant 1651 to Charles Hall:

13. 179° 00' 416.28 feet to a point;

14. 149° 00' 221.00 feet to a point;

15. 52° 00' 205.00 feet to a point;

16. 67° 00' 304.00 feet to a point;

17. 80° 00' 573.00 feet to a point;

18. 102° 00' 259.00 feet to a point;

19. 136° 00' 441.00 feet to a point;

20. 120° 00' 641.00 feet to a point;

21. 137° 00' 256.00 feet to a point;

22. 168° 20' 1123.00 feet to a point;

23. 163° 30' 456.00 feet to a point;

24. 206° 00' 214.09 feet to a point;

25. 243° 00' 693.46 feet to a point;

26. 193° 00' 282.00 feet to a point;

27. 222° 00' 513.00 feet to a point;

28. 210° 19' 324.00 feet to a point;

29. 198° 00' 497.68 feet to a point;

30. 181° 00' 307.60 feet to a point;

31. 258° 00' 140.74 feet to a point;

32. 188° 49' 30" 106.80 feet to a point;

33. 170° 53' 443.95 feet to a point;

34. 268° 39' 20.00 feet along Honalo-Kainaliu Beach Road;

Thence, for the next four (4) courses following along middle of stonewall and along Land Commission Award 3659 to J. Martin:

35. 272° 51' 57.35 feet to a point;

36. 267° 36' 189.05 feet to a point;

37. 269° 43' 203.15 feet to a point;

38. 275° 15' 223.35 feet to a point;

Thence, for the next three (3) courses following along middle of stonewall and along Royal Patent 1098, Land Commission Award 614 to Charles Hall:

39. 268° 14' 434.20 feet to a point;

40. 275° 04' 236.30 feet to a point;

41. 262° 13' 206.40 feet to the point of beginning and containing an area of 383.952 Acres, more or less. (Refer to Parcel 1 as shown on Exhibit "A").

SECTION 2. Section 25-88, Article 3, Chapter 25 (Zoning Code) of the Hawaii County Code, is amended to change the district classification of property described hereinafter as follows:

The district classification of the following area situated at Halekii, Keekee 1st and 2nd, Ilikahi, Kanakau 1st and 2nd, Kalukalu 1st, 2nd and 3rd and Onouli 1st, South Kona, Hawaii, shall be Agricultural (A-1a):

PARCEL 2:

Beginning at the Northeasterly corner of this parcel of land, being also an angle point on the Southerly boundary of Grant 1887 to John Peters, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OHAU", being 601.01 feet North and 2,479.11 feet East and running by azimuths measured clockwise from True South:

1.	334°	42'	342.98	feet along the remainder of Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to the American Board of Commissioners for Foreign Missions to a point:

Thence, following along the remainders of Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to the American Board of Commissioners for Foreign Missions and Grant 1176 to Kini on a curve to the left with a radius of 705.00 feet, the chord azimuth and distance being:

2.	298°	34'	831.43	feet to a point;
3.	262°	26'	397.26	feet along the remainder of Grant 1176 to Kini to a point;

Thence, following along the remainder of Grant 1176 to Kini on a curve to the right with a radius of 645.00 feet, the chord azimuth and distance being:

4.	277°	14'	329.53	feet to a point;
5.	292°	02'	85.32	feet along the remainder of Grant 1176 to Kini to a point;

Thence, following along the remainder of Grant 1176 to Kini on a curve to the right with a radius of

30.00 feet, the chord azimuth and distance being:

6.	337°	02'	42.43	feet to a point;
7.	22°	02'	35.26	feet along the remainder of Grant 1176 to Kini to a point;

Thence, following along the remainders of Grant 1176 to Kini and Grant 1177 to Kamakahiona on a curve to the left with a radius of 705.00 feet, the chord azimuth and distance being:

8.	6°	12'	384.70	feet to a point;
9.	350°	22'	60.05	feet along the remainder of Grant 1177 to Kamakahiona to a point;

Thence, following along the remainders of Grant 1177 to Kamakahiona and Grant 1175 to Nakauwaa on a curve to the right with a radius of 645.00 feet, the chord azimuth and distance being:

10.	6°	42'	30"	362.96	feet to a point;
11.	23°	03'		162.63	feet along the remainder of Grant 1175 to Nakauwaa to a point;

Thence, following along the remainders of Grant 1175 to Nakauwaa and Grant 1464 to Ialua along a curve to the left with a radius or 705.00 feet, the chord azimuth and distance being:

12.	6°	06'	411.07	feet to a point;
13.	349°	09'	54.98	feet along the remainder of Grant 1464 to Ialua to a point;

Thence, following along the remainder of Grant 1464 to Ialua on a curve to the right with a radius of 645.00 feet, the chord azimuth and distance being:

14.	3°	07'	311.35	feet to a point;
15.	17°	05'	307.17	feet along the remainders of Grant 1464 to Ialua and Grant 1576 to Lohi to a point;

Thence, following along the remainders of Grant 1576 to Lohi, Grant 1160 to H. N. Greenwell and Royal Patents 4386 and 7146, Land Commission Award 8452 to A. Keohokalole on a curve to the left with a radius of 1130.00 feet, the chord azimuth and distance being:

16.	349°	47'	1036.55	feet to a point;
17.	322°	29'	272.49	feet along the remainder of Royal Patents 4386 and 7146, Land Commission Award 8452 to A. Keohokalole to a point;

Thence, following along the remainder of Royal Patents 4386 and 7146, Land Commission Award 8452 to A. Keohokalole on a curve to the right with a radius of 870.00 feet, the chord azimuth and distance being:

18.	352°	50'	30"	879.41	feet to a point;
19.	23°	12'		488.09	feet along the remainder of Royal Patents 4386 and 7146, Land Commission Award 8452 to A. Keohokalole to a point;

Thence, following along middle of stonewall and along Grant 1162 to F. O. Shulze, the direct azimuth and distance being:

20.	78°	08'	30"	958.38	feet to a point;

Thence, following along middle of stonewall and along Grant 1162 to F. O. Shulze, the direct azimuth and distance being:

21.	57°	14'	50"	1532.00	feet to a point;

Thence, for the next four (4) courses following along the remainder of Royal Patents 4386 and 7146, Land Commission Award 8452 to A. Keohokalole:

22.	160°	00'		200.00	feet to a point;
23.	149°	00'		452.00	feet to a point;
24.	160°	51'		628.00	feet to a point;
25.	152°	30'		327.00	feet to a point;
26.	182°	19'		313.00	feet along the remainders of Royal Patents 4386 and 7146, Land Commission Award 8452 to A. Keohokalole and Grant 1745 to John Cavanah to a point;

Thence, for the next five (5) courses following along the remainder of Grant 1745 to John Cavanah:

27.	171°	27'		400.00	feet to a point;
28.	161°	20'		606.00	feet to a point;
29.	175°	16'		440.00	feet to a point;
30.	182°	42'	30"	1190.00	feet to a point;
31.	155°	00'		489.00	feet to a point;
32.	181°	00'		353.00	feet along the remainders of Grant 1745 to John Cavanah and Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to the American Board of Commissioners for Foreign Missions to a point;
33.	153°	00'		492.00	feet along the remainder of Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to the American Board of Commissioners for Foreign Missions to a point;
34.	179°	00'		126.72	feet along the remainder of Royal Patent 1670 to John D.

Parish on a portion of Land Commission Award 387, Part 4, Section 2 to the American Board of Commissioners for Foreign Missions to a point;

35. 247° 00' 285.55 feet along Grant 1651 to Charles Hall to a point;

36. 254° 30' 930.00 feet along Grant 1651 to Charles Hall to a point;

37. 246° 00' 770.00 feet along Grant 1587 to John Peters to the point of beginning and containing an area of 372.010 Acres, more or less.

All as shown on the map attached hereto, marked Exhibit "A" and by reference made a part hereof herein after referred to as "subject property").

SECTION 3. These changes in district classification are conditioned upon the following:

A. The applicant, successors or assigns shall be responsible for complying with all of the stated conditions of approval.

B. The applicant, successors or assigns shall be responsible for complying with all requirements of Chapter 205, Hawaii Revised Statutes, relating to permissible uses within the State Land Use Agricultural District.

C. The effectuation of the water commitment rights in the Kealakekua Source Agreement to the current landowners of the subject property with the acceptance of the prevailing facilities charge for the 499 units of water by the Department of Water

Supply of the required water commitment payment shall be in accordance with its "Water Commitment Policy". Prior to approval of the 500th lot within the development area, the applicant shall secure the necessary "Water Commitments" and comply with the Department of Water Supply's "Water Commitment Policy" for the remaining units of water for the proposed subdivision and golf course development.

D. Subdivision plans for any portion of the subject property for this change of zone shall be submitted to the Planning Department and Final Subdivision Approval secured within five (5) years from the effective date of this ordinance.

E. A wastewater disposal system shall be constructed in a manner meeting with the approval of the State Department of Health and/or the Department of Public Works, whichever is applicable.

F. All electrical and communication utilities and systems within the subject property shall be placed underground, with the exception of the main 69 KV transmission line from the Mamalahoa Highway to the proposed electrical substation site.

G. A Flood Study of the subject property shall be submitted to the Planning Department in conjunction with plans submitted for subdivision review for any portion of the subject property. Drainage improvements shall be constructed in a manner meeting with the approval of the Department of Public Works, prior to the issuance of Final Subdivision Approval for the subject property.

H. An archaeological mitigation and interpretation plan shall be prepared and submitted for approval by the Planning Director, in consultation with the Department of Land and Natural Resources-Historic Preservation Division and Hawaiian community organizations, prior to submitting plans for subdivision review. The Plan shall consist of three subplans:

1. an archaeological data recovery plan for the sites to undergo data recovery,

2. a detailed interim protection/preservation plan for the sites to undergo preservation, and

3. an interpretation plan which shall include buffer zones, signage and long-range preservation concerns which may be submitted at a later date. Approved mitigation measures shall be implemented prior to or in conjunction with any land alterations within the subject property.

I. Should any unidentified sites or remains such as artifacts, shell, bone, or charcoal deposits, human burials, rock or coral alignments, pavings or walls be encountered, work in the immediate area shall cease and the Planning Director shall be immediately notified. Subsequent work shall proceed upon an archaeological clearance from the Planning Director when it finds that sufficient mitigative measures have been taken.

J. A solid waste management plan shall be prepared meeting with the approval of the Department of

Public Works prior to submitting plans for subdivision review. The Plan shall include, but not be limited to, the management of construction solid waste as well as operating and domestic solid waste generated by the proposed development. Approved recommendations and mitigation measures shall be implemented at a time and in a manner meeting with the approval of the Department of Public Works.

K. A final comprehensive public access plan, to be developed in consultation with community groups, shall be submitted to and approved by the Planning Director prior to final subdivision approval, or any land alteration activity, whichever comes first. The final comprehensive public access plan shall be developed in consultation with the Planning Director and the Department of Land and Natural Resources and shall include mauka-makai and lateral shoreline accesses, parking area(s), signage, emergency response considerations, restrictions on use (if any), provision of recreational and restroom facilities at appropriate locations, and related improvements; provided, that the construction of the coastline park and access ways shall be subject to the obtaining of all necessary discretionary permits (e.g., Conservation District Use Approval, Special Management Area Use Permit, etc.); provided, further, that the applicant shall be responsible to comply with the following terms and conditions:

1. An area comprising twenty-five percent (25%) of the total park area, as shown on Exhibit "E" attached hereto and made a part hereof, shall be developed and improved by the applicant or its agent in phases within five (5) years from

the date Final Subdivision Approval is obtained on the subject property. The first phase shall be completed and open to the public within thirty (30) days following the opening of the golf course;

2. Upon opening the first phase of the park area, a minimum of twenty-five (25) public parking stalls in addition to parking stalls for residents, guests, and employees within the subject property and the applicant's adjacent lands at the principal shoreline access parking area(s), signage and provisions for public access for night fishing and marine food gathering purposes over designated vehicular and pedestrian access routes subject to restrictions which limit said uses to recreation uses only, and other restrictions which provide for the health and safety of the general public and residents alike. The number of parking stalls shall be increased commensurately with the approval of additional park phases in accordance with the public access plan; and

3. The public shoreline access plan shall also integrate where appropriate, any public accessway(s) to interpretive trail system(s) and to the historical and archaeological sites to be approved by the Planning Director, in consultation with the Department of Land and Natural Resources in conjunction with the detail mitigation plan for the park area situated in the Conservation district.

L. Prior to final approval of a small lot subdivision plat within the subject property, the applicant shall convey to the County of Hawaii by way of a perpetual easement the right to public access and recreational use of its privately owned coastline park and trails; provided, that restrictions will be allowed to be established by the applicant, subject to the approval of the Planning Director, to promote public health and safety and the general security of the premises for residents and guest of the project to protect the area's pristine condition, and to minimize any liability to the applicant, pursuant to Chapter 520, Section 520-4, Hawaii Revised Statutes. The applicant shall retain ownership of its coastline park and trails in fee simple and maintain all lands in the coastline park area and operate such facility for public recreational use in accordance with the above terms and conditions. This condition shall not be applicable to any roadway, trail or other rights-of-way, which are deemed public highways or trails as defined in Chapter 264, Hawaii Revised Statutes;

M. Roadway improvements and access(es) to the subject property, including all plans and construction, shall meet with the approval of the Department of Public Works. Prior to the issuance of Final Subdivision Approval for any portion of the subject property, the applicant shall:

1. construct the channelization and signalization of the Hamalahoa Highway-Haleki'i Street intersection;

2. determine the final right-of-way alignment of the entire Mamalahoa Highway Bypass between the approximate vicinity of Keauhou and Captain Cook, including its intersection areas and its acquired ownership or control. The applicant shall provide the Planning Director with a metes and bounds description of each road right-of-way segment involved and evidence of its ownership or control as deemed necessary by the Planning Director. In lieu of the applicant obtaining or acquiring ownership or control of any segment of the Mamalahoa Highway Bypass, the requirement shall be deemed fulfilled upon the county's formal initiation of condemnation action(s) for such segments and an agreement has been entered into between the applicant and the county providing for the applicant's reimbursement to the county for the acquisition of the lands condemned;

3. construct the Mamalahoa Highway Bypass in its entirety between the approximate vicinity of Keauhou and Captain Cook, consisting of two lanes with sufficient right-of-way for a total of four lanes, provided further, that the section of the Mamalahoa Highway Bypass between Keauhou and Haleki'i Street shall be completed and available for public use prior to the occupancy of any dwelling unit within the entire project area;

4. construct the extension of Haleki'i Street through the subject property as generally reflected in Exhibit "B", which phasing of improvements shall be approved by the

Department of Public Works. If, before the completion and opening of the entire Mamalahoa Highway Bypass, a portion of said bypass is completed and opened, and said portion provides a connection to Haleki'i Street, a barricade or breakaway gate meeting with the requirements of the Department of Public Works, shall be installed by the applicant as part of the required Haleki'i Street improvements. The purpose of this condition is to prevent the use of Haleki'i Street as a vehicular thoroughfare between the existing Mamalahoa Highway and a portion of the Mamalahoa Highway Bypass until the entire proposed Mamalahoa Highway Bypass between the approximate vicinity of Keauhou and Captain Cook has been completed and opened for general public use; and

5. provide roadway stub-outs, generally shown in Exhibit "B", to provide future connections between the subject property and the adjacent properties to the north and south; provided that such stubouts shall be constructed in accordance with the construction phasing as approved by the Department of Public Works.

The applicant shall construct the Mamalahoa Highway Bypass to standards set forth by the Department of Public Works for Alii Highway with such modifications as may be deemed necessary by the Department of Public Works. The applicant shall provide a landscape buffer along highway sections within five hundred feet of existing dwellings, as required by the chief engineer, to reduce the impacts of noise and light on the residents therein

and to generally beautify the highway appearance in such locations; provided that the applicant shall enter into a reimbursement agreement with the County which sets forth the terms and conditions of reimbursement for costs incurred for the construction, land acquisition and design of the Mamalahoa Highway Bypass out of funds paid to the state and/or county by other developers or landowners whom the county may determine as benefiting from the Mamalahoa Highway Bypass and which funds are available to the county for such purpose; and provided further, that the total amount of reimbursement due to the applicant shall not exceed the total cost of land acquisition, design and construction of the Mamalahoa Highway Bypass incurred by the applicant, less the pro rata portion attributed to the subject property;

N. In lieu of actual construction of infrastructural improvements as required under Conditions E, G, J, K, and M, the applicant may enter into an agreement with the Planning Director and the Department of Public Works and the Department of Water Supply, if applicable, to assure the county that the infrastructural improvements will be constructed together with the appropriate bond, surety or other security deemed acceptable to the Planning Director and approved by the Corporation Counsel. Upon execution of such agreement and filing of the security with the county, if applicable, Final Subdivision Approval for the subject property or portions thereof shall be granted prior to the actual construction of required infrastructural improvements.

O. The applicant shall make its fair share contribution to mitigate the potential regional impacts of the subject property with respect to parks and recreation , fire, police, solid waste disposal facilities, and roads. The amount of the fair share contribution shall be the sum which is the product of multiplying the number of lots proposed to be subdivided by the amounts allocated hereinbelow for each such lot, and shall become due and payable prior to final subdivision approval for any portion of the subject property or its increments. If the subject property is subdivided in two or more increments, the amount of the fair share contribution due and payable prior to final subdivision approval of each increment shall be a sum calculated in the same manner according to the number of additional proposed lots in each such increment. The fair share contribution for each lot, except for lots larger than ten acres in size or which are committed exclusively for golf course and park purposes, shall be based on the maximum allowable density of building sites as determined by the zoning of such lot. The fair share contribution in a form of cash, land, facilities, or any combination thereof acceptable to the director in consultation with the affected agencies shall have a maximum combined value of $7,239.16 per lot. Based upon the applicant's representation of intent to subdivide and develop up to 400 lots, the indicated total fair share contribution is $2,895,664.00, however, the total amount shall be increased or reduced in proportion with the actual number of subdivided lots according to the calculation and payment provisions set forth in this Condition O.

The fair share contribution shall be allocated as follows:

1. $3,490.85 per lot, for an indicated total of $1,396,340.00 to the County to support park and recreational improvements and facilities;

2. $168.40 per lot, for an indicated total of $67,360.00 to the County to support police facilities;

3. $332.61 per lot, for an indicated total of $133,044.00 to the County to support fire facilities;

4. $145.62 per lot, for an indicated total of $58,248.00 to the County to support solid waste facilities;

5. $3,101.68 per lot, for an indicated total of $1,240,672.00 to the State or County to support road and traffic improvements.

The fair share contributions described above shall be adjusted annually beginning three years after the effective date of this ordinance, based on the percentage change in the Honolulu Consumer Price Index (HCPI). In lieu of paying the fair share contribution, the applicant may construct and contribute improvements/facilities related to parks and recreation, fire, police, solid waste disposal facilities, and roads within the region impacted by the proposed development, subject to the approval of the director. The cost of constructing the improvements required in Conditions J, K and M shall

be credited against the sum specified in Condition O(4) for solid waste facilities, Condition O(1) for parks and recreation, and in Condition O(5) for road and traffic improvements. For purposes of administering Condition O, the value of land contributed or the cost of any improvements required or made in lieu of the fair share contribution shall be such amount as approved by the Planning Director, upon consultation with the appropriate agencies.

P. Comply with all applicable laws, rules, regulations and requirements, including those of the Department of Health, Fire, State Department of Education and the Department of Water Supply.

Q. Should the Council adopt a Unified Impact Fees Ordinance setting forth criteria for the imposition of exactions or the assessment of impact fees, conditions included herein shall be credited towards the requirements of the Unified Impact Fees Ordinance.

R. An annual progress report shall be submitted to the Planning Director prior to each anniversary date of the approval of this change of zone. The report shall address in detail the status of the development and the compliance with the conditions of approval. This condition shall remain in effect until all of the conditions of approval have been complied with and the Planning Director acknowledges that further reports are not required.

S. An extension of time for the performance of conditions within the ordinance, with the exception of Condition C, may be granted by the Planning Director upon the following circumstances:

1. the non-performance is the result of conditions that could not have been foreseen or are beyond the control of the applicant, successors or assigns, and that are not the result of their fault or negligence;

2. granting of the time extension would not be contrary to the General Plan or Zoning Code;

3. granting of the time extension would not be contrary to the original reasons for the granting of the change of zone;

4. the time extension granted shall be for a period not to exceed the period originally granted for performance (i.e., a condition to be performed within one year may be extended for up to one additional year); and

5. should the Applicant require an additional extension of time, the Planning Director shall submit the Applicant's request to the County Council for appropriate action.

Should any of the conditions not be met or substantially complied with in a timely fashion, the Director shall initiate rezoning of the area to its original or more appropriate designation.

SECTION 4. In the event that any portion of this ordinance is declared invalid, such invalidity shall not affect the other parts of this ordinance.

SECTION 5. This ordinance shall take effect upon its approval.

INTRODUCED BY:

COUNCIL MEMBER, COUNTY OF HAWAII

Hilo, Hawaii

Date of Introduction: December 15, 1995
Date of 1st Reading: December 15, 1995
Date of 2nd Reading: January 3, 1996
Effective Date: January 15, 1996

APPROVED as to FORM and LEGALITY
DEPUTY CORPORATION COUNSEL
COUNTY OF HAWAII
Date 1/11/96

OFFICE OF THE COUNTY CLERK
County of Hawaii
Hilo, *Hawaii*

RECEIVED
'96 JAN 16 AM 7 57
OFFICE OF THE COUNTY CLERK

ntroduced By: Takashi Domingo
late Introduced: December 15, 1995
irst Reading: December 15, 1995
ublished: N/A

EMARKS:

(DRAFT 4)

ROLL CALL VOTE				
	AYES	NOES	ABS	EX
Arakaki	X			
Bonk-Abramson		X		
Childs	X			
De Lima	X			
Domingo	X			
Osorio	X			
Rath		X		
Ray	X			
Smith	X			
	7	2	0	0

Second Reading: January 3, 1996
To Mayor: January 4, 1996
Returned: January 16, 1996
Effective: January 15, 1996
Published January 24, 1996

REMARKS:

(DRAFT 5)

ROLL CALL VOTE				
	AYES	NOES	ABS	EX
Arakaki	X			
Bonk-Abramson		X		
Childs	X			
De Lima	X			
Domingo	X			
Osorio	X			
Rath		X		
Ray	X			
Smith	X			
	7	2	0	0

***I DO HEREBY CERTIFY** that the foregoing BILL was adopted by the County Council and published as indicated above.*

COUNCIL CHAIRMAN

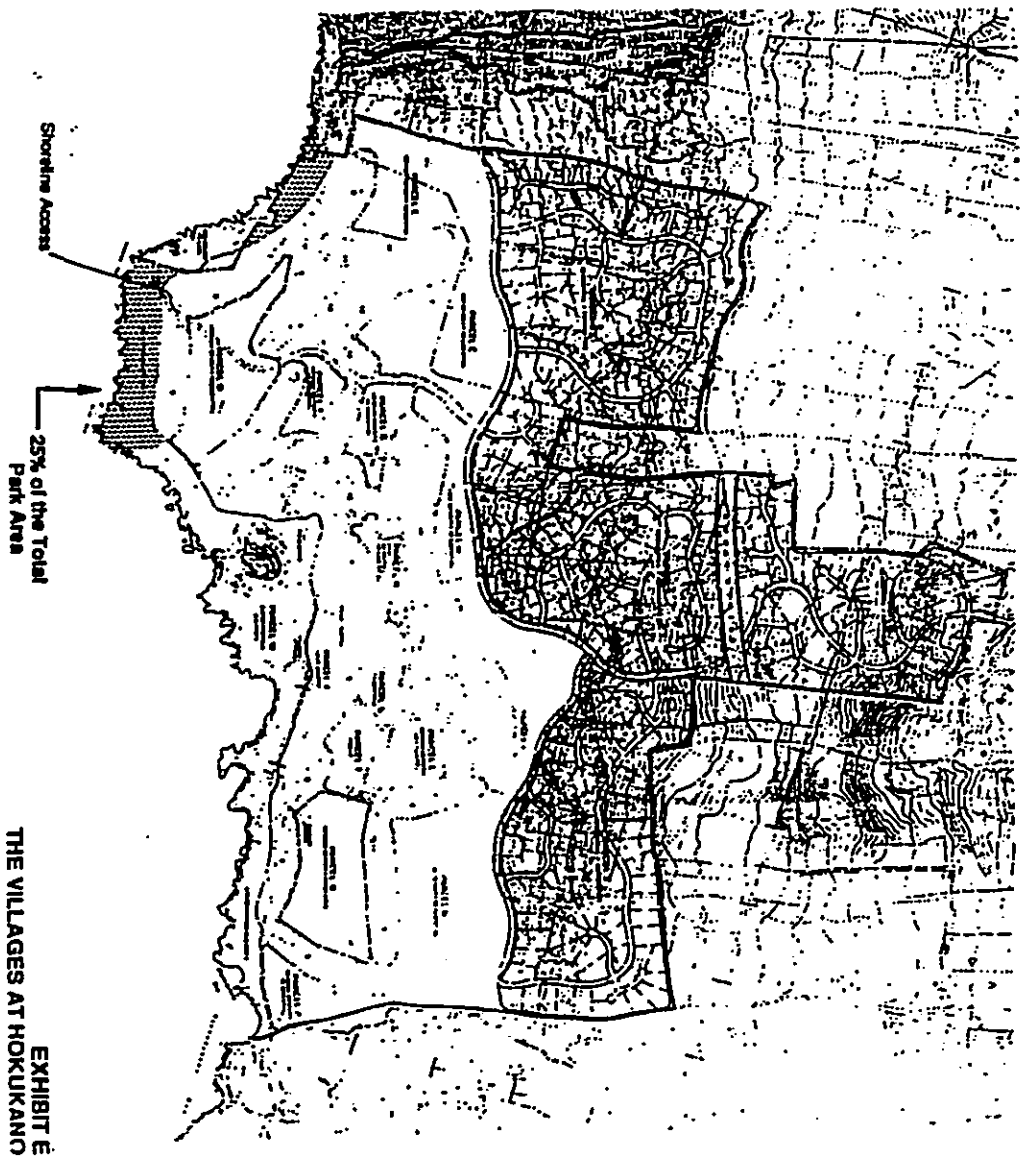
COUNTY CLERK

Approved / Disapproved this 15th *day of* January *19* 96.

MAYOR, COUNTY OF HAWAII

Bill No.: 158 (Draft 5)
Reference: C-734/PC-88
Ord. No.: 96 7

EXHIBIT E
THE VILLAGES AT HOKUKANO



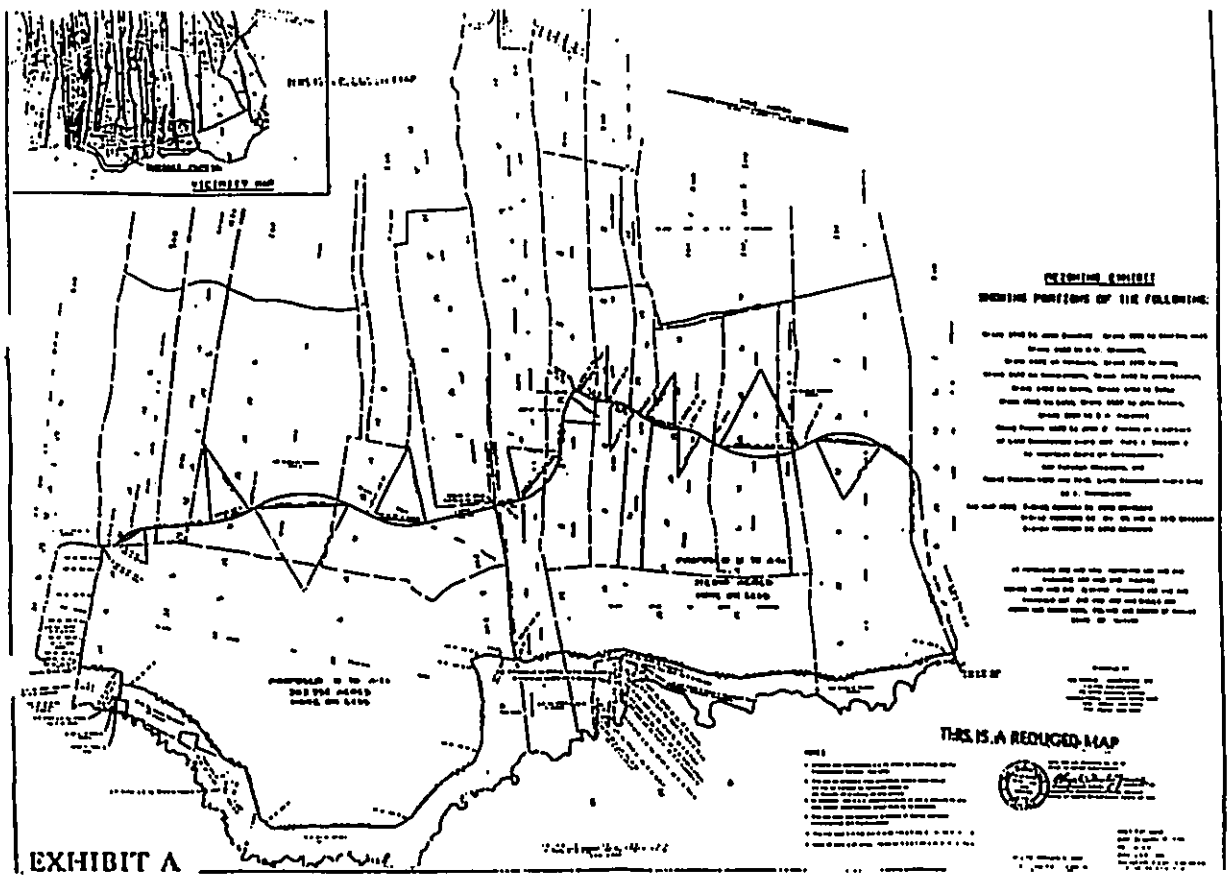


EXHIBIT A

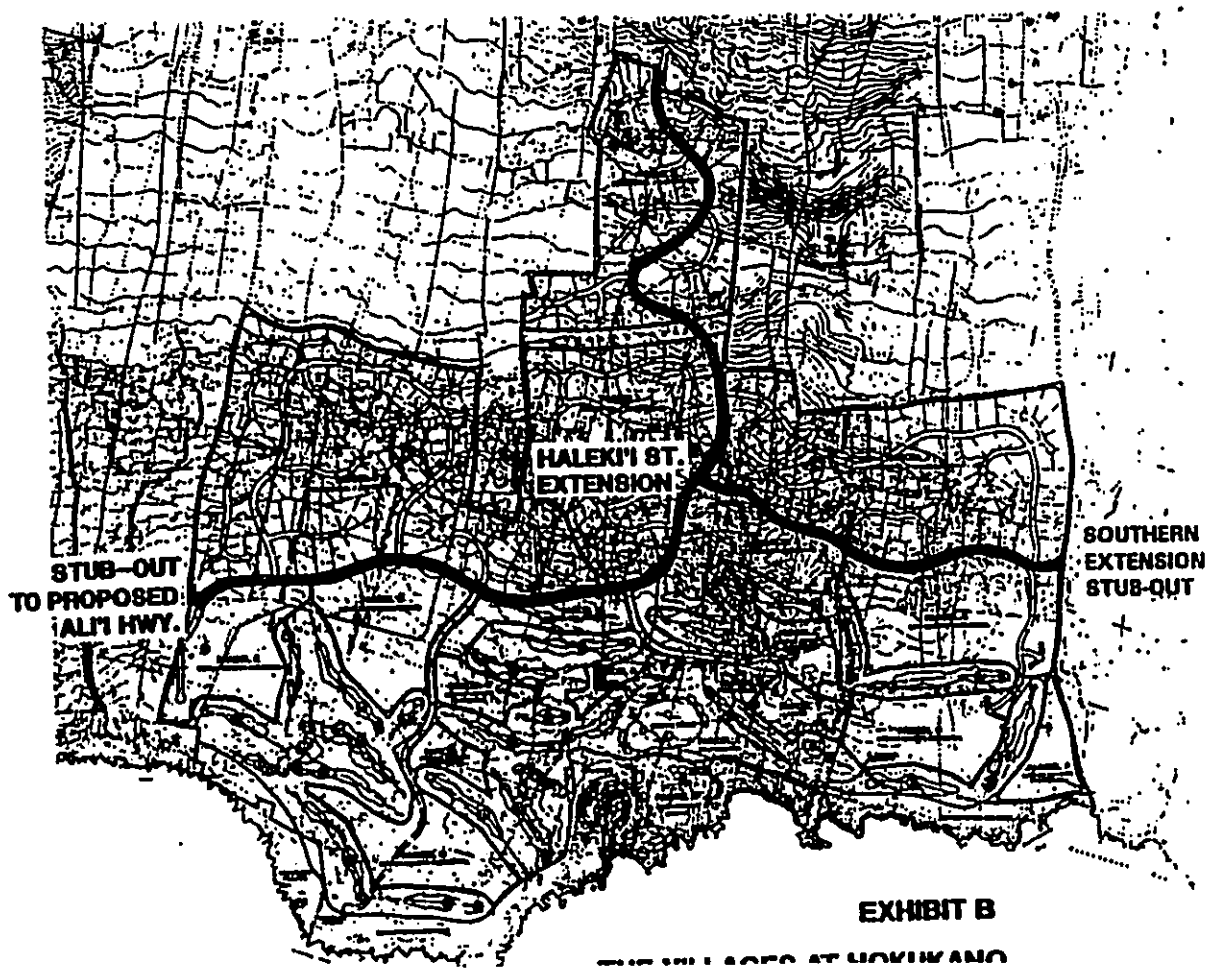


EXHIBIT B

Appendix C2
Ordinance 96-8

COUNTY OF HAWAII STATE OF HAWAII

BILL NO. 181
(Draft 6)

ORDINANCE NO. 96 8

AN ORDINANCE AMENDING SECTION 25-87 (NORTH KONA ZONE MAP) AND SECTION 25-88 (SOUTH KONA ZONE MAP), ARTICLE 3, CHAPTER 25 (ZONING CODE) OF THE HAWAII COUNTY CODE, AND ORDINANCE NO. 94-73, WHICH CLASSIFIED CERTAIN LANDS FROM AGRICULTURAL (A-5a) AND UNPLANNED (U) TO AGRICULTURAL (A-1a) AT HONUAINO 3RD AND 4TH, HOKUKANO 1ST AND 2ND, KANAUEUE 1ST AND 2ND, HALEKII, KEEKEE 1ST AND 2ND, ILIKAHI, KANAKAU 1ST AND 2ND, KALUKALU 1ST, 2ND AND 3RD AND ONOULI 1ST, NORTH AND SOUTH KONA, HAWAII, COVERED BY TAX MAP KEY 7-9-06:PORTION OF 1, 7-9-12:PORTIONS OF 3, 4, AND 5 AND 8-1-04:PORTION OF 3.

BE IT ORDAINED BY THE COUNCIL OF THE COUNTY OF HAWAII:

SECTION 1. Ordinance No. 94-73 is amended as follows:

"SECTION 1. Section 25-87, Article 3, Chapter 25 (Zoning Code) of the Hawaii County Code, is amended to change the district classification of properties described hereinafter as follows:

The district classification of the following area situated at Kanaueue 1st and 2nd, North Kona, Hawaii, shall be Agricultural (A-1a):

PARCEL 1:

Beginning at the Southeasterly corner of this parcel of land, being also a point on the Northerly boundary of Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to American Board of Commissioners for Foreign Missions, being also a point on the division between North and South Kona, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OHAU" being 1,704.58 feet North and 6,126.02 feet East and running by azimuths measured clockwise from True South:

1.	71°	45'		902.30 feet along Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to American Board of Commissioners for Foreign Missions to a point;
2.	152°	14'		1,055.02 feet along the remainder of Grant 865 to John Nakookoo to a point;

Thence, for the next seven (7) courses following along middle of stonewall and along Grant 992 to W. Whitmarsh:

3.	251°	23'	30"	224.69 feet to a point;
4.	250°	35'		58.35 feet to a point;
5.	255°	17'		131.07 feet to a point;
6.	240°	43'		26.91 feet to a point;
7.	257°	50'		172.57 feet to a point;
8.	243°	13'	30"	21.91 feet to a point;
9.	256°	57'		98.95 feet to a point;

Thence, for the next twelve (12) courses following along middle of stonewall and along the remainder of Grant 865 to John Nakookoo:

10.	338°	17'	30"	158.36 feet to a point;
11.	257°	24'		102.95 feet to a point;
12.	255°	40'	30"	171.35 feet to a point;
13.	261°	29'		101.46 feet to a point;
14.	346°	30'	30"	54.40 feet to a point;
15.	343°	21'	30"	152.40 feet to a point;
16.	346°	20'		165.46 feet to a point;
17.	343°	29'	30"	80.88 feet to a point;
18.	357°	13'		57.51 feet to a point;
19.	345°	53'	30"	154.41 feet to a point;
20.	333°	53'		114.71 feet to a point;
21.	345°	43'		43.78 feet to the point of beginning and containing an area of 22.251 Acres, more or less. (Refer to Parcel 1 as shown on Exhibit "A").

The district classification of the following area situated at Honuaino 3rd and 4th.

Hokukano 1st and 2nd and Kanaueue 1st and 2nd. North Kona. Hawaii. shall be

Agricultural (A-1a):

PARCEL 2:

Beginning at the Northwesterly corner of this parcel of land. being also a point on the Southerly boundary of Royal Patent 1098. Land Commission Award 614 to Charles Hall. the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OHAU" being 5,408.20 feet North and 934.23 feet East and running by azimuths measured clockwise from True South:

Thence, for the next sixty-seven (67) courses following along middle of stonewall and along Royal Patent 1098. Land Commission Award 614 to Charles Hall:

1.	172°	44'		35.46 feet to a point;
2.	250°	06'		26.01 feet to a point;
3.	245°	26'		19.20 feet to a point;
4.	251°	15'		39.58 feet to a point;
5.	259°	25'		18.68 feet to a point;
6.	246°	50'		16.35 feet to a point;
7.	254°	27'		40.28 feet to a point;
8.	323°	16'		7.32 feet to a point;
9.	249°	32'		44.32 feet to a point;
10.	265°	01'	30"	16.93 feet to a point;
11.	271°	10'	30"	50.61 feet to a point;
12.	261°	46'	30"	67.77 feet to a point;
13.	256°	32'	30"	36.61 feet to a point;
14.	262°	38'		30.23 feet to a point;
15.	258°	17'		37.28 feet to a point;
16.	254°	45'		21.32 feet to a point;

17.	257°	35'	30"	36.22 feet to a point;
18.	265°	03'		21.89 feet to a point;
19.	263°	53'	30"	45.49 feet to a point;
20.	266°	14'		44.43 feet to a point;
21.	249°	07'		32.29 feet to a point;
22.	256°	49'	30"	41.74 feet to a point;
23.	250°	03'	30"	91.17 feet to a point;
24.	257°	28'		88.18 feet to a point;
25.	253°	37'	30"	14.36 feet to a point;
26.	271°	49'		7.86 feet to a point;
27.	243°	18'	30"	43.30 feet to a point;
28.	252°	36'		45.75 feet to a point;
29.	262°	29'		35.65 feet to a point;
30.	265°	31'		13.70 feet to a point;
31.	260°	35'	30"	76.29 feet to a point;
32.	268°	05'	30"	59.53 feet to a point;
33.	253°	44'	30"	12.40 feet to a point;
34.	259°	40'		25.69 feet to a point;
35.	264°	02'		51.71 feet to a point;
36.	259°	49'	30"	85.74 feet to a point;
37.	266°	56'		48.70 feet to a point;
38.	265°	44'		61.02 feet to a point;
39.	272°	05'		60.95 feet to a point;
40.	269°	19'	30"	91.04 feet to a point;
41.	275°	29'		26.42 feet to a point;
42.	280°	52'	30"	26.76 feet to a point;

43.	272°	21'	30"	28.45 feet to a point;
44.	277°	12'		46.47 feet to a point;
45.	273°	22'	30"	84.54 feet to a point;
46.	273°	04'	30"	57.99 feet to a point;
47.	270°	29'		30.67 feet to a point;
48.	275°	46'	30"	91.01 feet to a point;
49.	267°	54'	30"	87.48 feet to a point;
50.	261°	05'	30"	28.16 feet to a point;
51.	266°	13'		128.24 feet to a point;
52.	270°	26'		114.47 feet to a point;
53.	260°	09'		81.24 feet to a point;
54.	262°	27'		166.66 feet to a point;
55.	261°	47'		108.98 feet to a point;
56.	243°	34'		33.10 feet to a point;
57.	259°	14'	30"	37.03 feet to a point;
58.	265°	34'	30"	77.10 feet to a point;
59.	262°	59'		118.99 feet to a point;
60.	256°	19'		39.78 feet to a point;
61.	262°	44'		82.08 feet to a point;
62.	267°	50'		34.11 feet to a point;
63.	265°	25'		63.09 feet to a point;
64.	273°	36'	30"	112.92 feet to a point;
65.	268°	50'		151.03 feet to a point;
66.	274°	59'	30"	35.27 feet to a point;
67.	268°	30'	30"	48.40 feet to a point;

Thence, for the next three (3) courses following along the Westerly side of old railroad and along the remainder of Grant 2029 to S. W. Makahiki:

68.	15°	00'		431.60 feet to a point;
69.	0°	23'		223.30 feet to a point;
70.	333°	44'		145.20 feet to a point;

Thence, for the next seven (7) courses following along the Westerly side of old railroad and along the remainder of Grant 1453 to John Cavanah:

71.	319°	08'		63.63 feet to a point;
72.	327°	12'	30"	92.54 feet to a point;
73.	333°	41'		55.11 feet to a point;
74.	341°	52'		42.41 feet to a point;
75.	350°	21'		65.77 feet to a point;
76.	357°	11'	30"	87.84 feet to a point;
77.	7°	46'		82.65 feet to a point;
78.	17°	59'		209.88 feet along the Westerly side of old railroad and along the remainders of Grant 1453 to John Cavanah and Grant 1463 to Keawe to a point;

Thence, for the next ten (10) courses following along the Westerly side of old railroad and along the remainder of Grant 1463 to Keawe:

79.	15°	46'	30"	221.91 feet to a point;
80.	350°	40'	30"	86.03 feet to a point;
81.	346°	02'	30"	127.39 feet to a point;
82.	347°	43'		68.36 feet to a point;
83.	356°	37'		108.84 feet to a point;
84.	358°	09'		110.66 feet to a point;
85.	6°	27'	30"	75.31 feet to a point;

Thence, for the next eleven (11) courses following along middle of stonewall:

5.	4°	59'		157.50 feet along Lots 22 and 21 of Keekee Estates (File Plan 2087) and along the remainder of Grant 977 to Panaunau to a point;
6.	17°	24'	30"	102.93 feet along Lots 21 and 20 of Keekee Estates (File Plan 2087) and along the remainder of Grant 977 to Panaunau to a point;
7.	7°	45'	30"	174.98 feet along Lots 20 and 19 of Keekee Estates (File Plan 2087) and along the remainder of Grant 977 to Panaunau to a point;
8.	91°	17'	30"	56.46 feet along Lot 18 of Keekee Estates (File Plan 2087) and along the remainder of Grant 977 to Panaunau to a point;
9.	355°	54'	30"	333.18 feet along Lots 18 and 17 of Keekee Estates (File Plan 2087) and along the remainder of Grant 977 to Panaunau to a point;

Thence, for the next four (4) courses following along Grant 866 to Kapule:

10.	86°	02'	30"	309.93 feet along Lot 2 to a point;
11.	80°	19'		207.35 feet along Lot 1 to a point;
12.	75°	14'		183.86 feet along Lot 1 to a point;
13.	79°	02'		674.13 feet along Lot 1 to a point;
14.	177°	38'		634.16 feet along the remainder of Grant 977 to Panaunau to a point;
15.	75°	14'		1,338.05 feet along Grant 977 to Panaunau to a point;
16.	150°	55'		956.00 feet along the remainder of Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to American Board of Commissioners for Foreign Missions to a point;
17.	251°	45'		902.30 feet along Grant 865 to John Nakookoo to a point;

Thence, for the next thirty-six (36) courses following along middle of stonewall and along Grant 865 to John Nakookoo:

18.	250°	02'	30"	41.72 feet to a point;
19.	238°	11'	30"	99.82 feet to a point;
20.	246°	13'		93.37 feet to a point;
21.	253°	29'		121.82 feet to a point;
22.	257°	51'		121.61 feet to a point;
23.	249°	33'		59.76 feet to a point;
24.	245°	51'		177.23 feet to a point;
25.	248°	02'	30"	92.17 feet to a point;
26.	240°	26'	30"	60.37 feet to a point;
27.	254°	58'		110.46 feet to a point;
28.	258°	29'		24.30 feet to a point;
29.	274°	56'	30"	31.91 feet to a point;
30.	260°	18'	30"	148.31 feet to a point:
31.	253°	43'		47.09 feet to a point:
32.	243°	21'	30"	89.60 feet to a point;
33.	263°	53'	30"	70.49 feet to a point:
34.	254°	39'	30"	21.88 feet to a point:
35.	269°	41'		41.10 feet to a point:
36.	288°	24'		45.97 feet to a point:
37.	255°	29'	30"	27.38 feet to a point:
38.	241°	21'		30.35 feet to a point:
39.	227°	12'	30"	53.91 feet to a point;
40.	216°	24'	30"	55.73 feet to a point:
41.	238°	55'	30"	27.24 feet to a point:

42.	355°	23'	30"	29.74 feet to a point;
43.	271°	22'		69.73 feet to a point;
44.	265°	04'		29.52 feet to a point;
45.	275°	29'	30"	98.69 feet to a point;
46.	271°	04'		85.71 feet to a point;
47.	277°	42'	30"	71.32 feet to a point;
48.	269°	46'		21.84 feet to a point;
49.	270°	48'		110.24 feet to a point;
50.	268°	22'		91.02 feet to a point;
51.	258°	19'		92.53 feet to a point;
52.	270°	26'		57.58 feet to a point;
53.	265°	38'		177.70 feet to the point of beginning and containing an area of 94.387 Acres, more or less. (Refer to Pacel 3 as shown on Exhibit "A".)

The district classification of the following area situated at Halekii, Keekee 1st and 2nd, Ilikahi, Kanakau 1st and 2nd, Kalukalu 1st, 2nd, and 3rd and Onouli 1st, South Kona, Hawaii, shall be Agricultural (A-1a):

PARCEL 4:

Beginning at the Southeasterly corner of this parcel of land, being also a point on the Northerly boundary of Grant 1162 to F. O. Schulze, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OHAU" being 4,046.78 feet South and 6,502.93 feet East and running by azimuths measured clockwise from True South:

1.	65°	45'	54"	1,071.96 feet along middle of stonewall and along Grant 1162 to F. O. Schulze to a point;
2.	78°	08'	30"	1,407.43 feet along middle of stonewall and along Grant 1162 to F. O. Schulze to a point;

Thence, for the next three (3) courses following along the remainder of Royal Patents 4386 and 7146, Land Commission Award 8452 to A. Keohokalole:

3.	203°	12'		488.09 feet to a point;

Thence, following on a curve to the left with a radius of 870.00 feet, the chord azimuth and distance being:

4.	172°	50'	30"	879.41 feet to a point;
5.	142°	29'		272.49 feet to a point;

Thence, following along the remainders of Royal Patents 4386 and 7146, Land Commission Award 8452 to A. Keohokalole, Grant 1160 to H. N. Greenwell, and Grant 1576 to Lohi on a curve to the right with a radius of 1,130.00 feet, the chord azimuth and distance being:

6.	169°	47'	1,036.55 feet to a point;
7.	197°	05'	307.17 feet along the remainders of Grant 1576 to Lohi and Grant 1464 to Ialua to a point;

Thence, following along the remainder of Grant 1464 to Ialua on a curve to the left with a radius of 645.00 feet, the chord azimuth and distance being:

8.	183°	07'	311.35 feet to a point;
9.	169°	09'	54.98 feet along the remainder of Grant 1464 to Ialua to a point;

Thence, following along the remainders of Grant 1464 to Ialua and Grant 1175 to Nakauwaa on a curve to the right with a radius of 705.00 feet, the chord azimuth and distance being:

10.	186°	06'	411.07 feet to a point;
11.	203°	03'	162.63 feet along the remainder of Grant 1175 to Nakauwaa to a point;

Thence, following along the remainder of Grant 1175 to Nakauwaa and Grant 1177 to Kamakahiona on a curve to the left with a radius of 645.00 feet, the chord azimuth and distance being:

12.	186°	42'	30"	362.96 feet to a point;

13.	170°	22'		60.05 feet along the remainder of Grant 1177 to Kamakahiona to a point;

Thence, following along the remainders of Grant 1177 to Kamakahiona and Grant 1176 to Kini on a curve to the right with a radius of 705.00 feet, the chord azimuth and distance being:

14.	186°	12'		384.70 feet to a point;

Thence, for the next five (5) courses following along the remainder of Grant 1176 to Kini:

15.	202°	02'		35.26 feet to a point;

Thence, following on a curve to the left with a radius of 30.00 feet, the chord azimuth and distance being:

16.	157°	02'		42.43 feet to a point;
17.	112°	02'		85.32 feet to a point;

Thence, following on a curve to the left with a radius of 645.00 feet, the chord azimuth and distance being:

18.	97°	14'		329.53 feet to a point;
19.	82°	26'		397.26 feet to a point;

Thence, following along the remainders of Grant 1176 to Kini and Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to American Board of Commissioners for Foreign Missions on a curve to the right with a radius of 705.00 feet, the chord azimuth and distance being:

20.	118°	34'		831.43 feet to a point;
21.	154°	42'		342.97 feet along the remainder of Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to American Board of Commissioners for Foreign Missions to a point;
22.	252°	13'		704.78 feet along Grant 1587 to John Peters and Grant 865 to John Nakookoo to a point;

Thence, for the next three (3) courses following along Grant 865 to John Nakookoo:

23.	257°	00'		987.00 feet to a point;
24.	259°	26'		602.00 feet to a point;
25.	244°	12'		628.00 feet to a point;
26.	330°	55'		956.00 feet along the remainder of Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to American Board of Commissioners for Foreign Missions to a point;
27.	255°	14'		1,338.05 feet along Royal Patent 1670 to John D. Parish on a portion of Land Commission Award 387, Part 4, Section 2 to American Board of Commissioners for Foreign Missions to a point;
28.	357°	38'		634.16 feet along Grant 977 to Panaunau to a point;
29.	76°	40'	30"	1,596.74 feet along Grant 1177 to Kamakahiona to a point;
30.	76°	40'	30"	44.81 feet along Grant 1177 to Kamakahiona to a point;

Thence, for the next six (6) courses following along the Westerly side of old railroad:

31.	353°	25'		54.23 feet to a point;
32.	346°	06'		95.32 feet to a point;
33.	342°	16'	30"	289.54 feet to a point;
34.	341°	04'		132.29 feet to a point;
35.	345°	33'		48.71 feet along the remainders of Grant 1177 to Kamakahiona and Grant 1175 to Nakauwaa to a point;

Thence, for the next six (6) courses following along the remainder of Grant 1175 to Nakauwaa:

36.	350°	55'	30"	47.80 feet to a point;

37.	260°	45'		8.34 feet to a point;

Thence, for the next four (4) courses following along the Westerly face of stonewall and along the Easterly side of old railroad:

38.	353°	43'	30"	58.69 feet to a point;
39.	1°	03'	30"	50.75 feet to a point;
40.	4°	06'	30"	32.09 feet to a point;
41.	9°	18'	30"	46.75 feet to a point;

Thence, for the next four (4) courses following along the Northerly face of stonewall:

42.	79°	50'		28.51 feet along Grant 787 to H. N. Greenwell to a point;
43.	63°	01'	30"	205.62 feet along Grant 787 to H. N. Greenwell to a point;

Thence, for the next twenty-six (26) courses following along the remainder of Grant 787 to H. N. Greenwell:

44.	58°	15'		190.84 feet to a point;
45.	95°	12'	30"	36.26 feet to a point;

Thence, for the next ten (10) courses following along the Westerly face of stonewall:

46.	340°	55'	30"	51.47 feet to a point;
47.	336°	12'	30"	95.40 feet to a point;
48.	340°	54'		85.38 feet to a point;
49.	338°	48'	30"	46.81 feet to a point;
50.	342°	23'		65.75 feet to a point;
51.	334°	35'	30"	65.95 feet to a point;
52.	332°	23'		82.87 feet to a point;
53.	324°	00'		11.13 feet to a point;
54.	332°	36'	30"	113.50 feet to a point;

55.	347°	43'		24.68 feet to a point;

Thence, for the next four (4) courses following along the Westerly side of old railroad:

56.	338°	19'		61.45 feet to a point;
57.	327°	39'	30"	17.91 feet to a point;
58.	347°	16'		94.25 feet to a point;
59.	344°	55'	30"	113.58 feet to a point;
60.	267°	05'	30"	16.83 feet to a point;

Thence, for the next six (6) courses following along middle of stonewall:

61.	341°	48'	30"	54.25 feet to a point;
62.	346°	24'	30"	109.52 feet to a point;
63.	330°	20'		62.30 feet to a point;
64.	336°	48'		111.89 feet to a point;
65.	325°	21'		106.90 feet to a point;
66.	62°	18'	30"	29.22 feet to a point;

Thence, for the next three (3) courses following along Westerly face of stonewall:

67.	337°	28'	30"	112.46 feet to a point;
68.	337°	08'		183.98 feet to a point;
69.	337°	36'	30"	153.52 feet to a point;
70.	254°	02'	30"	25.45 feet along the Southerly face of stonewall and along Grant 787 to H. N. Greenwell to a point:

Thence, for the next seven (7) courses following along the Westerly side of old railroad and along the remainder of Royal Patents 4386 and 7146, Land Commission Award 8452 to A. Keohokalole:

71.	338°	26'		168.87 feet to a point;
72.	337°	34'		153.12 feet to a point;

73.	335°	16'	30"	329.74 feet to a point;
74.	336°	16'	30"	122.94 feet to a point;
75.	334°	38'	30"	193.93 feet to a point;
76.	335°	59'		267.46 feet to a point;
77.	329°	13'	30"	141.50 feet to the point of beginning and containing an area of 271.415 Acres. (Refer to Parcel 4 as shown on Exhibit "A".)

All as shown on the map attached hereto, marked Exhibit "A" and by reference made a part hereof (herein after referred to as "subject property").

SECTION 3. These changes in district classification are conditioned upon the following:

(A) The applicant, successors or assigns shall be responsible for complying with all of the stated conditions of approval;

(B) The effective date of the rezoning shall be upon:

(1) the execution of an agreement, between the applicant, Lyle Anderson, and the County through its Department of Water Supply and Planning, to assign water commitment rights in the Kealakekua Source Agreement to the current landowners of the subject property within one-hundred-eighty (180) days from the effective date of this ordinance; provided that a maximum ninety (90) day extension may be granted by the Planning Director with reasonable and sufficient justification; and

(2) the acceptance by the Department of Water Supply of the required water commitment payment in accordance with its "Water Commitment Policy" within one-hundred-eighty (180) days from the effective date of this ordinance;

(C) Subdivision plans for any portion of the subject property shall be submitted to the Planning Department and Tentative Subdivision Approval secured within four (4) years from the effective date of this rezoning as determined in Condition B; Final Subdivision Approval shall be secured within five (5) years from the effective date of this rezoning as determined in Condition B. For the purpose of this ordinance,

Final Subdivision Approval shall be defined as the subdivision of any agricultural zoned lot to a lot less than twenty (20) acres in size within the subject property;

(D) A wastewater disposal system shall constructed in a manner meeting with the approval of the State Department of Health and/or the Department of Public Works, whichever is applicable;

(E) All electrical and communication utilities lines within the subject property shall be placed underground, with the exception of the main 69 KV transmission line from the Mamalahoa Highway to the proposed electrical substation site;

(F) A Flood Study of the subject property shall be submitted to the Planning Department in conjunction with plans submitted for subdivision review for any portion of the subject property. Drainage improvements shall be constructed in a manner meeting with the approval of the Department of Public Works, prior to the issuance of Final Subdivision Approval for the subject property;

(G) An archaeological mitigation and interpretation plan shall be prepared and submitted for approval by the Planning Director, in consultation with the Department of Land and Natural Resources-Historic Preservation Division, prior to submining plans for subdivision review. The Plan shall consist of three subplans:

(1) an archaeological data recovery plan for the sites to undergo data recovery,

(2) a detailed interim protection/preservation plan for the sites to undergo preservation, and

(3) an interpretation plan which shall include buffer zones. signage and long-range preservation concerns which may be submited at a later date. Approved mitigation measures shall be implemented prior to or in conjunction with any land alterations within the subject property;

(H) A final comprehensive public access plan, to be developed in consultation with community groups, shall be submitted to and approved by the Planning Director prior

to final subdivision approval, or any land alteration activity, whichever comes first. The final comprehensive public access plan shall be developed in consultation with the Planning Director and the Department of Land and Natural Resources and shall include mauka-makai and lateral shoreline accesses, parking area(s), signage, emergency response considerations, restrictions on use (if any), provision of recreational and restroom facilities at appropriate locations, and related improvements [The applicant shall be responsible to comply with Condition No. 8 of SMA Permit No. 345 issued to the applicant on November 5, 1993]; provided, that the construction of the coastline park and access ways shall be subject to the obtaining of all necessary discretionary permits (e.g., Conservation District Use Approval, Special Management Area Use Permit, etc.); provided, further, that the applicant shall be responsible to comply with the following terms and conditions:

[(1) The applicant shall develop and submit a comprehensive public shoreline access plan for the subject property and the properties described in the SMA Permit No. 345, subject to the review and approval by the Planning Director, in consultation with the Department of Land and Natural Resources, prior to Final Subdivision Approval, or any land alteration activity, whichever comes first;]

(1)[(2)] An area comprising twenty-five percent (25%) of the total park area, as shown on Exhibit "E" attached hereto and made a part hereof, shall be developed and improved by the applicant or its agent in phases within five (5) years from the date Final Subdivision Approval is obtained on the subject property. The first phase shall be completed and open to the public within thirty (30) days following the opening of the golf course;

[(3) No more than a total land area of twelve (12) acres shall be permitted to be constructed, operated and maintained as part of the applicant's golf course, approved as Use Permit No. 115, and included within the coastline park or the existing conservation district lands;]

(2)[(4)] [A] Upon opening the first phase of the park area, a minimum of twenty-five (25) public parking stalls in addition to parking stalls for residents, guests, and employees within the subject property and the applicant's adjacent lands at the

principal shoreline access parking area(s), signage and provisions for public access for night fishing and marine food gathering purposes over designated vehicular and pedestrian access routes subject to restrictions which limit said uses to recreation uses only, and other restrictions which provide for the health and safety of the general public and residents alike. The number of parking stalls shall be increased commensurately with the approval of additional park phases in accordance with the public access plan; and

(3)[(5)] The public shoreline access plan shall also integrate where appropriate, any public accessway(s) to interpretive trail system(s) and to the historical and archaeological sites to be approved by the Planning Director, in consultation with the Department of Land and Natural Resources in conjunction with the detail mitigation plan for the park area situated in the Conservation district.

(I) Prior to final approval of a small lot subdivision plat within the subject property, the applicant shall convey to the County of Hawaii by way of a perpetual easement the right to public access and recreational use of [the] its privately owned coastline park and trails; provided, that restrictions [in accordance with Chapter 115, Hawaii Revised Statutes,] will be allowed to be established by the applicant, subject to the approval of the Planning Director, to promote public health and safety and the general security of the premises for residents and guest of the project to protect the area's pristine condition, and to minimize any liability to the applicant, pursuant to Chapter 520, Section 520-4, Hawaii Revised Statutes. The applicant shall retain ownership of its [own the] coastline park and trails in fee simple and maintain all lands in the coastline park area and operate such facility for public recreational use in accordance with the above terms and conditions. This condition shall not be applicable to any roadway, trail or other rights-of-way, which are deemed public highways or trails as defined in Chapter 264, Hawaii Revised Statutes;

(J) Should any unidentified sites or remains such as artifacts, shell, bone, or charcoal deposits, human burials, rock or coral alignments, pavings or walls be encountered, work in the immediate area shall cease and the Planning Director shall be immediately notified. Subsequent work shall proceed upon an archaeological clearance from the Planning Director when it finds that sufficient mitigative measures have been taken;

(K) A solid waste management plan shall be prepared meeting with the approval of the Department of Public Works prior to submitting plans for subdivision review. The Plan shall include, but not be limited to, the management of construction solid waste as well as operating and domestic solid waste generated by the subject property. Approved recommendations and mitigation measures shall be implemented at a time and in a manner meeting with the approval of the Department of Public Works;

(L) Roadway improvements and access(es) to the subject property, including all plans and construction, shall meet with the approval of the Department of Public Works. Prior to the issuance of Final Subdivision Approval for any portion of the subject property, the applicant shall:

(1) construct the channelization and signalization of the Mamalahoa Highway-Haleki'i Street intersection;

(2) determine the final right-of-way alignment of the entire Mamalahoa Highway Bypass [road as shown in Exhibit "C",] between the approximate vicinity of Keauhou and Captain Cook, including its intersection areas and its acquired ownership or control. The applicant shall provide the Planning Director with a metes and bounds description of each road right-of-way segment involved and evidence of its ownership or control as deemed necessary by the Planning Director. In lieu of the applicant obtaining or acquiring ownership or control of any segment [within the Phase Two portion] of the Mamalahoa Highway Bypass [road], the requirement shall be deemed fulfilled upon the county's formal initiation of condemnation action for such segments and an agreement has been entered into [to] between the applicant and the county providing for the applicant's reimbursement to the county for the acquisition of the lands condemned;

(3) construct [Phase One of] the Mamalahoa Highway Bypass [as shown in Exhibit "C",] in its entirety between the approximate vicinity of Keauhou and Captain Cook, consisting of two lanes with sufficient right-of-way for a total of four lanes, provided further that the section of the Mamalahoa Highway Bypass between Keauhou and Haleki'i Street shall be completed and available

for public use prior to the occupancy of any dwelling unit within the entire project area;

[(4) construct the channelization improvements on Kuakini Highway at its intersection with the north end of the Mamalahoa Bypass;]

(4) [(5)] construct the extension of Haleki'i Street through the subject property as generally reflected in Exhibit "B", which phasing of improvements shall be approved by the Department of Public Works. [A] If, before the completion and opening of the entire Mamalahoa Highway Bypass, a portion of said bypass is completed and opened, and said portion provides a connection to Haleki'i Street, a barricade or breakaway gate, meeting with the requirements of the Department of Public Works, shall be installed by the applicant as part of the required Haleki'i Street improvements, [prior to the completion of Phase 1 of the Mamalahoa Highway Bypass or the construction of any dwelling unit or golf course clubhouse facility, whichever occurs first.] The purpose of this condition is to prevent the use of Haleki'i Street as a vehicular thoroughfare between the existing Mamalahoa Highway and a portion [the Phase 1 section]of the Mamalahoa Highway Bypass until the entire proposed Mamalahoa Highway Bypass between the approximate vicinity of Keauhou and Captain Cook has been completed and opened for general public use; and

(5) [(6)] provide roadway stub-outs, generally shown in Exhibit "B", to provide future connections between the subject property, [the Alii Highway, and southern extensions there from:] and the adjacent properties to the north and south; provided that such stub-outs shall be constructed in accordance with the construction phasing as approved by the Department of Public Works.

The applicant shall construct the Mamalahoa Highway Bypass to [State Department of Transportation-Highways Division Standards for a regional arterial bypass highway or segments thereof, and] standards set forth by the Department of Public Works for Alii Highway with such modifications as may be deemed necessary by the Department of Public Works. The applicant shall provide a landscape buffer along highway sections within five hundred feet of existing dwellings , as required by the chief engineer, to

reduce the impacts of noise and light on the residents therein and to generally beautify the highway appearance in such locations[. Roadway segments providing the bypass's connection with the existing highways at its north termini shall be built to county dedicable standards for secondary arterials, pursuant to Chapter 23 of the Hawaii County Code, instead of the State DOT standards for major arterials, in the case where the roadway segment is consistent with a Department of Transportation plan which provides for such segments to be a lesser, connector road and for the later extension of the arterial bypass highway to be substantially further north or south before merging with other arterial roadways]; provided that the applicant shall enter into a reimbursement agreement with the County which sets forth the terms and conditions of reimbursement for costs incurred for the construction, land acquisition and design of the Mamalahoa Highway Bypass out of funds paid to the state and/or county by other developers or landowners whom the county may determine as benefiting from the Mamalahoa Highway Bypass [Highway] and which funds are available to the county for such purpose; and provided further, that the total amount of reimbursement due to the applicant shall not exceed the total cost of land acquisition, design and construction of the Mamalahoa Highway Bypass [Highway] incurred by the applicant, less the pro rata portion attributed to the subject property;

[(M) Prior to Final Subdivision Approval of any portion within Area 2 as shown in Exhibit "D" except for the golf course, golf clubhouse, lodge and related facilities, the applicant shall:

(1) complete the construction of the Phase Two of the Mamalahoa Bypass consisting of two lanes with sufficient right-of-way for a total of four lanes as shown in Exhibit "C", meeting with the approval of the Department of Public Works, in consultation with the State Department of Transportation-Highways Division; and

(2) complete the construction of the Mamalahoa Bypass channelization improvements at its intersection with Mamalahoa Highway and Napo'opo'o Road, meeting with the requirements of the Department of Public Works, in consultation with the State Department of Transportation-Highways Division;]

[(M)](N)] All roadway improvements stated in Condition L [and M] of this ordinance shall be dedicated to the [appropriate government entity. Those improvements associated with the Mamalahoa Highway Bypass shall by offered to the State Director of Transportation pursuant to Section 264-1 of the Hawaii Revised Statutes. Any connector roadways, and any portion of the Mamalahoa Highway Bypass not accepted by the State Director of Transportation shall be dedicated to the County, as provided by law] County of Hawaii;

[(N)](O)] To ensure that the Goals and Policies of the Recreational Element of the General Plan are implemented, the applicant shall provide [a maximum of] two acres of land abutting the north side of Kona Scenic Park for public purposes prior to Final Subdivision Approval of the subject property.

[(O)](P)] In lieu of actual construction of infrastructural improvements as required under Conditions D, F, H, K, and L,[and M,] the applicant may enter into an agreement with the Planning Director to assure the county that the infrastructural improvements will be constructed together with the appropriate bond, surety or other security deemed acceptable to the Planning Director and the Corporation Counsel. Upon execution of such agreement and/or filing of the security with the County, Final Subdivision approval for the subject property or portions thereof shall be granted prior to the actual construction of required infrastructural improvements;

[(Q) The Applicant shall participate in the funding and construction of any regional roadway improvements as may be required by the State Department of Transportation, provided that any costs borne by the applicant shall be credited and limited to the amount of its fair share contribution for regional road and traffic impacts, as required in Conditions L and M];

[(P)](R)] It shall be demonstrated to the satisfaction of the Planning Director that agricultural activity is being conducted on the subdivided lots within three years from the date of Final Subdivision Approval. For the purposed of this condition, "agriculture" shall be defined as the cultivation of crops, including but not limited to flowers, vegetable, foliage, and fruits that are propagated for economic or personal use. An agricultural activity will be considered satisfactory;

(1) if such activity is implementing a conservation program for the affected property(ies), as approved by the applicable soil and water conservation district directors and filed with the Soil Conservation Service;

(2) if it provides a source of income to the person(s) who reside on the property; or

(3) if the property is dedicated for agriculture uses in accordance with applicable Tax Department procedures and that such agriculture dedication shall be made a deed covenant and duly recorded with the State Bureau of Conveyances and a copy of the recorded deeds shall be filed with the Planning Department within one year from the date of Final Subdivision Approval.

Each approved lot must comply with at least one of the above requirements to satisfy the conditions of approval of this ordinance;

(Q)[(S)] Restrictive covenants in the deeds of all the proposed lots shall prohibit the construction of a second dwelling unit on each lot; provided that this shall not preclude the construction of a guest house as defined under Chapter 25 of the Hawaii County Code. A copy of the proposed covenant(s) to be recorded with the Bureau of Conveyances shall be submitted to the Planning Department for review and approval prior to final subdivision approval. A copy of the approved covenant shall be recited in an instrument executed by the applicant and the county and recorded with the Bureau of Conveyances likewise prior to final subdivision approval;

(R)[(T)] [The Applicant shall pay its fair share contribution to address potential regional impacts of the subject property with respect to park, fire, police, solid waste disposal facilities, sewer and roads. The fair share contribution shall be initially based on the representations contained within the change of zone application and may be increased or reduced proportionally if the agricultural lot counts are adjusted. The fair share contributions described below shall be adjusted annually based on the percentage change in the Honolulu Consumer Price Index (HCPI). The fair share contribution for each agricultural zoned lot of the subject property less than ten acres in size shall be based on a maximum density for each lot as determined by the zoning resulting from this change of zone. The fair share contribution in a form of cash, land, facilities, or

any combination thereof shall have a maximum combined value of $ 4,701,205.74. In lieu of paying the fair share contribution, the applicant may construct such improvements/facilities related to park, fire, police, solid waste disposal facilities, sewers and roads with the approval of the appropriate agency(ies).

Any contributions required by this ordinance that exceed the fair share requirement of this proposed development shall, at the applicant's request be credited towards any of the applicant's future developments that require infrastructural impact contributions;]

The applicant shall make its fair share contribution to mitigate the potential regional impacts of the subject property with respect to parks and recreation, fire, police, solid waste disposal facilities, and roads. The amount of the fair share contribution shall be the sum which is the product of multiplying the number of lots proposed to be subdivided by the amounts allocated hereinbelow for each such lot, and shall become due and payable prior to final subdivision approval for any portion of the subject property or its increments. If the subject property is subdivided in two or more increments, the amount of the fair share contribution due and payable prior to final subdivision approval of each increment shall be a sum calculated in the same manner according to the number of additional proposed lots in each such increment. The fair share contribution for each lot, except for lots larger than ten acres in size or which are committed exclusively for golf course and park purposes, shall be based on the maximum allowable density of building sites as determined by the zoning of such lot. The fair share contribution in a form of cash, land, facilities, or any combination thereof acceptable to the director in consultation with the affected agencies shall have a maximum combined value of $7,239.16 per lot. Based upon the applicant's representation of intent to subdivide and develop up to 400 lots, the indicated total fair share contribution is $2,895,664.00, however, the total amount shall be increased or reduced in proportion with the actual number of subdivided lots according to the calculation and payment provisions set forth in this Condition Q. The fair share contribution shall be allocated as follows:

(1) $3,490.85 per lot, for an indicated total of $1,396,340.00 to the County to support park and recreational improvements and facilities;

(2) $168.40 per lot, for an indicated total of $67,360.00 to the County to support police facilities;

(3) $332.61 per lot, for an indicated total of $133,044.00 to the County to support fire facilities;

(4) $145.62 per lot, for an indicated total of $58,248.00 to the County to support solid waste facilities;

(5) $3,101.68 per lot, for an indicated total of $1,240,672.00 to the State or County to support road and traffic improvements.

The fair share contributions described above shall be adjusted annually beginning three years after the effective date of this ordinance, based on the percentage change in the Honolulu Consumer Price Index (HCPI). In lieu of paying the fair share contribution, the applicant may construct improvements/facilities related to parks and recreation, fire, police, solid waste disposal facilities, and roads within the region impacted by the proposed development, subject to the approval of the planning director. The cost of constructing the improvements required in Conditions H, K and L shall be credited against the sum specified in Condition R(1) for parks and recreation, Condition R(4) for solid waste facilities, and in Condition R(5) for road and traffic improvements. For purposes of administering Condition R, the value of land contributed or the cost of any improvements required or made in lieu of the fair share contribution shall be such amount as approved by the Planning Director, upon consultation with the appropriate agencies.

[(U) The Applicant shall conform, to the best extent practicable, with the guidelines as provided within the Strategies for Energy Efficient Architecture by Hawaiian Design and the State Model Energy Code, in the construction of dwellings within the subject property;]

(S)[(T)] In the event that the State Department of Education adopts an educational facilities impact fee program, the applicant shall participate in the requirements of the program;

([T][(W)] Comply with all applicable laws, rules, regulations and requirements, including those of the Department of Health, Fire, and the Department of Water Supply;

([U][(X)] Should the Council adopt a Unified Impact Fees Ordinance setting forth criteria for the imposition of exactions or the assessment of impact fees, conditions included herein shall be credited towards the requirements of the Unified Impact Fees Ordinance;

(V)[(Y)] An annual progress report shall be submitted to the Planning Director prior to each anniversary date of the approval of this change of zone. The report shall address in detail the status of the development and the compliance with the conditions of approval. This condition shall remain in effect until all of the conditions of approval have been complied with and the Planning Director acknowledges that further reports are not required; and,

(W)[(Z)] An extension of time for the performance of conditions within the ordinance, with the exception of Condition C, may be granted by the Planning Director upon the following circumstances:

(1) the non-performance is the result of conditions that could not have been foreseen or are beyond the control of the applicant, successors or assigns, and that are not the result of their fault or negligence;

(2) granting of the time extension would not be contrary to the General Plan or Zoning Code;

(3) granting of the time extension would not be contrary to the original reasons for the granting of the change of zone;

(4) the time extension granted shall be for a period not to exceed the period originally granted for performance (i.e., a condition to be performed within one year may be extended for up to one additional year); and

(5) should the Applicant require an additional extension of time, the Planning Director shall submit the Applicant's request to the County Council for appropriate action.

Further, should any of the conditions not be met or substantially complied with in a timely fashion, the Director shall initiate rezoning of the area to its original or more appropriate designation."

SECTION 2. In the event that any portion of the ordinance is declared invalid, such invalidity shall not affect the other parts of this ordinance.

SECTION 3. This ordinance shall take effect upon its approval.

INTRODUCED BY:

COUNCIL MEMBER, COUNTY OF HAWAII

Hawaii

f Introduction: December 15, 1995
f 1st Reading: December 15, 1995
f 2nd Reading: January 3, 1996
ive Date: January 15, 1996

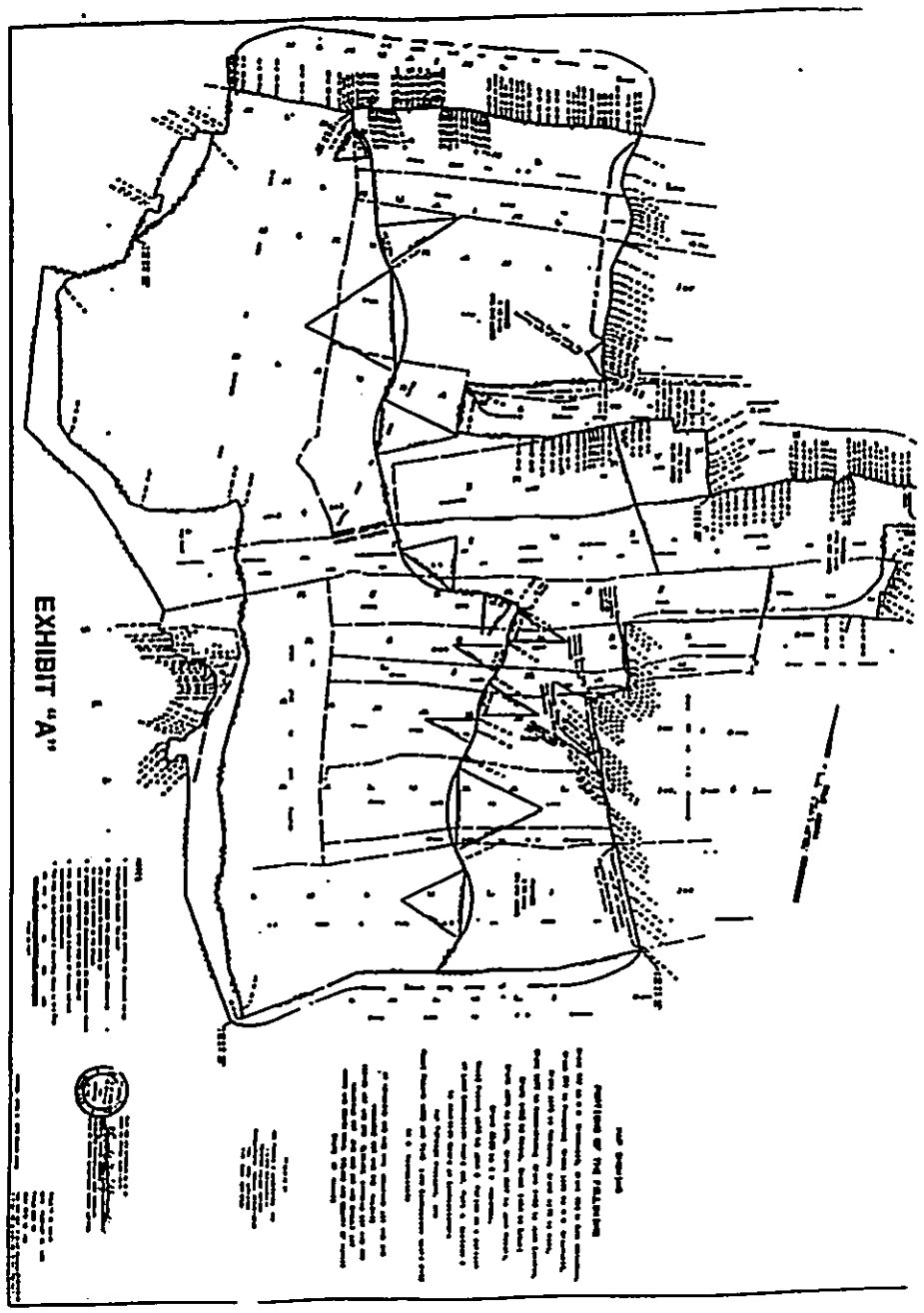
APPROVED as to FORM and LEGALITY

DEPUTY CORPORATION COUNSEL
COUNTY OF HAWAII

Date 1/8/96

THIS IS A REDUCED MAP

EXHIBIT "A"



OFFICE OF THE COUNTY CLERK
County of Hawaii
Hilo, Hawaii

RECEIVED
(DRAFT) 16 AM 7 57

Introduced By: Takashi Domingo
Date Introduced: December 15, 1995
First Reading: December 15, 1995
Published: N/A

REMARKS:

ROLL CALL VOTE				
COUNT	AYES	NOES	ABS	EX
Arakaki	X			
Bonk-Abramson		X		
Childs	X			
De Lima	X			
Domingo	X			
Osorio	X			
Rath		X		
Ray	X			
Smith	X			
	7	2	0	0

(DRAFT 6)

Second Reading: January 3, 1996
To Mayor: January 4, 1996
Returned: January 16, 1996
Effective: January 15, 1996
Published January 24, 1996

REMARKS:

ROLL CALL VOTE				
	AYES	NOES	ABS	EX
Arakaki	X			
Bonk-Abramson		X		
Childs	X			
De Lima	X			
Domingo	X			
Osorio	X			
Rath		X		
Ray	X			
Smith	X			
	7	2	0	0

I DO HEREBY CERTIFY that the foregoing BILL was adopted by the County Council and published as indicated above.

COUNCIL CHAIRMAN

COUNTY CLERK

Approved / ~~Disapproved~~ this 15th day of January, 1996.

MAYOR, COUNTY OF HAWAII

Bill No.: 181 (Draft 6)
Reference: C-821/PC-91
Ord. No.: 96 8

Appendix C3
Ordinance 97-36

COUNTY OF HAWAII STATE OF HAWAII

BILL NO. 373 (Draft 5)

ORDINANCE NO. 97 36

AN ORDINANCE AMENDING SECTION 25-88 (SOUTH KONA ZONE MAP), ARTICLE 3, CHAPTER 25 (ZONING CODE) OF THE HAWAII COUNTY CODE, BY CHANGING THE DISTRICT CLASSIFICATION FROM AGRICULTURAL (A-1a) TO RESORT (V-6.0) AT KEEKEE 2nd, ILIKAHI, KANAKAU 1st and 2nd, and KALUKALU 1st, 2nd and 3rd, SOUTH KONA, HAWAII, COVERED BY TAX MAP KEY 8-1-04:PORTION OF 3.

BE IT ORDAINED BY THE COUNCIL OF THE COUNTY OF HAWAII:

SECTION 1. Section 25-88, Article 3, Chapter 25 (Zoning Code) of the Hawaii County Code, is amended to change the district classification of property described hereinafter as follows:

The district classification of the following subject area situated at Keekee 2nd, Ilikahi, Kanakau 1st and 2nd, and Kalukalu 1st, 2nd and 3rd, South Kona, Hawaii, shall be Resort (V-6.0):

Beginning at the Northwesterly corner of this parcel of land at a point bearing 300° 33' 20" 399.34 feet from an angle point on the Easterly boundary of the State Land Use Conservation District, the coordinates of said point of beginning referred to Government Survey Triangulation Station "PUU OHAU" being 1,636.53 feet South and 1,386.52 feet East and running by azimuths measured clockwise from True South:

Thence, for the next fifteen (15) courses following along the remainder of Grant 1745 to John Cavanah:

1.	226°	00'		604.00	feet to a point;
2.	316°	00'		319.00	feet to a point;
3.	353°	00'		80.00	feet to a point;
4.	16°	00'		290.00	feet to a point;
5.	67°	00'		275.79	feet to a point;
6.	157°	00'		50.27	feet to a point;
7.	67°	00'		144.00	feet to a point;
8.	337°	00'		174.00	feet to a point;
9.	247°	00'		105.36	feet to a point;
10.	337°	00'		725.39	feet to a point;
11.	89°	00'		447.00	feet to a point;
12.	157°	00'		238.00	feet to a point;
13.	146°	00'		303.00	feet to a point;
14.	191°	00'		362.00	feet to a point;
15.	182°	42'	30"	255.00	feet to the point of beginning and containing an area of 14.854 Acres.

All as shown on the map attached hereto, marked Exhibit "A" and by reference made a part hereof.

SECTION 2. This change in district classification is conditioned upon the following:

A. The applicant, its successors or assigns shall be responsible for complying with all of the stated conditions of approval.

B. The effectuation of the water commitment rights in the Kealakekua Source Agreement to the current landowners of the subject area with acceptance of the prevailing facilities charge by the Department of Water Supply of the required water commitment payment shall be in accordance with its "Water Commitment Policy" prior to the issuance of Final Plan Approval.

C. Subdivision plans for any portion of the subject area shall be submitted to the Planning Director and Final Subdivision Approval secured within five (5) years from the effective date of this ordinance.

D. Final Plan Approval for the proposed development within the subject area shall be secured within five (5) years from the effective date of this ordinance.

E. A wastewater disposal system for the subject area shall be constructed in a manner meeting with the approval of the State Department of Health and/or the Department of Public Works, whichever is applicable.

F. All electrical and communication lines within the subject area shall be placed underground.

G. A Flood Study of the subject area shall be submitted to the Planning Director in conjunction with plans submitted for subdivision or plan approval review, whichever occurs first, for any portion of the 14.8 acre area. Drainage improvements shall be constructed meeting with the approval of the Department of Public Works, prior to the issuance of Final Subdivision or Plan Approval for the subject area.

H. An archaeological mitigation and interpretation plan shall be prepared and submitted for approval by the Planning Director in consultation with the Department of Land and Natural Resources-Historic Preservation Division and Hawaiian community organizations, prior to submitting plans for subdivision or plan approval review, whichever occurs first. The Plan shall consist of three subplans:

(1) an archaeological data recovery plan for the sites to undergo data recovery;

(2) a detailed interim protection/preservation plan for the sites to undergo preservation; and

(3) an interpretation plan which shall include buffer zones, signage and long-range preservation concerns which may be submitted at a later date. Approved mitigation measures shall be implemented prior to or in conjunction with any land alterations within the subject area.

I. Should any unidentified sites or remains such as artifacts, shell, bone, or charcoal deposits, human burials, rock or coral alignments, pavings or walls be encountered, work in the immediate area shall cease and the Department of Land and Natural Resources-Historic Preservation Division (DLNR-HPD) shall be immediately notified. Subsequent work shall proceed upon an archaeological clearance from the DLNR-HPD when the DLNR-HPD finds that sufficient mitigative measures have been taken.

J. A Solid Waste Management Plan shall be prepared meeting with the approval of the Department of Public Works prior to submitting plans for subdivision or plan approval review, whichever occurs first. The Plan shall include, but not be limited to, the management of construction solid waste as well as operating and domestic solid waste generated by the proposed development within the subject area. Approved recommendations and mitigation measures shall be implemented meeting with the approval of the Department of Public Works.

K. Access(es) to the subject area shall be constructed meeting with the approval of the Department of Public Works. The following roadway improvements between Haleki'i Street and the 14.8-acre subject area shall be completed in conjunction with the issuance of a certificate of occupancy for any development within the subject area:

(1) the channelization and signalization of the project site's Mamalahoa Highway-Haleki'i Street intersection;

(2) the extension of Haleki'i Street shall be constructed as an arterial along its general mauka-makai alignment, as shown on Exhibit "B", which phasing of improvements shall be approved by the Department of Public Works. If, before the completion and opening of the entire Mamalahoa Highway Bypass, a portion of said bypass is completed and opened, and said portion provides a connection to Haleki'i Street, a barricade or breakaway gate meeting with the requirements of the Department of Public Works, shall be installed by the applicant as part of the required Haleki'i Street improvements. The purpose of this condition is to prevent the use of Haleki'i Street as a vehicular thoroughfare between the existing Mamalahoa Highway and a portion of the Mamalahoa Highway Bypass until the entire proposed Mamalahoa Highway Bypass between the approximate vicinity of Keauhou and Captain Cook has been completed and opened for general public use;

(3) the roadway segment from the Haleki'i Street extension to the subject area shall be constructed prior to the certificate of occupancy for any development within the 14.8 acre subject area.

Also, the Mamalahoa Highway Bypass shall be constructed in its entirety between the approximate vicinity of Keauhou and Captain Cook, consisting of two lanes with sufficient right-of-way for a total of four lanes, provided further, that the section of the Mamalahoa Highway Bypass between Keauhou and Haleki'i Street shall be completed and available for public use prior to the issuance of a certificate of occupancy of the proposed development within the subject area.

L. Infrastructural improvements as required under Conditions C, E, F, G, J, and K shall not prohibit the applicant from participating in a Development Agreement or any other agreement together with the appropriate bond, surety or other security deemed acceptable by the Planning Director, appropriate agencies or the County

Council, whichever is applicable, to ensure the provision of necessary infrastructural improvements to support the proposed development in a timely manner.

M. The applicant shall establish a program for employee housing which shall be submitted for the review and approval of the Planning Director and Housing Agency together with the submittal of plans for Plan Approval for the proposed lodge. The program shall include provisions for on-site or off-site housing for the employees of the lodge in an amount to be determined by a study of surrounding housing opportunities and employee needs. The program may also include consideration for other alternatives such as rental housing subsidies or housing allowances. The approval of the program shall be secured prior to the issuance of a certificate of occupancy of the lodge within the subject area.

N. The applicant shall make its fair share contribution to mitigate the potential impacts of the proposed development within the subject area with respect to parks and recreation, fire, solid waste disposal facilities and roads. The amount of the fair share contribution shall be the sum which is the product of multiplying the number of units proposed to be developed by the amounts allocated hereinbelow for each such unit, and shall become due and payable prior to final plan approval or final subdivision approval, whichever occurs first, for any portion of the subject area or its increments. If the subject area is developed in two or more increments, the amount of the fair share contribution due and payable prior to final plan approval of each increment shall be a sum calculated in the same manner according to the number of proposed units in each such increment. The fair share contribution may be in a form of cash, land, facilities, or any combination thereof acceptable to the Planning Director in consultation with the affected agencies. The fair share contribution shall have a maximum combined value of $7,965.90 per resort unit. Based upon the applicant's representation of intent to develop up to 80 units, the indicated

total fair share contribution is $637,272.00. However, the total amount shall be increased or reduced in proportion with the actual number of lots/units according to the calculation and payment provisions set forth in this Condition N. The fair share contribution shall be allocated as follows:

1. $1,942.74 per resort unit for an indicated total of $155,419.20 to the County to support park and recreational improvements and facilities;

2. $87.99 per resort unit or an indicated total of $7,039.20 to the County to support fire facilities;

3. $43.02 per resort unit for an indicated total of $3,441.60 to the County to support solid waste facilities;

4. $5,892.15 per resort unit for an indicated total of $471,372.00 to the State or County to support road and traffic improvements.

The fair share contributions described above shall be adjusted annually beginning three years after the effective date of the change of zone, based on the percentage change in the Honolulu Consumer Price Index (HCPI). In lieu of paying the fair share contribution, the applicant may construct and contribute land, improvements/facilities related to parks and recreation, fire, solid waste disposal facilities, and roads within the region impacted by the proposed development, subject to the approval of the Planning Director. The cost of constructing the improvements and the fair market value of land contributed required in Condition K shall be credited against the sum specified in Condition N(4) for road and traffic improvements. For purposes of administering Condition N, the fair market value of land contributed or the cost of any improvements required or made in lieu of the fair share contribution shall be

subject to the review and approval of the Planning Director, upon consultation with the appropriate agencies.

O. Comply with all applicable laws, rules, regulations and requirements, including those of the Department of Health, Fire Department and the Department of Water Supply.

P. Should the Council adopt a Unified Impact Fees Ordinance setting forth criteria for the imposition of exactions or the assessment of impact fees, conditions included herein shall be credited toward the requirements of the Unified Impact Fees Ordinance.

Q. An annual progress report shall be submitted to the Planning Director prior to each anniversary date of the approval of this change of zone. The report shall address in detail the status of the development and the compliance with the conditions of approval. This condition shall remain in effect until all of the conditions of approval have been complied with and the Planning Director acknowledges that further reports are not required.

R. An initial extension of time for the performance of conditions within the ordinance, with the exception of Condition B, may be granted by the Planning Director upon the following circumstances:

(1) The non-performance is the result of conditions that could not have been foreseen or are beyond the control of the applicant, successors or assigns, and that is not the result of their fault or negligence.

(2) Granting of the time extension would not be contrary to the General Plan or Zoning Code.

(3) Granting of the time extension would not be contrary to the original reasons for the granting of the change of zone.

(4) The time extension granted shall be for a period not to exceed the period originally granted for performance (i.e., a condition to be performed within one year may be extended for up to one additional year).

S. Should any of the conditions not be met or substantially complied within a timely fashion, the Director may initiate rezoning of the subject area to its original or more appropriate designation.

SECTION 3. In the event that any portion of this ordinance is declared invalid, such invalidity shall not affect the other parts of this ordinance.

SECTION 4. This ordinance shall take effect upon its approval.

INTRODUCED BY:

COUNCIL MEMBER, COUNTY OF HAWAII

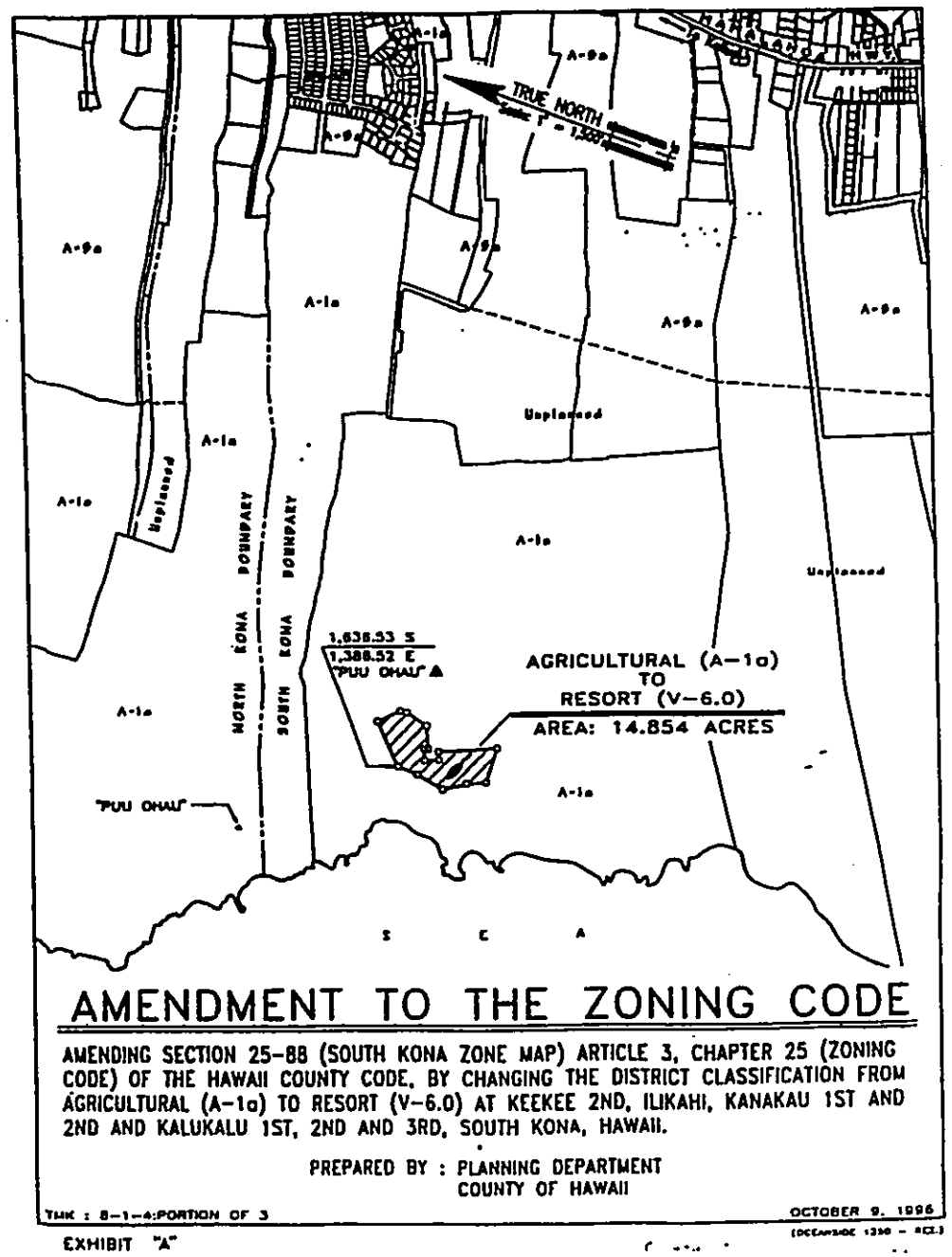
Hilo, Hawaii

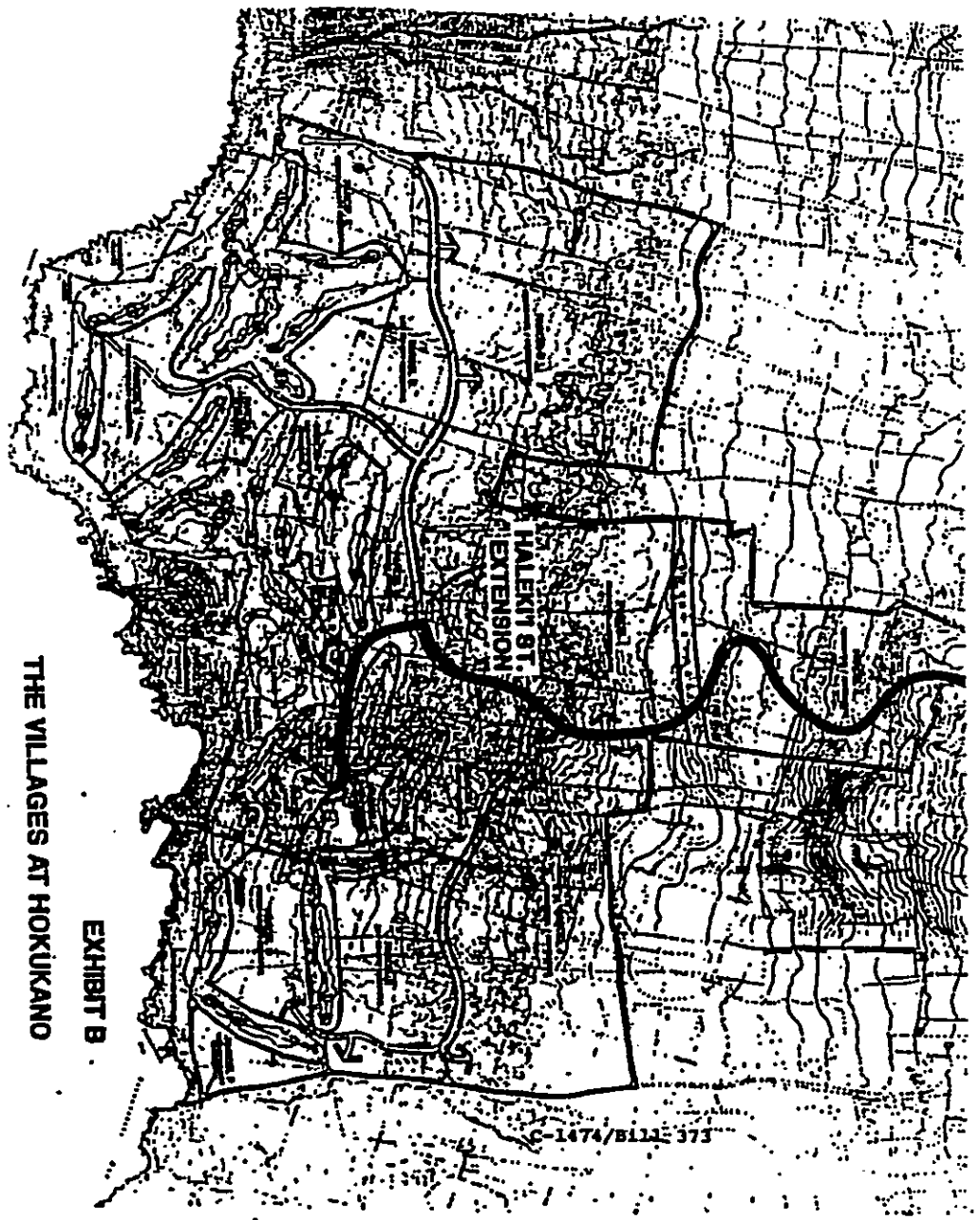
Date of Introduction: February 19, 1997
Date of 1st Reading: February 19, 1997
Date of 2nd Reading: March 7, 1997
Effective Date: March 13, 1997

APPROVED AS TO FORM AND LEGALITY

DEPUTY CORPORATION COUNSEL

DATED: 3/10/97





THE VILLAGES AT HOKUKANO

EXHIBIT B

OFFICE OF THE COUNTY CLERK
County of Hawaii
Hilo, Hawaii

RECEIVED
'97 MAR 13 PM 2 17
COUNTY CLERK
COUNTY OF HAWAII

(DRAFT 5)

Introduced By: Bobby Jean Leithead-Todd
Date Introduced: February 19, 1997
First Reading: February 19, 1997
Published: February 28, 1997

REMARKS:

ROLL CALL VOTE				
	AYES	NOES	ABS	EX
Arakaki	X			
Chung	X			
Leithead-Todd	X			
Ray	X			
Reynolds	X			
Santangelo	X			
Smith	X			
Tyler	X			
Yagong	X			
	9	0	0	0

Second Reading: March 7, 1997
To Mayor: March 7, 1997
Returned: March 13, 1997
Effective: March 13, 1997
Published: March 21, 1997

REMARKS:

ROLL CALL VOTE				
	AYES	NOES	ABS	EX
Arakaki	X			
Chung	X			
Leithead-Todd	X			
Ray	X			
Reynolds	X			
Santangelo	X			
Smith	X			
Tyler		X		
Yagong	X			
	8	1	0	0

I DO HEREBY CERTIFY that the foregoing BILL was adopted by the County Council and published as indicated above.

APPROVED AS TO FORM AND LEGALITY:

DEPUTY CORPORATION COUNSEL
COUNTY OF HAWAII
Date 3/10/97

COUNCIL CHAIRMAN

COUNTY CLERK

Approved / Disapproved this 13 *day of* March, *19* 97

MAYOR, COUNTY OF HAWAII

Bill No.: 373 (Draft 5)
Reference: C-1474/1996/PC-27
Ord. No.: 97 36

Appendix C4
Development Agreement

BOBBY JEAN LEITHEAD-TODD
Councilwoman

Phone: (808) 961-8261
FAX: (808) 969-3291

COUNTY COUNCIL
County of Hawaii
Hawaii County Building
25 Aupuni Street
Hilo, Hawaii 96720

March 16, 1998

TO: James Y. Arakaki, Chair
and Members of the Hawaii County Council

FROM: Bobby Jean Leithead-Todd, Chair
Committee on Planning

Re: **Proposed Resolution No. 244, Draft 2**
Oceanside 1250 Development Agreement

Attached for your favorable consideration is proposed Resolution No. 244, Draft 2, which includes the TMKs for the subject development, the addition of the fifth "Whereas", and some minor changes.

Res. 244, D. 2

Comm. No. 759.01
File No. HCC/DEV
Ref. To Presented PC
Ref. Date MAR 16 1998

COUNTY OF HAWAII STATE OF HAWAII

RESOLUTION NO. 244 98
(Draft 2)

A RESOLUTION AUTHORIZING THE COUNTY OF HAWAII TO ENTER INTO A DEVELOPMENT AGREEMENT WITH 1250 OCEANSIDE PARTNERS.

WHEREAS, the Hawaii State Legislature, under section 46-123, Hawaii Revised Statutes, granted authorization to the County of Hawaii (County) to enact an ordinance authorizing the executive branch of the County to enter into a development agreement with any person having a legal or equitable interest in real property for the development of such property; and

WHEREAS, pursuant to 46-123, Hawaii Revised Statutes, the Hawaii County Council enacted Ordinance No. 93-37 (Chapter 30, Hawaii County Code) establishing the requirements for Development Agreements, which ordinance was passed into law on April 27, 1993; and

WHEREAS, pursuant to Section 46-123, Hawaii Revised Statutes, and Chapter 30, Hawaii County Code, the County adopted rules governing Development Agreements on May 16, 1995; and

WHEREAS, 1250 Oceanside Partners, a Hawaii limited partnership, dba Oceanside 1250 (Oceanside) is the owner in fee simple and lessee of certain lands situated in North and South Kona, Hawaii County, Hawaii, TMK: (3)7-9-12:03, (3) 7-9-12:04, (3)7-9-12:11 and (3)8-1-04:03 (por) (" Property") and more particularly described in Exhibit "A" of the Development Agreement (Oceanside Development Agreement), which is attached hereto and incorporated herein; and

WHEREAS, Oceanside or its related entity, affiliate or subsidiary, plans to develop the Property and has submitted a development agreement and application to the Office of the Mayor; and

WHEREAS, Oceanside's development will provide many public benefits to the County through the zoning, Special Management Area conditions of approval, and the imposition of on- and off-site development requirements; and

WHEREAS, pursuant to Section 30-5(d), Hawaii County Code, the Mayor, through the Planning Director, has submitted a final draft of the Oceanside Development Agreement to the County Council for its action; and

WHEREAS, pursuant to Section 30-4(b), Hawaii County Code, the Mayor may enter into development agreements on behalf of the County.

NOW, THEREFORE, BE IT RESOLVED BY THE COUNCIL OF THE COUNTY OF HAWAII that the provisions of the Oceanside Development Agreement are consistent with the County General Plan, as amended.

BE IT FURTHER RESOLVED that the County Council hereby approves the Oceanside Development Agreement as submitted in accordance with Section 30-5(d) of the Hawaii County Code.

BE IT FURTHER RESOLVED that the Honorable Stephen K. Yamashiro, or his designee, is hereby authorized to execute said Oceanside Development Agreement on behalf of the County.

BE IT FINALLY RESOLVED that the County Clerk is hereby directed to forward copies of this Resolution to the Honorable Stephen K. Yamashiro, Mayor of the County of Hawaii and 1250 Oceanside Partners.

Dated at Hilo, Hawaii this _____ day of _____,1998.

INTRODUCED BY:

_____
COUNCIL MEMBER, COUNTY OF HAWAII

COUNTY COUNCIL
County of Hawaii
Hilo, Hawaii

I hereby certify that the foregoing RESOLUTION was by the vote indicated to the right hereof adopted by the COUNCIL of the County of Hawaii on _____.

ATTEST:

ROLL CALL VOTE

	AYES	NOES	ABS	EX
ARAKAKI				
CHUNG				
LEITHEAD-TODD				
RAY				
REYNOLDS				
SANTANGELO				
SMITH				
TYLER				
YAGONG				

Reference C-259.01/P-PC

COUNTY CLERK CHAIRMAN & PRESIDING OFFICER RESOLUTION NO. 244 98 (DRAFT 2)

DONALD IKEDA
County Clerk

ALAN S. KONISHI
Deputy County Clerk

CONSTANCE R. KIRIU
Legislative Auditor

OFFICE OF THE COUNTY CLERK
County of Hawaii
Hawaii County Building
25 Aupuni Street
Hilo, Hawaii 96720

NOTE

On Res. 244-98, Draft 2, reference is made to Exhibit "A" being attached thereto. Because of the voluminous size of said exhibit, copies are available for viewing in the Office of the County Clerk, 25 Aupuni Street, Hilo; the Kona Mayor's Office at Hanama Place, 75-5706 Kuakini Highway, #103, Kailua-Kona; and the following public libraries: Hilo, Holualoa, Kailua-Kona, Kealakekua, and the Thelma Parker Memorial Public-School Library in Kamuela.

If further information is needed, call 961-8255.

Donald Ikeda
COUNTY CLERK

Appendix D
Botanical Survey Report
(Evangeline Funk, Ph. D. Botanical Consultants)

BOTANICAL SURVEY REPORT FOR THE PROPOSED MAMALAHOA BYPASS ROAD RIGHT-OF-WAY

FOR
PBR-HAWAII
101 AUPUNI STREET, HILO LAGOON CENTER, SUITE 310
HILO HAWAII 96720-4276

BY
EVANGELINE J. FUNK, PH.D.
BOTANICAL CONSULTANTS
HONOLULU, HAWAII 96815
1999

INTRODUCTION

The proposed Mamalahoa Highway By-pass Road will extend from the current terminus of Ali'i Highway at Keauhou, Hawaii to Captain Cook, Hawaii near the Mamalahoa Highway and the Napo'opo'o Road junction, a distance of approximately 5.5 miles. The highway corridor or right-of-way (ROW) is 150 feet across and travels through land that has been in pasture for many years. Two outstanding features of the area are the number of large, mature, planted monkey pod trees found in the pastures and the frequent stone walls built to restrict the movement of cattle. A botanical survey of the proposed ROW was carried out in March of 1997. The purpose of the survey was to ascertain the species composition of the vegetation of the site and to prepare a list of all taxa found along the ROW, to describe the vegetation types the ROW passes through, and to locate and describe any proposed or listed threatened or endangered plant species.

BOTANICAL HISTORY OF THE RIGHT-OF-WAY

The first known plant collection made in this area was that of David Nelson, the botanist on Capt. James Cook's third voyage (St. John 1976, 1978, 1979). Since Nelson's time the introduction of grazing animals and other perturbations have greatly changed the vegetation of the area. Botanical studies in the a'ahupua'a of Hokukano, Keopuka, and Keauhou (Funk, 1991, 1991, 1995), all areas that the proposed ROW will pass through, indicate that the vegetation is largely composed of alien or introduced species.

METHODS

A walk through survey of the ROW was carried out by a two person team from Ali'i Drive southward to the Kona Tust property, from Halekii Street extension southward to the urbanized area, from Halekii Street extension northward to the Kona Trust property, and west and north from Napoopoo Road. Data were collected

from all parts of the flagged ROW.

RESULTS

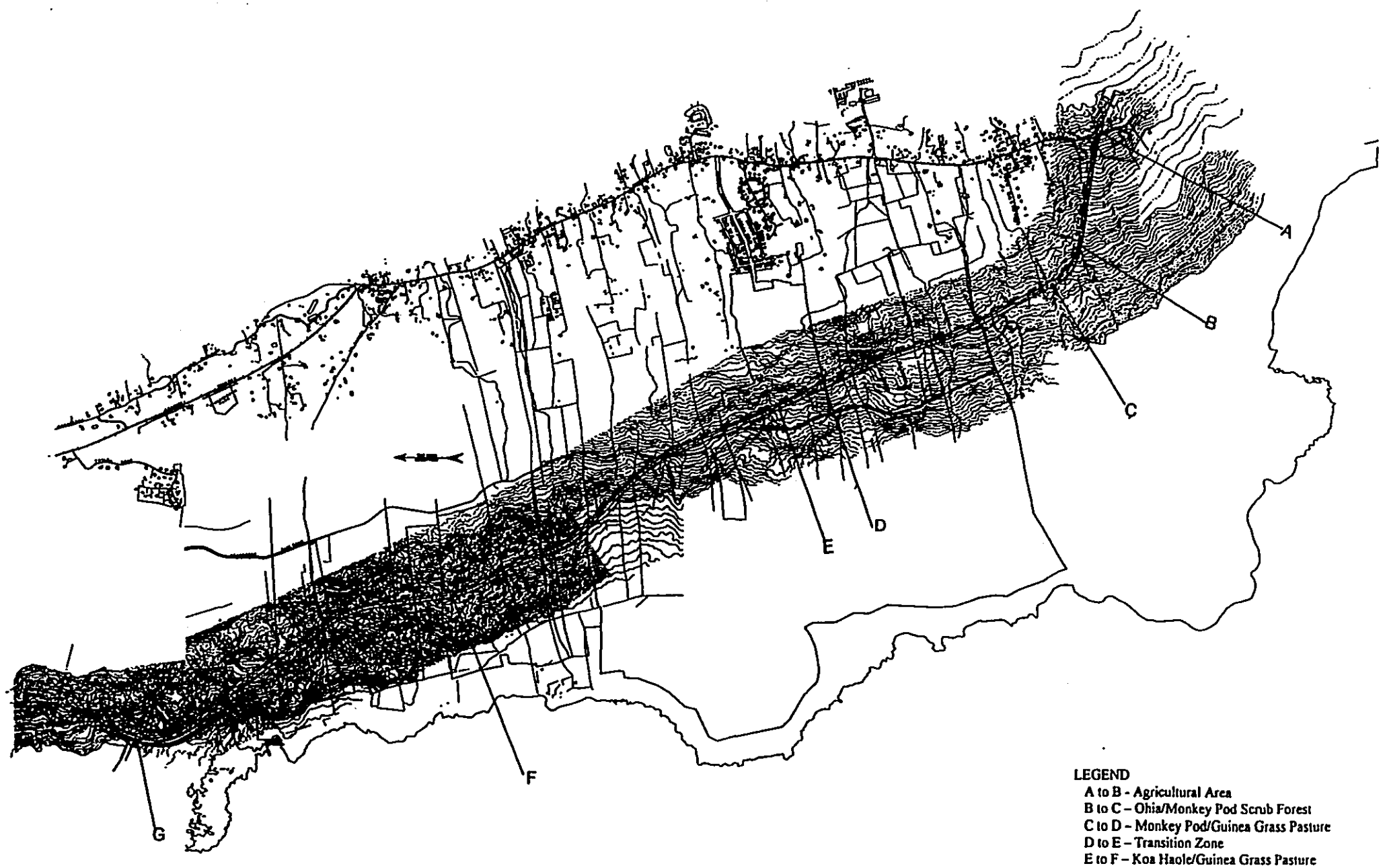
The ROW passes through six vegetation types and a narrow transition zone.

Agricultural Area

Beginning at the southern terminus of the by-pass road where the ROW leaves Mamalahoa Highway it passes through an agricultural area for approximately three quarters of a mile (Figure 1. A to B). This area consists of both working and idle pasture land with widely separated, single family dwellings with large gardens of flowering and fruiting trees. In the idle pastures, dense stands of Guinea grass (*Panicum maximum* Jacq.) attain a height of eight to ten feet. Within the Guinea grass can be found patches of Honohono grass (*Commelina diffusa* N. L. Burm.) and the big tree marigold, *Tithonia diversifolia* (Hemsl.), and brambles of the legume known as wait-a-bit (*Caesalpinia bonduc* (L.) Roxb.).

Ohia/Monkey Pod Scrub Forest

From about 1100 feet elevation to approximately 950 feet elevation (Figure 1 B to C) the ROW crosses a high, broad a'a lava flow where the emergent vegetation is very widely spaced ohia (*Metrosideros polymorpha* Gaud.) trees and broad crowned monkey pod (*Samanea saman* (Jacq.) Merr.) trees from 40 to 60 feet in height (Figure 1.). The understory is made up of scrubby koa haole (*Leucaena leucocephala* (Lam.) de Wit), and Brazilian pepper shrubs (*Schinus terebinthifolius* Raddi) and small guava trees (*Psidium* spp.). The ground layer is largely lantana brambles (*Lantana camara* L.). The scrubby trees support dense tangles of bitter yam (*Dioscorea bulbifera* L.), huehue vine (*Cocculus tribobus* (Thunb.) DC), and huehue haole (*Passiflora suberosa* L.). The northwestern edge of the a'a flow is marked by a broad enclave of trees



LEGEND
A to B - Agricultural Area
B to C – Ohia/Monkey Pod Scrub Forest
C to D – Monkey Pod/Guinea Grass Pasture
D to E – Transition Zone
E to F – Koa Haole/Guinea Grass Pasture
F to G – A'a/Fountain Grass/Koa Haole

(*Hibiscus tiliaceus* L.). Also on this broad lava flow was found a number of native Hawaiian taxa. In addition to the ohia trees were also found ulei vines (*Osteomeles anthyllidifolia* (Sm.) Lindl.), akia (*Wikstroemia phillyreifolia* A. Gray), moa (*Psilotum nudum* (L.) Griseb.), huehue or moonseed vine (*Cocculus tribobus* (Thunb.) DC), 'ilie'e (*Plumbago zeylanica* L.), and koali or morning glory (*Ipomoea indica* (J. Burm.) Merr.) vines.

Monkey Pod/Guinea Grass Pasture

From the a'a flow northward to approximately one quarter mile north of the Halekii Street extension, the vegetation of the pasture lands is widely spaced, broad crowned monkey pod trees with a ground cover of guinea grass (*Panicum maximum* Jacq.) (Figure 1.). The guinea grass reaches a height of eight feet or more in those pasture lands where cattle are absent. There can be found intermittent enclaves of lantana, Sacramento bur (*Triumfetta semitriloba* Jacq.), and spiny amaranth (*Amaranthus spinosus* L.).

Transition Zone

There is a narrow transition zone north of Halekii Street extension where the Monkey Pod/Guinea Grass Pasture drops out and another, drier vegetation type, Koa Haole/Guinea Grass Pasture begins (Figure 1. D to E). The substrate of the Transition Zone is a broad a'a lava flow approximately six-hundred feet across. In addition to the large, scattered monkey pod trees there are kukui trees (*Aleurites moluccana* (L.) Willd.), koa haole, and papaya (*Carica papaya* L.) 40 feet high. In the very mixed understory can be found the very thorny wait-a-while (*Caesalpinia bonduc* (L.) Roxb.), kukui and koa haole seedlings, castor bean bushes (*Ricinus cummunis L.), 'ilie'e, Senna pendula* H. Irwin & Barneby, and coffee senna (*Senna occidentalis* (L.) Link) among others. The

transition zone appears to be wetter than the surrounding pasture. It ends in a wide swale filled with 'opiuma (*Pithecellobium dulce* (Roxb.) Benth) and china berry (*Melia azedarach* L.) trees 25 to 30 feet in height.

Koa Haole/Guinea Grass Pasture

Beyond this swale the ROW passes through vegetation that becomes much drier. It is Koa Haole/Guinea Grass Pasture (Figure 1. E to F.) The koa haole ranges from seedlings to small trees 40 feet in height. The plants also vary in density from 2 to 8 feet apart. This vegetation type is found from the swale northward to the beginning of the A'a/Fountain Grass/Koa Haole vegetation type.

Lantana, bur bush, amaranth, and many other weed taxa are also found in the understory. As the ROW nears the big A'a flow, scattered kiawe trees (*Prosopis pallida* Kunth) begin to appear.

A'a/Fountain Grass/Koa Haole

From the northern boundary of the Kona Trust Property to Ali'i Drive (Figure 1. F to G) the ROW crosses another high a'a lava flow where the vegetation varies from a very scant cover of koa haole, Christmasberry, maiapilo (*Capparis sandwichiana* DC), naupaka (*Scaevola sericea* Vahl) and various weeds to dense stands of fountain grass (*Pennisetum setaceum* (Forssk.) Choiv.), dense Christmasberry and koa haole.

Two features common to the entire length of the ROW are the frequent rock outcrops and agricultural rock walls. The outcrops are often covered by white flowered 'ilie'e plants.

ENDANGERED SPECIES

No candidate, proposed, or listed threatened or endangered species as set forth in the Endangered Species Act of 1973, as amended (16 U.S.C. 1531-1543), were found along the proposed Mamalahoa Bypass Road Right-of-way.

SPECIES LIST

In the following species list the plant families have been arranged alphabetically within three groups, Ferns and Fern Allies, Monocotyledons, and Dicotyledons. The genera and species have been arranged alphabetically within the families. The taxonomy and nomenclature follow that of Wagner, Herbst, and Sohmer (1990), St.John (1973), and Neal (1965). For each taxon the following information is provided:

1. An asterisk before the plant name indicates a plant introduced to the Hawaiian Islands since Captain Cook or by the aborigines.

2. The scientific name.

3. The Hawaiian name or the mostly widely used common name.

4. Species abundance. Abundance ratings are for this site only and they have the following meanings:

Uncommon = a plant that was found less than five times.

Occasional = a plant that was found between five to ten times.

Common = a plant considered an important part of the vegetation.

Locally abundant = plants found in large numbers over a limited area. For example the plants found in grassy patches.

This species list is the result of extensive surveys of this site completed at the end of the rainy season (March 1997) and in July 1997. It reflects the vegetative composition of the flora during two growing seasons. Changes in the vegetation will occur due to introductions and losses and a slightly different species list would result from surveys conducted during different growing seasons. In addition there maybe environmental factors such as fire which will lead to species composition alteration.

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
FERNS AND FERN ALLIES		
PSILOTUM FAMILY		
Psilotum nudum (L.) Griseb.	Moa	Uncommon
POLYPODIACEAE - Common Fern Family		
Nephrolepis exaltata (L.) Schott.	Swoard fern	Occasional
**Phymatosorus scolopendria* Copel		Locally abundant
Pleopeltis thunbergiana Kaulf.	Pakahakaha	Occasional
Polypodium pellucidum Kaulf	*Ae	Occasional
MONOCOTYLEDONS		
AGAVACEAE - Agave Family		
Cordyline fruticosa (L.) A. chev.	Ti	Occasional
ARACEAE - Aroid Family		
**Colocasia esculenta* (L.) Schott	Taro	Locally abundant
ARECACEAE - Palm Family		
**Cocos nucifera* L.	Coconut	Occasional
COMMELINACEAE - Spiderwort Family		
**Commelina diffusa* N. L. Burm.	Honohono	Uncommon
DISCOREACEAE - Yam Family		
**Dioscorea bulbifera* L.	Bitter yam	Common
POACEAE - Grass Family		
**Bothriochloa pertusa* (L.) A. Camus	Pitted beardgrass	Locally abundant
**Brachiaria mutica* (Forssk.) Stapf	California grass	Locally abundant
**Digitaria ciliaris* (Retz.) Koeler	Henry's crabgrass	Occasional
**Digitaria insularis* (L.) Mez ex Ekman	Sourgrass	Locally abundant
**Eleusine indica* (L.) Gaertn.	Wiregrass	Occasional
**Eragrostis ciliaensis* (All.) Link	Stinkgrass	Occasional
**Eragrostis tenella* (L.) P. Beauv. ex Roem. & Schult.		Occasional
**Heteropogon contortus*)L.) P. Beauv. ex Roem. & Schult	Pili grass	Locally abundant
**Melinis multiflora* P. Beauv.	Molasses grass	Locally abundant
**Oplismenus hirtellus* (L.) P. Beauv.	Basket grass	Locally abundant
**Panicum maximum* Jacq.	Guinea grass	Abundant
**Pennisetum setaceum* (Forssk.) Chiov.	Fountain grass	Common
**Rhynchelytrum repens* (Willd.) Hubb.	Natal redtop	Uncommon

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
DICOTYLEDONES		
AMARANTHACEAE - Amaranth Family		
**Achyranthes aspera* L.		Occasional
**Amaranthus spinosus* L.	Spiny amaranth	Locally abundant
ANACARDIACEAE - Mango Family		
**Mangifera indica* L.	Mango	Occasional
**Schinus terebinthifolius* L.	Brazilian pepper	Abundant
ACANTHACEAE - Acanthus Family		
**Asystasia gangetica* (L.) T. Anderson	Chinese violet	Uncommon
APOCYNACEAE - Dogbane Family		
**Catharanthus roseus* (L.) D. Don	Periwinkle	Uncommon
ASCLEPIADACEAE - Milkweed Family		
**Stapelia gigantea* N. E. Brown	Carrion flower	Locally abundant
ASTERACEAE - Sunflower Family		
**Bidens cynapiifolia* Kunth		Common
**Elephantopus spicatus* Juss. ex Aubl.		Uncommon
**Emilia coccinia* (Sims) G. Don	Flora's paintbrush	Uncommon
**Erechtites hieracifolia* (L.) Raf. ex DC		Occasional
**Pluchia symphytifolia* (Mill.) Gillis	Sour bush	Locally abundant
**Tithonia diversifolia* (Hemsl.) A. Gray	Tree marigold	Locally abundant
**Tridax procumbens* L.	Coat buttons	Locally abundant
**Sigesbeckia orientalis* L.	Crown beard	Occasional
BIGNONIACEAE - Bignonia Family		
**Spathodea campanulata* P. Beauv.	African tulip	Uncommon
CAPPARACEAE - Caper Family		
Capparis sandwichiana DC	Maiapilo	Occasional
**Cleome gynandra* L.	Wild Spider Flower	Common
CARICACEAE - Papaya Family		
**Carica papaya* L.	Papaya	Occasional
CONVOLVULACEAE - Morningglory Family		
**Ipomoea indica* (J. Burm.) Merr.	Koali	Uncommon
**Ipomoea turbolides* Degener & Ooststr.	Hawaiian moon flower	Locally abundant

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
CRASSULACEAE - Orpine Family		
**Kalanchoe pinnata* (Lam.) Pers.	Mother-of-thousands	Locally abundant
CUCURBITACEAE - Gourd Family		
**Coccinia grandis* (L.) Voight	Ivory gourd	Occasional
**Cucumis dipsaceus* Ehrenb. ex Spach	Hedgehog Gourd	Occasional
**Momordica charantia* L.	Balsam pear	Locally abundant
EUPHORBIACEAE - Spurge Family		
Aleurites moluccana (L.) Willd.	Kukui	Occasional
**Chamaesyce hirta* (L.) Millsp.	Hairy spurge	Locally abundant
**Chamaesyce hypericifolia* (L.) Millsp.	Graceful spurge	Locally abundant
**Ricinus cummunis* L.	Castor bean	Occasional
FABACEAE - Bean Family		
**Acacia farnesiana* (L.) Willd.	Klu	Common
**Caesalpinia bonduc* (L.) Roxb.	Kakalaioa	Occasional
**Chamaecrista nictitans* L.	Partridge pea	Occasional
**Crotalaria pallida* Aiton	Smooth rattlepod	Common
**Desmanthus virgatus* (L.)	Slender mimosa	Locally abundant
**Desmodium triflorum* (L.) DC		Occasional
**Indigo suffruticosa* Mill	Indigo	Occasional
**Leucaena leucocephala* (Lam). deWit	Koa haole	Common
**Macroptilium atropurpureum* (DC) Urb.		Locally abundant
**Mimosa pudica* L.	Sensitive plant	Common
**Pithecellobium dulce* (Roxb.) Benth	Opiuma	Locally abundant
**Prosopis pallida* Kunth	Kiawe	Occasional
**Samanea saman* (Jacq.) Merr.	Monkey pod	Common
**Senna occidentalis* (L.) Link	Coffee senna	Occasional
**Senna pendula* (Humb. & Bonpl. ex Willd.) H. Irwin & Barney		Occasional
GOODENIACEAE - Goodenia Family		
Scaevola sericea Vahl.	Naupaka	Occasional
LAMIACEAE - Mint Family		
**Hyptis pectinata* (L.) Poit.	Hyptis	Common
**Ocimum gratissimum* L.	Wild basil	Occasional
Plectranthus parviflorus Willd.	'Ala'ala wai nui	Common
**Salvia coccinea* Etl.	Scarlet sage	Locally abundant
**Salvia occidentalis* Sw.	West Indian sage	Occasional

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
MALVACEAE - Hibiscus Family		
**Abutilon grandifolium* (Willd.) Sweet	Hairy abutilon	Occasional
Hibiscus tiliaceus L.	Hau	Locally abundant
**Malva parviflora* L.	Cheese weed	Locally abundant
**Malvastrum coromandelianum* (L.) Garcke	False mallow	Occasional
**Sida rhombifolia* L.		Occasional
MELIACEAE - Mahogany Family		
**Melia azedarach* L.	Chinaberry	Occasional
MENISPERMACEAE - Moonseed Family		
Cocculus trilobus (Thunb.) DC	Huehue	Common
MORACEAE - Mulberry Family		
**Ficus microcarpa* L. fil	Banyan	Occasional
MYRTACEAE - Myrtle Family		
Metrosideros polymorpha Gaud.	Ohia	Occasional
**Psidium cattleianum* Sabine	Strawberry guava	Locally abundant
**Psidium guajava* L.	Common guava	Locally abundant
NYCTAGINACEAE - Four-o'clock Family		
Boerhavia coccinea Mill.		Occasional
**Mirabilis jalapa* L.	Four-o'clock	Occasional
OXALIDACEAE - Wood sorrel Family		
**Oxalis corniculata* L.	Yellow wood sorrel	Locally abundant
PASSIFLORACEAE - Passion flower Family		
**Passiflora edulis* Sims	Passion fruit	Uncommon
**Passiflora foetida* L.	Love-in-a-mist	Occasional
**Passiflora suberosa* L.	Huehue haole	Common
PHYTOLACCACEAE - Pokeweed Family		
**Phytolacca octandra* L.	Southern pokeweed	Occasional
PIPERACEAE - Pepper Family		
Peperomia leptostachya Hook. & Arnott		Common

SCIENTIFIC NAME	COMMON NAME	ABUNDANCE
PLUMBAGINACEAE - Plumbago Family		
Plumbago zeylanica L.	Ilie'e	Common
PORTULACACEAE - Purslane Family		
**Talinum fruticosum* (L.) Juss.		Common
ROSACEAE - Rose Family		
Osteomeles anthyllidifolia (Sm.) Lindl.	Ulei	Uncommon
RUBIACEAE - Coffee Family		
**Coffea arabica* L.	Coffee	Locally abundant
Morinda citrifolia L.	Noni	Common
**Pentas lanceolata* (Forsk.) Differs	Penta	Occasional
SOLANACEAE - Nightshade Family		
**Capsicum frutescens* L.	Bird pepper	Occasional
**Solanum americanum* Mill.	Popolo berry	Occasional
**Solanum linnaeanum* Hepper & Jarger	Apple of Sodom	Common
**Solanum seaforthianum* Andr.		Occasional
STERCULIACEAE - Cacao Family		
Waltheria indica L.	'Uhaloa	Common
THYMELAEACEAE - Akia Family		
Wikstroemia pulcherrima Skottsb.		Occasional
TILIACEAE - Linden Family		
**Triumfetta semitriloba* Jacq.	Sacramento bur	Common
VERBENACEAE - Verbena Family		
**Lantana camara* L.	Lantana	Common
**Stachytarpheta dichotoma* (Ruiz & Pav.) Vahl		Common

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LEGEND
A to B - Agricultural Area
B to C - Ohia/Monkey Pod Scrub Forest
C to D - Monkey Pod Guinea Grass Pasture
D to E - Transition Zone
E to F - Koa Haole/Guinea Grass Pasture
F to G - Kona Trust Property
G to H - A'a/Fountain Grass/Koa Haole

Appendix E
Avifaunal and Feral Mammal Survey
(Phillip L. Bruner Environmental Consultant)

AVIFAUNAL AND FERAL MAMMAL SURVEY FOR THE MAMALAHOA HIGHWAY BYPASS ROAD, NORTH AND SOUTH KONA, HAWAII

Prepared for

Oceanside 1250
Kailua-Kona, Hawaii

by

Phillip L. Bruner
Environmental Consultant - Faunal (Bird & Mammal) Surveys

3 February 1999

INTRODUCTION

This report provides the findings of field survey of the 5.5 mile route for the proposed Mamalahoa Bypass Road in North and South Kona, Hawaii. Observations were obtained on 7-9 March and 31 May 1997 as well as 2,3 October 1998. Figure One shows the portion of the route covered in 1997 and Figure Two the section surveyed in 1998. References to published and unpublished sources are also used to supplement this report.

The objectives of the field survey were:

1- Document what species of birds and mammals occur in the area of the proposed project.

2- Note the relative abundance of each species.

3- Locate all the habitat types along the proposed route.

4- Record unusual or unique resources important to native wildlife.

GENERAL SITE DESCRIPTION

The 5.5 mile route of the proposed Mamalahoa Bypass Road traverse a variety of disturbed habitats. These second growth habitats include: grazed pasture; ungrazed pasture with grass often over five feet high; open lands with scattered trees and grass; and dense brush covered thickets. No wetlands were discovered in this area. The topography contains some steep areas mixed with

relatively flat sections. Figure One and Two show the proposed route and area surveyed. The survey periods were to accomodate various adjustments to the roadway alignment.

METHODS

The proposed route for the Mamalahoa Bypass Road was walked along its entire length. The width of the area surveyed varied depending on habitat. In some cases an area 200m from the alignment was investigated. All habitat types were examined and at regular intervals of approximately 100m census counts were taken of all birds seen or heard over a five minute period and within a 50m radius of the count station. This method follows Hutto et al. (1986). Any unusual sightings of birds between these census stations were also noted. Observations were made from dawn through dusk. Census counts obtained during the mid-day periods were likely on the low side as birds were less active and thus less detectable during this time of day. Three evenings were devoted to looking for bats and owls.

The weather during the survey was variable with clear, calm and hot periods mixed with some light rain and cloudy conditions. Scientific names of birds used in this report follow those in Pratt et al. (1987); and Pyle (1997). Mammal names follow Honacki et al. (1982).

RESULTS AND DISCUSSION

Birds:

Nearly all of the birds recorded on the surveys were introduced species (Table 1 and 2). This result was not surprising given the location, elevation, and available habitats in this region of the island. The introduced birds were the typical array of exotics known for this region (Bruner 1988, 1989, 1990, 1991; Hawaii Audubon Society 1993).

The only native species recorded on the survey was the endemic and endangered Hawaiian Hawk or Io (Buteo solitarius). One dark phase Io was seen flying south on 8 March 1997 and a light phase bird was noted soaring over the south terminus of the bypass on 9 March 1997. None were recorded on the 1998 survey. This species is widespread on the Big Island.

The native Short-eared Owl or Pueo (Asio flammeus sandwichensis) is also known from the Kona area and could possibly occur at this site but were not observed. They are not listed as threatened or endangered on the Big Island. No other native birds would be expected in the area of the proposed bypass.

Migratory birds like the Pacific Golden-Plover (Pluvialis fulva) often forage in grasslands and pastures that have been grazed so that the grass is less than six to eight inches high. No plover were seen on the 1997 and 1998 surveys. The open areas had grass that was too high for preferred plover habitat.

Mammals:

Four feral pigs (Sus scrofa) were seen on the 1997 survey and two on the 1998 survey. Evidence of pig foraging was noted in many areas along the route. The Small Indian Mongoose (Herpestes auropunctatus) was also common particularly in the drier areas at the north end of the site. Two Roof Rats (Rattus rattus) were seen near a stone wall crossing the bypass route. No mice (Mus musculus) were found but would be expected to occur in this area. The native and endangered Hawaiian Hoary Bat (Lasiurus cinereus semotus) was seen at dusk on both the 7th and 8th of March 1997 but not on 2 October 1998. The two bats were observed flying back and forth foraging for flying insects over the bay at the north end and makai of the proposed bypass. Another bat was also seen flying over the athletic field at the end of Halekii Road mauka of the proposed bypass during the 1997 survey. The Hawaiian Hoary Bat is widespread on the Big Island and may move seasonally in search of prey (Tomich 1986). Recent studies by Kepler and Scott (1990), Jacobs (1991, 1993) and Reynolds et al. (1998) have also added to our knowledge of this species.

CONCLUSIONS

These surveys were conducted to determine what wildlife occurs in the area and what habitats are available for wildlife. All of the lands along the proposed route were surveyed.

The only endangered bird recorded on the survey was the Hawaiian Hawk or Io. This was not unusual. Io occur widely on the Big Island and forage in a variety of habitats. The remainder of the birds recorded were introduced species commonly found in this region of the island.

Feral mammals included pigs, mongooses, rats and the endangered Hawaiian Hoary Bat. Bats were seen along the coast makai of the north end of the proposed route and mauka near Halekii Road. I have seen bats at many locations in North and South Kona and was not surprised to find them at this location.

In general the lands involved in the proposed Mamalahoa Bypass contain disturbed second growth vegetation and pasture lands. No unusual or unique resources important to native birds or mammals were found on the survey. Disturbed habitats similar to this area are widespread in this region of the island.

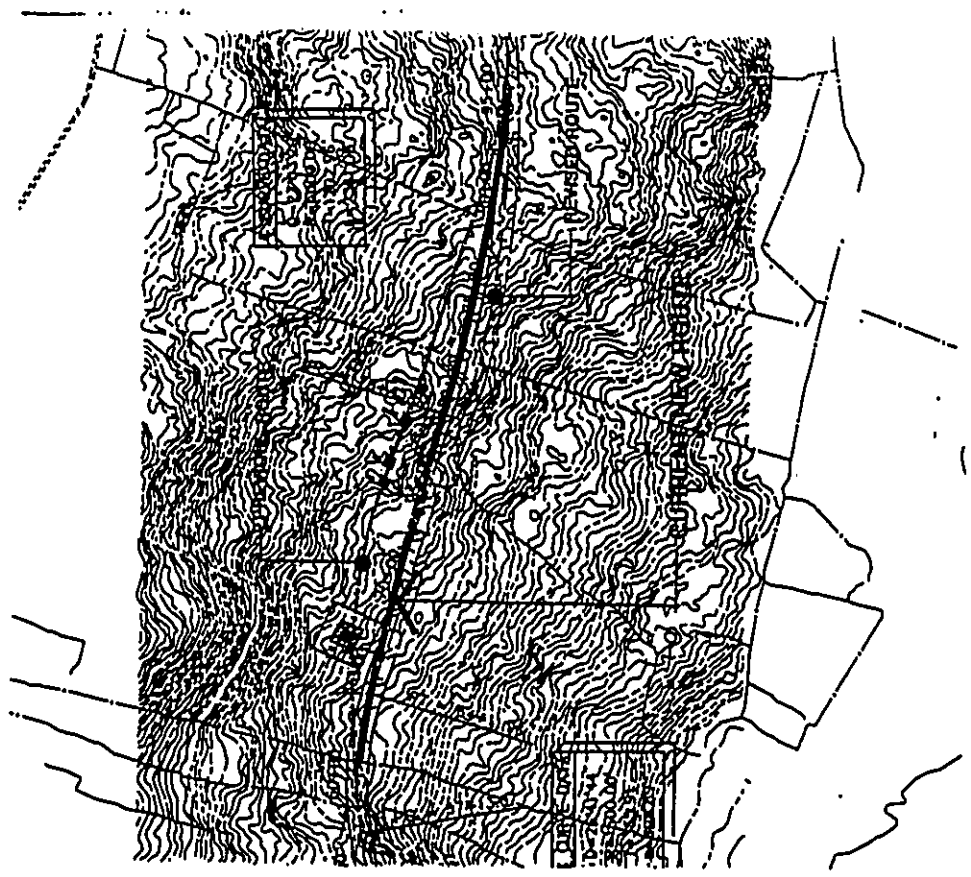

Fig. 2. Location of the area surveyed during October 1998.

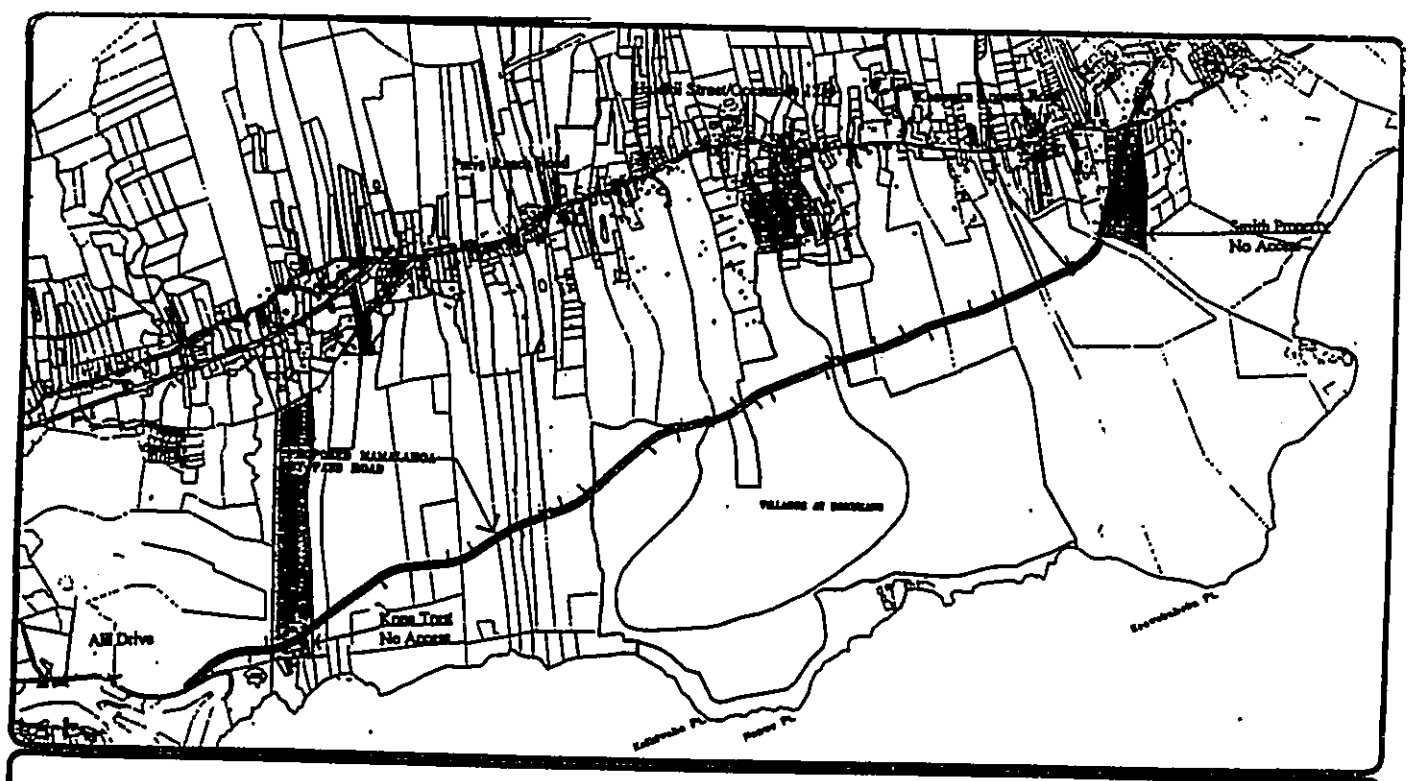

Fig. 1. Location of the proposed bypass. The faunal survey covered all of the route except the Kona Trust property. The Smith Property was surveyed on 31 May and the remainder of the bypass, minus the Kona Trust site, on 7-9 March 1997.

FIGURE
PROPOSED BY-PASS HIGHWAY ALIGNMENT
MAMALAHOA HIGHWAY BY-PASS ROAD

TABLE 2

Introduced species recorded on 2, 3 October 1998 along the proposed Hamalahoa Bypass Road, North and South Kona, Hawaii. Relative abundance estimates from census station counts are given as: A=abundant (average 10+ per census station in appropriate habitat); C=common (5-10 per census station); U=uncommon (1-5 per census station); R=recorded (only at a few stations. Number which follows is total for the entire survey).

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE
Gray Francolin	Francolinus pondicerianus	R= 6
Spotted Dove	Streptopelia chinensis	U
Zebra Dove	Geopelia striata	C
Common Myna	Acridotheres tristis	R= 3
Northern Cardinal	Cardinalis cardinalis	U
Yellow-billed Cardinal	Paroaria capitata	A
Japanese White-eye	Zosterops japonicus	A
Northern Mockingbird	Mimus polyglottus	R= 1
House Finch	Carpodacus mexicanus	C
Saffron Finch	Sicalis flaceola	C
Nutmeg Mannikin	Lonchura punctulata	R=10
Warbling Silverbill	Lonchura malabarica	R= 4

TABLE 1

Introduced species recorded on the survey of the proposed Hamalahoa Bypass Road, North and South Kona, Hawaii. Relative abundance estimates from census station counts are given as: A=abundant (average 10+ per census station in appropriate habitat); C=common (5-10 per census station); U=uncommon (1-5 per census station); R=recorded (only at a few stations. Number which follows is total for the entire survey). Data are from 7,9 March and 31 May 1997.

COMMON NAME	SCIENTIFIC NAME	RELATIVE ABUNDANCE
Cattle Egret	Bubulcus ibis	R= 4
Wild Turkey	Meleagris gallopavo	R= 3
Common Peafowl	Pavo cristatus	R= 2
Ring-necked Pheasant	Phasianus colchicus	R=12
Kalij Pheasant	Lophura leucomelana	R=10
Black Francolin	Francolinus francolinus	U
Gray Francolin	Francolinus pondicerianus	C
Spotted Dove	Streptopelia chinensis	C
Zebra Dove	Geopelia striata	A
Barn Owl	Tyto alba	R= 1
Common Myna	Acridotheres tristis	U
Northern Cardinal	Cardinalis cardinalis	C
Japanese White-eye	Zosterops japonicus	A
Northern Mockingbird	Mimus polyglottus	U
House Finch	Carpodacus mexicanus	C
Saffron Finch	Sicalis flaceola	U
Yellow-fronted Canary	Serinus mozambicus	U
Nutmeg Mannikin	Lonchura punctulata	C
Warbling Silverbill	Lonchura malabarica	U
Yellow-billed Cardinal	Paroaria capitata	C

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Appendix F
Environmental Noise Assessment
(Darby and Associates)

D. L. ADAMS ASSOCIATES, LTD.
dba
DARBY & ASSOCIATES
ACOUSTICAL CONSULTANTS

Project No. 97-06A

ENVIRONMENTAL NOISE ASSESSMENT
MAMALAHOA HIGHWAY BYPASS
ISLAND OF HAWAII

September 5, 1997

Prepared for
PBR HAWAII
Hilo, Hawaii

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1.0 SUMMARY

1.1 Noise level measurements conducted in, and within the vicinity of the project site indicate the ambient noise levels are currently dominated by natural sources such as surf, birds and wind. These sources, together with an occasional overflight by small aircraft, contributed to measured ambient noise levels ranging from about 40 to 50 dBA for the measurements conducted within undeveloped lands. Within the nearby residential area of the Kona Scenic Subdivision, a daytime ambient noise level of 52.3 dBA was measured. These levels are typical for rural and quiet suburban areas:

1.2 Without the proposed Mamalahoa Highway Bypass, the traffic noise levels should increase as compared to existing conditions, along Kamehameha III Road and Kuikini and Mamalahoa Highways for both future years examined, 2010 and 2015. With the proposed bypass if the Alii Highway Extension is constructed, the traffic noise levels should decrease along all these roads for the year 2010. The year 2015 is expected to result in only a slight increase in traffic noise levels--less than 1 dB relative to existing levels--to sites adjacent to Kamehameha III Road and to some portions of Kuikini and Mamalahoa Highways during afternoon peak hour traffic. Such small increases are not perceptible to most people and are considered insignificant.

1.3 The traffic noise levels are expected to perceptibly increase along locations adjacent to Kamehameha III Road, if the Mamalahoa Highway Bypass is constructed and the Alii Highway Extension is not.

1.4 Existing noise sensitive locations include several homes no closer than 200 feet to the southern end of the proposed bypass. The noise levels due to traffic on the proposed bypass at these homes for the years 2010 and 2015 are expected to be less than L_{dn} 65 dBA, the upper level for HUD "Acceptable" classification. Below this level, HUD requires no additional noise mitigation beyond that provided by normal local construction.

1.5 The closest significant concentration of homes, the Kona Scenic Subdivision, should experience future peak hour traffic noise levels due to the proposed bypass below the existing ambient noise levels.

1.6 Noise due to construction of the proposed project may impact the noise sensitive locations; however, since this noise will be transient, no long term adverse effects are expected.

2.0 PROJECT DESCRIPTION

The proposed bypass is a two lane highway that will connect the North and South Kona Districts on the Island of Hawaii. This highway will offer an alternate route to portions of Mamalahoa and Kuikini Highways and extend from the southern end of Alii Drive in the north to Captain Cook in the south--a route covering a distance of about 5.25 miles as shown in Figure 1. From Captain Cook, at an elevation of 1,377 feet, the bypass will proceed north-northwest through rugged terrain covered by tall grass, bushes and trees, to eventually join Alii Drive at an elevation of 58 feet. Currently, the lands adjacent to the proposed bypass are primarily utilized for horse grazing.

3.0 NOISE STANDARDS AND GUIDELINES

Standards and guidelines promulgated by the various local, state and federal agencies use different noise descriptors to express noise levels. To better understand the various noise descriptors used, a brief description of some common acoustical terminology is presented in Appendix A.

3.1 U.S. Federal Highway Administration

The Federal Highway Administration (FHWA) has developed noise abatement criteria as part of its regulation which constitute the noise standards mandated by 23 U.S.C. 109(i) [Reference 1]. The noise abatement criteria is comprised of four land use categories and corresponding maximum hourly equivalent sound levels, $L_{eq(h)}$, which are listed in Table 1. The FHWA noise standards are applicable to Federal or Federal-aid highway projects and, ... "All highway projects which are developed in conformance with this regulation shall be deemed to be in conformance with the Federal Highway Administration (FHWA) noise standards".

3.2 U.S. Department of Housing and Urban Development

The U.S. Department of Housing and Urban Development (HUD) has established Site Acceptability Standards for interior and exterior noise for housing [Reference 2]. These standards are based on day-night average sound levels, L_{dn}, and identify the need for noise abatement, either at the site property line or in the building construction. HUD Site Acceptability Criteria rank sites as Acceptable, Normally Unacceptable, or Unacceptable. "Acceptable" sites are those where noise levels do not exceed an L_{dn} of 65 dBA. Housing on acceptable sites do not require additional noise attenuation other than that provided in customary building techniques. "Normally Unacceptable" sites are those where the L_{dn} is above 65 dBA, but does not exceed 75 dBA. Housing on "Normally Unacceptable" sites requires some means of noise

abatement, either at the property line or in the building construction, to assure the interior noise levels are acceptable. "Unacceptable" sites are those where the L_{dn} is 75 dBA or higher. The term "unacceptable" does not necessarily mean that housing cannot be built on these sites, but rather that more sophisticated sound attenuation will likely be needed.

3.3 U.S. Environmental Protection Agency

The U.S. Environmental Protection Agency (EPA) has identified a range of yearly day-night average sound levels, L_{dn}, sufficient to protect public health and welfare from the effects of environmental noise [Reference 3]. The EPA has established a goal to reduce exterior environmental noise to an L_{dn} not exceeding 65 dBA and a future goal to reduce exterior environmental noise to an L_{dn} not exceeding 55 dBA. Additionally, the EPA states that to protect against hearing damage, one's 24-hour equivalent sound level exposure, $L_{eq(24)}$, at the ear should not exceed 70 dBA. The EPA emphasizes that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather these goals are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

3.4 State of Hawaii Department of Transportation

The Hawaii Department of Transportation (DOT) traffic noise policy [Reference 4] is based on the noise standards adopted by the Federal Highway Administration [Reference 1]. The DOT has determined that ...,

> "A traffic noise impact occurs when the predicted traffic noise levels approach or exceed FHWA's noise abatement criteria (NAC), ... or when the predicted traffic noise levels substantially exceed the existing noise levels. 'Approach' shall mean at least 1 dBA less than the NAC and 'substantially exceed the existing noise levels' shall mean an increase of at least 15 dBA."

4.0 EXISTING ACOUSTICAL ENVIRONMENT

On Wednesday, February 26, 1997, ambient noise levels were measured at seven locations in the vicinity of the proposed bypass. The measurement locations were selected so as to yield results representative of the existing acoustical environment along the proposed bypass corridor. This information was used as the basis from which any impacts to nearby developed and undeveloped lands could be predicted.

Weather conditions during the measurements were partly sunny skies with temperatures in the low to mid-80's and 5 to 10 mph easterly winds. At each of the seven locations, continuous 15-minute measurements were taken using a Larson-Davis

Model 700 Sound Level Meter. The measurement locations are shown in Figure 2 and results presented in Table 2, along with the identifiable noise sources that contributed to these levels.

The measured ambient noise levels, expressed in terms of equivalent sound levels (L_{eq}) ranged between 40 and 53 dBA which is typical for quiet suburban and rural areas. The highest noise level was measured at Location 7, within the Kona Scenic Subdivision.

5.0 POTENTIAL IMPACT DUE TO THE PROJECT

5.1 Traffic

Traffic noise levels corresponding to the morning and afternoon peak hour travel periods were calculated at five locations along Kamehameha III Road, Kuikini Highway and Mamalahoa Highway as shown in Figure 3. The traffic noise levels were estimated using the Federal Highway Administration Traffic Noise Prediction Model [Reference 5] in conjunction with existing and predicted future peak hour traffic volumes [Reference 6].

Two other projects that, if constructed, will alter the traffic in the vicinity of the proposed bypass are the Alii Highway Extension and the Villages of Hokukano. The Alii Highway Extension is a proposed new highway extending from Queen Kaahumanu Highway to Kamehameha III Road. The Villages of Hokukano is a proposed residential development located makai of Kona Scenic Subdivision as shown in Figure 4. Accordingly, the traffic noise levels each of these projects will contribute has been calculated for the proposed bypass.

The traffic noise levels at the five locations shown in Figure 3 have been calculated for the for the existing year and the years 2010 and 2015 for the following scenarios:

1. No Build
2. Build, including Alii Highway Extension and Villages of Hokukano
3. Build, including Alii Highway Extension
4. Build, including Villages of Hokukano

The results of these traffic noise level calculations are presented in Tables 3 and 4 for the years 2010 and 2015, respectively. The traffic noise levels presented in these tables are those expected at a distance of 100 feet from the roadway centerlines at each location. Although distances closer than 100 feet will experience higher traffic noise levels, the relative difference between the existing and future traffic noise levels should

be the same at any given distance. Tables 5 and 6 summarize the difference in future traffic noise levels relative to the existing traffic noise levels for each of the four scenarios listed above.

According to Tables 5 and 6, without the proposed bypass, the traffic noise levels are expected to increase at all five locations during the morning and afternoon peak hour travel periods for both future years examined. By contrast, with the proposed bypass, the traffic noise levels are expected to decrease at most locations for both future years. The minimal change in noise levels perceptible to the average listener is generally taken to be about 3 dB, therefore, the expected increases or decreases in traffic noise levels with the proposed bypass should not be perceptible to most people along these roadways through the year 2015. The only exception is at locations along Kamehameha III Road including Location 1, where, with the proposed bypass and without the Alii Highway Extension, perceptible increases are expected for both future years.

The projected traffic noise level increases at Location 1 range from 3.4 dB for the year 2010, during the afternoon peak hour travel, to 5.2 dB for the year 2015, during the morning peak hour travel. However, without the proposed bypass, increases of 1.8 dB and 2.5 dB for afternoon and morning peak hour travel, respectively, are also expected at Location 1 during these same periods. The contribution to the traffic noise level increases due to the proposed bypass, therefore, should amount to less than 3 dB.

In addition to defining acceptable land uses according to the annual average day-night sound level, L_{dn}, HUD has developed a procedure to estimate traffic generated L_{dn}s for sites in the vicinity of major roadways. An estimate of the L_{dn} can be made from the peak hour L_{eq}, provided heavy trucks do not exceed 10 percent of the total traffic flow in vehicles per 24 hours, and the traffic flow between 10 pm and 7 am does not exceed 15 percent of the average daily traffic flow in vehicles per 24 hours [Reference 2].

As discussed in Section 3.2, HUD has established Site Acceptability Standards for exterior noise exposure at housing areas. These standards are based on L_{dn} levels and identify the need for noise abatement. Traffic noise from adjacent roadways should be considered in determining the use for lands contiguous to these roadways.

The annual day-night average sound levels, L_{dn}, due to traffic were calculated for the existing residences located nearest to the proposed bypass for the future years 2010 and 2015. These residences are located along the southern end of the proposed bypass near Captain Cook, where there are several homes no closer than about 200 feet to the proposed bypass centerline. At this distance, L_{dn}s due to traffic for the years 2010 and 2015 have been calculated and are presented in Table 7. These levels are below the HUD defined L_{dn} of 65 dBA for "Acceptable" sites, thus no additional noise mitigation

should be required. Additionally, these levels do not reflect any attenuation provided by the topography and intervening vegetation that might shield the homes, and in effect, they represent the highest expected L_{dn}s due to traffic.

The nearest significant concentration of homes are located in the Kona Scenic Subdivision which is accessed by Halekii Street from Mamalahoa Highway. Situated no less than 3,000 feet mauka from the proposed bypass, these homes should be exposed to traffic generated L_{dn}s from the proposed bypass of no more than 50.0 dBA for any of the future year Build scenarios. These noise levels are compatible with the ambient noise level of 52.3 dBA measured within the subdivision, Location 7 in Figure 2, and well below the HUD defined levels for "Acceptable" sites.

5.2 Construction Noise

The construction of the proposed project will involve excavation, grading and possibly blasting. The various construction phases could generate significant noise, which could impact the nearby noise sensitive areas. The actual noise levels produced are dependent on the construction methods employed during each phase of the construction process. Typical noise level ranges produced by various types of construction equipment are shown in Figure 5. Earth moving equipment, e.g., diesel engine powered bulldozers, trucks, backhoes, front-end loaders, graders, etc., will probably be the noisiest equipment used during construction. However, as the noise will be temporary, no lasting impact due to the construction of the proposed project is expected.

Blasting may be required in some portions of the proposed bypass corridor, which could have noise impacts if conducted near noise sensitive locations. However, such impacts can be mitigated provided appropriate design techniques are utilized such as using numerous small charges and employing blast mats to direct the explosive force and muffle the noise.

REFERENCES:

1. *Department of Transportation, Federal Highway Administration Procedures for Abatement of Highway Traffic Noise*, Title 23, CFR, Chapter 1, Subchapter J, Part 772, 38 FR 15953, June 19, 1973, Revised at 47 FR 29654, July 8, 1982.

2. *HUD Environment Criteria and Standards*, 24 CFR 51, Federal Register, Volume 44, No. 135, July 12, 1979; Amended 49 FR 880, January 6, 1984.

3. *Toward a National Strategy for Noise Control*, U.S. Environmental Protection Agency, April 1977.

4. *Noise Analysis And Abatement Policy*, State of Hawaii, Department of Transportation, Highways Division, Materials Testing And Research Branch, Approved June 26, 1997.

5. *FHWA Highway Traffic Noise Prediction Model*, FHWA-RD-77-108; U.S. Department of Transportation, December 1978.

6. *A Traffic Analysis For An Environmental Impact Statement For The New Highway, North And South Kona, Hawaii*, M & E Pacific, Inc., June 1997.

TABLE 1

FEDERAL HIGHWAY ADMINISTRATION RECOMMENDED EQUIVALENT HOURLY SOUND LEVEL BASED ON LAND USE

Activity Category	$L_{eq(h)}$	Description of Activity Category
A	57 (Exterior)	Lands on which serenity and quiet are of extraordinary significance and serve an important public need and where the preservation of those qualities is essential if the area is to continue to serve its intended purpose.
B	67 (Exterior)	Picnic areas, recreation areas, playgrounds, active sports areas, parks, residences, motels, hotels, schools, churches, libraries, and hospitals.
C	72 (Exterior)	Developed lands, properties, or activities not included in Categories A or B above.
D	---	Undeveloped lands.
E	52 (Interior)	Residences, motels, hotels, public meeting rooms, schools, churches, libraries, hospitals, and auditoriums.

TABLE 2

AMBIENT NOISE LEVEL RESULTS IN L_{eq} (dBA)

Location*	L_{eq} (dBA)	Noise Sources
1	48.3	Surf, wind in foliage
2	50.1	Wind in foliage, small plane, birds
3	47.5	Wind in foliage, birds, helicopter
4	46.6	Wind in foliage, birds
5	40.9	Wind in foliage, birds, distant aircraft
6	44.6	Birds, barking dog
7	52.3	Distant construction, slamming door, local traffic, wind in foliage, birds

**As shown in Figure 2.*

TABLE 3

EXISTING (1996) AND PROJECTED FUTURE (2010) TRAFFIC NOISE LEVELS,
L_{eq} (dBA) AT 100 FEET FROM ROADWAY CENTERLINES
DURING MORNING AND AFTERNOON PEAK TRAFFIC HOURS

Locations*	Existing		No Build		Build w/Alii Hwy Extension and Villages of Hokukano		Build w/Alii Hwy Extension		Build w/ Villages of Hokukano	
	1996		2010		2010		2010		2010	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	58.1	59.5	60.0	61.3	57.1	59.1	57.8	58.8	62.4	63.9
2	66.4	66.6	68.2	68.3	65.6	65.4	65.6	65.4	65.6	65.4
3	60.6	60.7	62.5	62.5	59.6	59.7	59.6	59.7	59.6	59.7
4	60.5	60.4	62.3	62.2	60.2	59.7	60.2	59.7	60.2	59.7
5	59.3	59.5	60.8	61.3	58.2	58.5	58.2	58.5	58.2	58.5

** As shown in Figure 3.*

TABLE 4

EXISTING (1996) AND PROJECTED FUTURE (2015) TRAFFIC NOISE LEVELS,
L_{eq} (dBA) AT 100 FEET FROM ROADWAY CENTERLINES
DURING MORNING AND AFTERNOON PEAK TRAFFIC HOURS

Locations*	Existing		No Build		Build w/Alii Hwy Extension and Villages of Hokukano		Build w/Alii Hwy Extension		Build w/ Villages of Hokukano	
	1996		2015		2015		2015		2015	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
1	58.1	59.5	60.6	61.9	59.0	59.9	58.9	59.4	63.3	63.9
2	66.4	66.6	68.8	68.9	65.8	66.0	65.8	66.0	65.8	66.0
3	60.6	60.7	63.1	63.0	60.3	60.8	60.3	60.8	60.3	60.8
4	60.5	60.4	62.9	62.8	60.4	60.6	60.4	60.6	60.4	60.6
5	59.3	59.5	61.4	61.8	58.4	59.1	58.4	59.1	58.4	59.1

** As shown in Figure 3.*

TABLE 5

INCREASE OR (DECREASE) FROM EXISTING TRAFFIC NOISE LEVELS,
DURING FUTURE (2010) MORNING AND AFTERNOON PEAK TRAVEL PERIODS

Location*	No Build		Build w/Alii Hwy Extension and Villages of Hokukano		Build w/Alii Hwy Extension		Build w/Villages of Hokukano	
	2010		2010		2010		2010	
	AM	PM	AM	PM	AM	PM	AM	PM
1	1.9	1.8	(1.0)	(0.4)	(0.3)	(0.7)	4.3	3.4
2	1.8	1.7	(0.8)	(1.2)	(0.8)	(1.2)	(0.8)	(1.2)
3	1.9	1.8	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)	(1.0)
4	1.8	1.8	(0.3)	(0.7)	(0.3)	(0.7)	(0.3)	(0.7)
5	1.5	1.8	(1.1)	(1.0)	(1.1)	(1.0)	(1.1)	(1.0)

** As shown in Figure 3.*

TABLE 6

INCREASE OR (DECREASE) FROM EXISTING TRAFFIC NOISE LEVELS,
DURING FUTURE (2015) MORNING AND AFTERNOON PEAK TRAVEL PERIODS

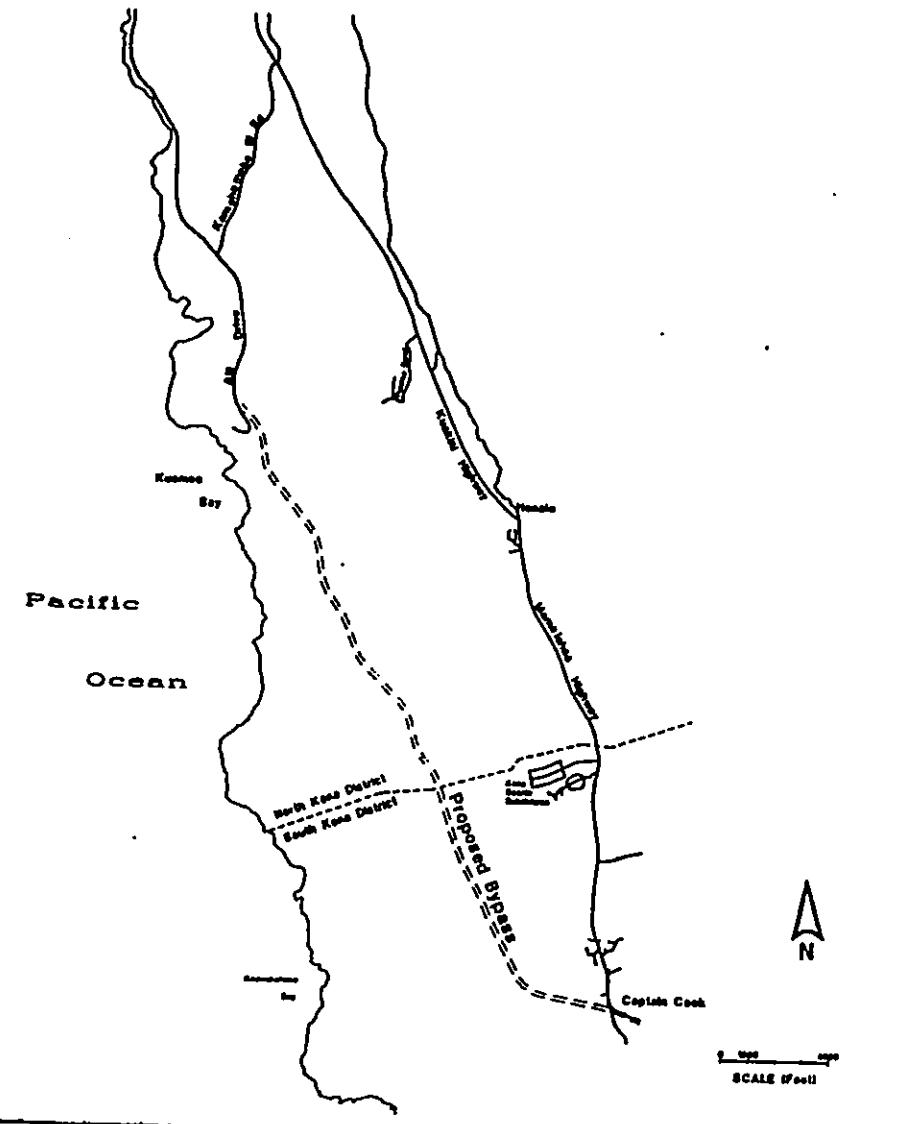
Location*	No Build		Build w/Alii Hwy Extension and Villages of Hokukano		Build w/Alii Hwy Extension		Build w/Villages of Hokukano	
	2015		2015		2015		2015	
	AM	PM	AM	PM	AM	PM	AM	PM
1	2.5	2.4	0.9	0.4	0.8	(0.1)	5.2	4.4
2	2.4	2.3	(0.6)	(0.6)	(0.6)	(0.6)	(0.6)	(0.6)
3	2.5	2.3	(0.3)	0.1	(0.3)	0.1	(0.3)	0.1
4	2.4	2.4	(0.1)	0.2	(0.1)	0.2	(0.1)	0.2
5	2.1	2.3	(0.9)	(0.4)	(0.9)	(0.4)	(0.9)	(0.4)

** As shown in Figure 3.*

TABLE 7

PROJECTED L_{dn} (dBA) AT 200 FEET FROM THE CENTERLINE OF THE SOUTHERN END OF THE PROPOSED BYPASS

YEAR	Build w/Alii Hwy Extension and Villages of Hokukano	Build w/Alii Hwy Extension	Build w/Villages of Hokukano
2010	63.1	63.0	63.1
2015	64.2	63.9	64.0



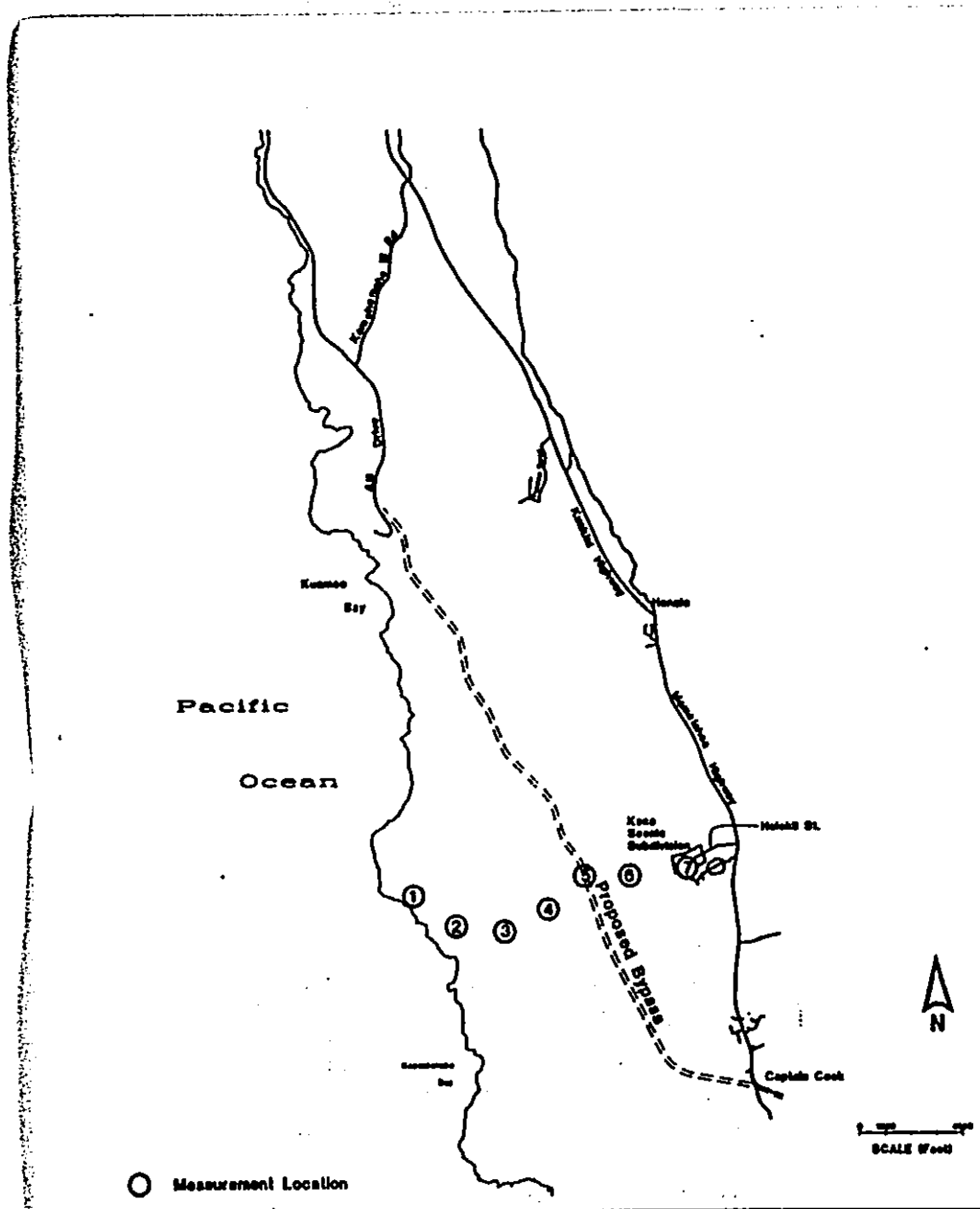
PROPOSED HIGHWAY BYPASS ALIGNMENT

Mamalahoa Highway Bypass

Figure No. 1

Date August 1997 | Project No. 97-06A | Drawn By SSB

R.L. ADAMS ASSOCIATES, LTD. dba DARBY & ASSOCIATES
CIVIL ENGINEERING CONSULTANTS
PALI PALMS PLAZA
970 N. KALAHEO AVENUE, SUITE A-211
KAILUA, HAWAII 96734
808/254-3318 FAX 808/254-3396



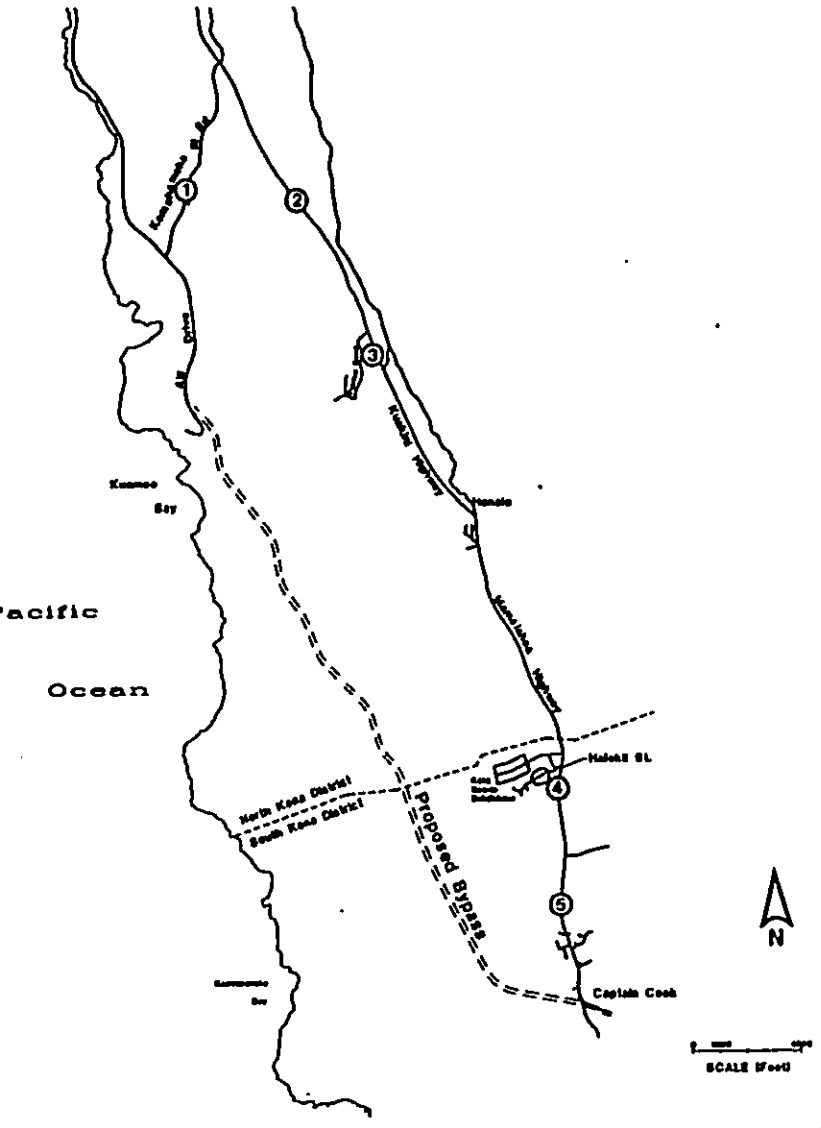
AMBIENT NOISE MEASUREMENT LOCATIONS

S.L. ADAMS ASSOCIATES, LTD. dba DARBY & ASSOCIATES
INDUSTRIAL CONSULTANTS
PALI PALMS PLAZA
970 N. KALAHEO AVENUE, SUITE A-211
KAILUA, HAWAII 96734
808/254-3318 FAX 808/254-3296

Mamalahoa Highway Bypass

Figure No. 2

Date August 1997 | Project No. 97-06A | Drawn By SSB



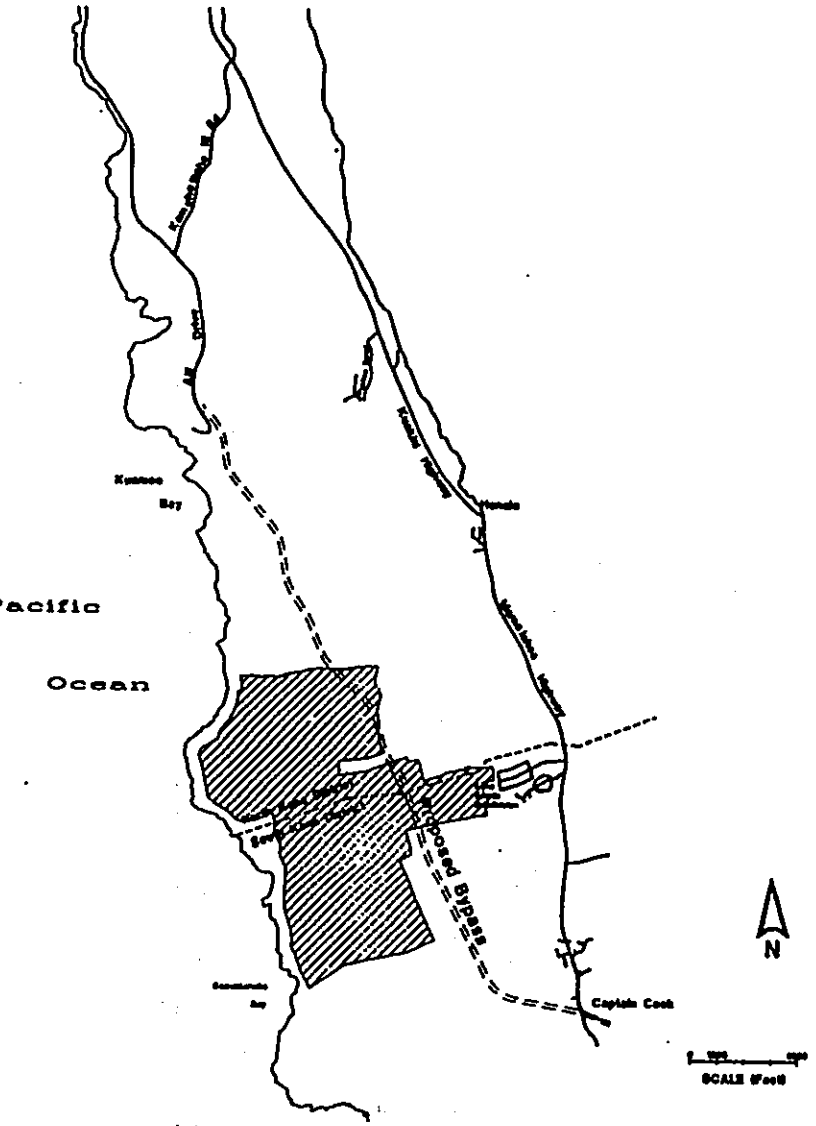
PROJECTED TRAFFIC NOISE LEVEL LOCATIONS

S.L. ADAMS ASSOCIATES, LTD. dba DARBY & ASSOCIATES
INDUSTRIAL CONSULTANTS
PALI PALMS PLAZA
970 N. KALAHEO AVENUE, SUITE A-211
KAILUA, HAWAII 96734
808/254-3318 FAX 808/254-3296

Mamalahoa Highway Bypass

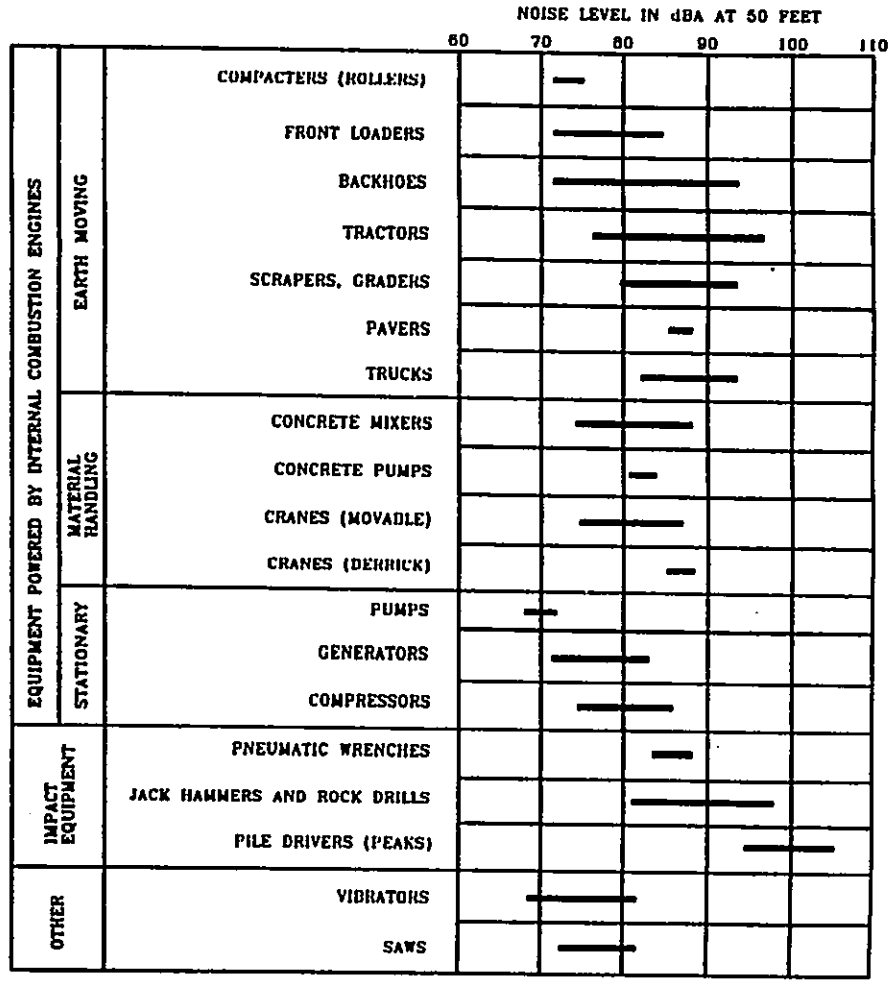
Figure No. 3

Date April 1997 | Project No. 97-06A | Drawn By SSB



S.L. ADAMS ASSOCIATES, LTD. dba DARBY & ASSOCIATES AGRICULTURAL CONSULTANTS PALI PALMS PLAZA 970 N. KALAHEO AVENUE, SUITE A-311 KAILUA, HAWAII 96734 808/254-3318 FAX 808/254-3296	VILLAGES OF HOKUKANO DEVELOPMENT		
	Mamalahoa Highway Bypass		Figure No. 4
	Date August 1997	Project No. 97-06A	Drawn By SSB

PROJECT NO. 97-06A



NOTE: BASED ON LIMITED AVAILABLE DATA SAMPLES

S.L. ADAMS ASSOCIATES, LTD. dba DARBY & ASSOCIATES AGRICULTURAL CONSULTANTS PALI PALMS PLAZA 970 N. KALAHEO AVENUE, SUITE A-311 KAILUA, HAWAII 96734 808/254-3318 FAX 808/254-3295	CONSTRUCTION EQUIPMENT NOISE LEVELS		
	Mamalahoa Highway Bypass		Figure No. 5
	U.S. Environmental Protection Agency 1972		
	Date August 1997	Project No. 97-08A	Drawn By PTN

PROJECT NO: 97-06A

APPENDIX A

ACOUSTICAL TERMINOLOGY

Sound Pressure Level

Sound or noise consists of minute fluctuations in atmospheric pressure capable of evoking the sense of hearing. It is measured in terms of decibels (dB) using precision instruments known as sound level meters. Noise is defined as "unwanted" sound.

Technically, sound pressure level (SPL) is defined as:

$$SPL = 20 \log (P/Pref) \text{ dB}$$

where P is the sound pressure fluctuation (above or below atmospheric pressure) and Pref is the reference pressure, 20 micropascals, which is approximately the lowest sound pressure that can be detected by the human ear. For example, if P is 20 micropascals, then SPL = 0 dB, or if P is 200 micropascals, then SPL = 20 dB. The relation between sound pressure in micropascals and sound pressure level in decibels (dB) is shown in Figure A-1.

The sound pressure level that results from a combination of noise sources is not the arithmetic sum of the individual sound levels, but rather the logarithmic sum. For example; two sound levels of 50 dB produce a combined level of 53 dB, not 100 dB; two sound levels of 40 and 50 dB produce a combined level of 50.4 dB.

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of a sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 5 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

A-Weighted Sound Level

The human ear is more sensitive to sound in the frequency range of 250 Hertz (Hz) and higher, than in frequencies below 250 Hz. Due to this type of frequency response, a frequency weighting system, was developed to emulate the frequency response of the human ear. This system expresses sound levels in units of A-weighted decibels (dBA). A-weighted sound levels de-emphasizes the low frequency portion of the spectrum of a signal. The A-weighted level of a sound is a good measure of the loudness of that sound. Different sounds having the same A-weighted sound level are perceived as being about equally loud. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

Statistical Sound Levels

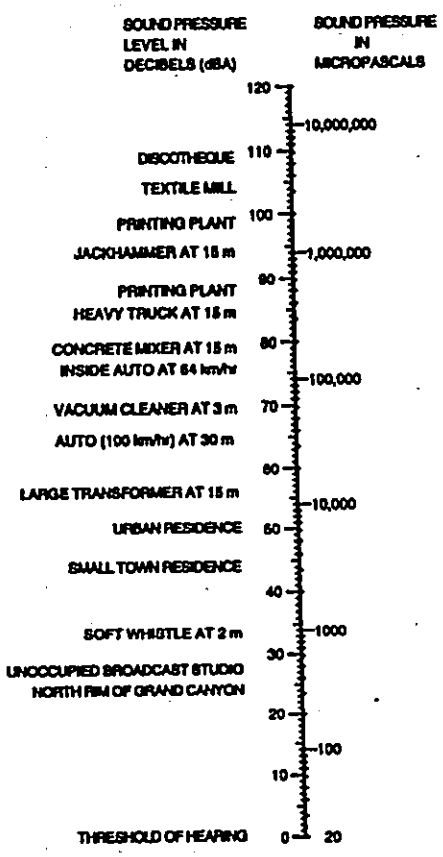
The sound levels of long-term noise producing activities, such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels developed. It is known as the Exceedence Level, L_n. The Exceedence Level, L_n, represents the sound level which is exceeded for n% of the measurement time period. For example, L_{10} = 60 dBA indicates that for the duration at the measurement period, the sound level exceeded 60 dBA 10% of the time. Commonly used Exceedence Levels include L_1, L_{10}, L_{50}, and L_{90}, which are widely used to assess community and environmental noise. Figure A-2 illustrates the relationship between selected statistical noise levels.

Equivalent Sound Level

The Equivalent Sound Level, L_{eq}, represents a constant level of sound having the same total acoustic energy as that contained in the actual time-varying sound being measured over a specific time period. L_{eq} is commonly used to describe community noise, traffic noise, and hearing damage potential. It has units of dBA and is illustrated in Figure A-2.

Day-Night Equivalent Sound Level

The Day-Night Equivalent Sound Level, L_{dn}, is the Equivalent Sound Level, L_{eq}, measured over a 24-hour period. However, a 10 dB penalty is added to the noise levels recorded between 10 pm and 7 am to account for people's higher sensitivity to noise at night when the background noise level is typically lower. The L_{dn} is a commonly used noise descriptor in assessing land use compatibility, and is widely used by federal and local agencies and standards organizations. Qualitative descriptions, as well as local examples of L_{dn}, are shown in Figure A-3.



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dba
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ACOUSTICAL CONSULTANTS

FIGURE A-1 THE RELATION BETWEEN SOUND PRESSURE, P, AND SOUND PRESSURE LEVEL, SPL. ALSO SHOWN ARE TYPICAL VALUES OF A-WEIGHTED SOUND LEVELS OF VARIOUS NOISE SOURCES.

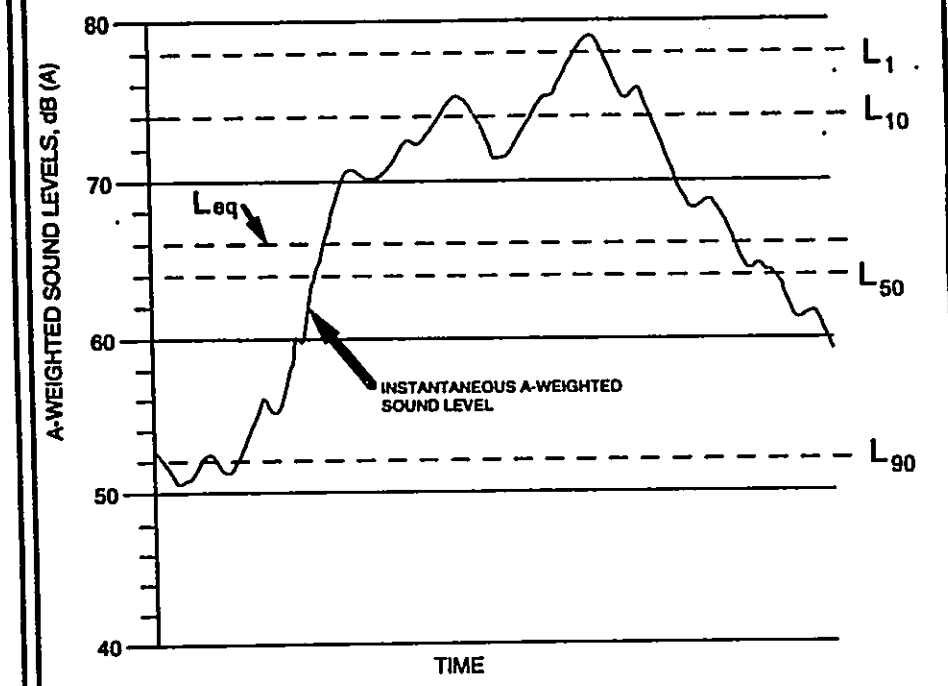

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FIGURE A-2 COMPARISON OF AN INSTANTANEOUS SOUND LEVEL AND THE CORRESPONDING STATISTICAL SOUND LEVELS

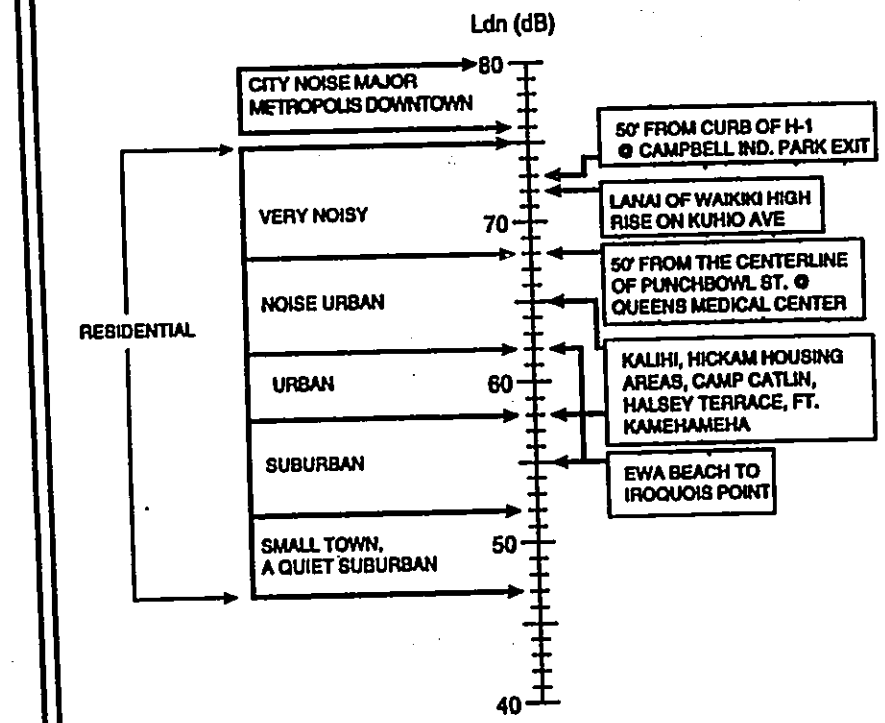

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FIGURE A-3 QUALITATIVE DESCRIPTION OF THE DAY-NIGHT EQUIVALENT SOUND LEVELS (Ldn) AND EXAMPLE Ldn's AT SELECTED LOCATIONS ON OAHU

Appendix G
Air Quality Study
(B.D. Neal and Associates)

AIR QUALITY STUDY

FOR THE PROPOSED

MAMALAHOA HIGHWAY BYPASS PROJECT

NORTH AND SOUTH KONA, HAWAII

Prepared for:

PBR HAWAII

AUGUST 1997

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1.0 SUMMARY

Oceanside 1250 is proposing to construct the Mamalahoa Highway Bypass Road which will traverse parts of both the North and South Kona districts on the island of Hawaii. The 5.5-mile bypass road is being constructed to mitigate traffic from the proposed Villages at Hokukano project, and it will serve to alleviate existing traffic congestion on Mamalahoa Highway. The proposed roadway would connect with the existing roadway system near the intersection of Mamalahoa Highway and Napoopoo Road at the south end and the end of Alii Highway at the north terminus.

This study examines the potential short- and long-term air quality impacts that could occur as a result of construction and use of the proposed bypass road. Mitigative measures are suggested where possible and appropriate to lessen any significant impacts from the roadway project.

At the present time, air quality standards have been established by both federal and state governments that limit ambient concentrations of particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. In addition, a state standard has been established for hydrogen sulfide. The Hawaii air quality standards, particularly those for carbon monoxide, are more stringent than the comparable national limits except for the standards for sulfur dioxide, particulate matter and lead, which are set at the same levels.

Regional and local climate together with the amount and type of human activity generally dictate the air quality of a given location. The climate of the project area is very much affected by its leeward and near coastal situation and by nearby

mountains. Winds are predominantly light and variable, although kona storms generate occasional strong winds from the south or southwest during winter. Temperatures in the project area are generally very consistent and moderate with average daily temperatures ranging from about 60°F to 80°F. The extreme minimum temperature recorded at nearby Kainaliu is 48°F, while the extreme maximum temperature is 89°F. Average annual rainfall in the area at the elevation of the project site amounts to about 38 inches with each month typically contributing between about 2 and 4 inches.

Except for periodic impacts from volcanic emissions and possibly occasional localized impacts from traffic congestion, the present air quality of the project area is believed to be relatively good. The little air quality data that are available for the area from the Department of Health indicate that concentrations are well within state and federal air quality standards.

If the proposed roadway project is given the necessary approvals to proceed, it is inevitable that some short- and long-term impacts on air quality will unavoidably occur either directly or indirectly as a consequence of roadway construction and use. Short-term impacts from fugitive dust will likely occur during the roadway construction phase. To a lesser extent, exhaust emissions from stationary and mobile construction equipment and from the disruption of traffic may also affect air quality during the period of construction. State air pollution control regulations require that there be no visible fugitive dust emissions at the project boundary. Hence, an effective dust control plan should be implemented to ensure compliance with state regulations. Fugitive dust emissions can be controlled to a large extent by watering of active work areas, using wind

screens, keeping adjacent paved roads clean, and by covering of open-bodied haul trucks. Other dust control measures could include limiting the area that can be disturbed at any given time and/or mulching or chemically stabilizing inactive areas that have been worked. Paving and landscaping of roadway project areas early in the construction schedule will also reduce dust emissions. Excess exhaust emissions from traffic disruption can be mitigated by moving construction equipment and workers to and from the roadway project site during off-peak traffic hours and by minimizing road closures during peak traffic periods.

To assess the potential long-term impact of emissions from vehicles operating on the new roadway, an air quality modeling study of selected intersections within the roadway project study area was undertaken. The analysis involved the use of computerized emission and dispersion models to estimate current worst-case ambient concentrations of carbon monoxide during peak travel hours. Two of the intersections where the roadway project is likely to have the most impact were studied: Mamalahoa Highway at Napoopoo Road and Kamehameha III Road at Alii Drive. Three scenarios were examined for each of the two intersections studied. These included 1997 with existing conditions and the year 2015 both with and without the roadway project.

Worst-case carbon monoxide concentrations for 1997 in the roadway project vicinity were estimated to be within both national and state ambient air quality standards. In the year 2015 without the roadway project, worst-case concentrations were predicted to increase to levels that would exceed the state standards at both intersections studied, particularly near the intersection of Mamalahoa Highway and Napoopoo Road. Potential exceedance of the less stringent national 8-hour standard for carbon monoxide was

also indicated at the Mamalahoa Highway/Napoopoo Road intersection.

With the roadway project in the year 2015, concentrations were predicted to decrease compared to the without roadway project case at the Mamalahoa Highway/Bypass Road/Napoopoo Road intersection. The predicted decrease with the roadway project would bring the intersection into compliance with the national standards, but worst-case concentrations would continue to potentially exceed the state standards. Concentrations near the Kamehameha III Road/Alii Drive intersection were forecast to increase by about 50 to 70 percent due to the added traffic using this route as an alternative to Mamalahoa Highway. Concentrations at this location would continue to potentially exceed the state 1-hour and 8-hour standards but would remain within the national standards.

It should be noted here that, because the state standards are set at such stringent levels, it is likely that they are currently exceeded at many locations in the state, including some locations in the Kailua-Kona area, that have even moderate traffic volumes. Also, due to the methodologies involved, the 8-hour concentration estimates are probably less reliable than the 1-hour estimates. All concentration estimates should be considered conservatively high.

It should also be noted that this study focused on those locations where the roadway project would likely have the most significant negative impact. Although areas along Mamalahoa Highway north of Napoopoo Road were not studied, these locations will likely derive a significant air quality benefit from the

roadway project due to the substantially reduced traffic volumes the project will provide.

This roadway project is in itself a measure to mitigate traffic and traffic-related impacts associated with the proposed Villages at Hokukano project. Any additional measures to mitigate project-related air quality impacts are probably unwarranted.

2.0 INTRODUCTION AND PROJECT DESCRIPTION

Oceanside 1250 is proposing to construct the Mamalahoa Highway Bypass Road which will traverse portions of the districts of North and South Kona on the island of Hawaii. The 5.5-mile bypass road, a mitigation measure of Oceanside 1250's Villages at Hokukano project, would extend from the current terminus of Alii Highway at Keauhou southward to Captain Cook, near the junction of Mamalahoa Highway and Napoopoo Road. It is intended that the bypass road would help to alleviate traffic congestion on one of the busier sections of Mamalahoa Highway and would help to mitigate traffic and traffic-related impacts from the proposed Villages at Hokukano project. A location map for the proposed roadway project is provided as Figure 1.

The purpose of this study was to evaluate the potential air quality impacts of the proposed roadway project and recommend mitigative measures, if possible and appropriate, to reduce or eliminate any significant project-related degradation of air quality in the area. Before examining the potential impacts of the proposed roadway project, a discussion of ambient air quality standards is presented and background information concerning the regional and local climatology and the present air quality of the roadway project area is provided.

3.0 AMBIENT AIR QUALITY STANDARDS

Ambient concentrations of air pollution are regulated by both national and state ambient air quality standards (AAQS). National AAQS are specified in Section 40, Part 50 of the Code of Federal Regulations (CFR), while State of Hawaii AAQS are defined in Chapter 11-59 of the Hawaii Administrative Rules. Table 1 summarizes both the national and the state AAQS that are specified in the cited documents. As indicated in the table, national AAQS have been established for six air pollutants. These nationally regulated air pollutants include: particulate matter, sulfur dioxide, nitrogen dioxide, carbon monoxide, ozone and lead. The state has also set a standard for hydrogen sulfide. National AAQS are stated in terms of primary and secondary standards. National primary standards are designed to protect the public health with an "adequate margin of safety". National secondary standards, on the other hand, define levels of air quality necessary to protect the public welfare from "any known or anticipated adverse effects of a pollutant". Secondary public welfare impacts may include such effects as decreased visibility, diminished comfort levels, or other potential injury to the natural or man-made environment, e.g., soiling of materials, damage to vegetation or other economic damage. In contrast to the national AAQS, Hawaii State AAQS are given in terms of a single standard that is designed "to protect public health and welfare and to prevent the significant deterioration of air quality".

Each of the regulated air pollutants has the potential to create or exacerbate some form of adverse health effect or to produce environmental degradation when present in sufficiently high

concentration for prolonged periods of time. The AAQS specify a maximum allowable concentration for a given air pollutant for one or more averaging times to prevent harmful effects. Averaging times vary from one hour to one year depending on the pollutant and type of exposure necessary to cause adverse effects. In the case of the short-term (i.e., 1- to 24-hour) AAQS, both national and state standards allow one exceedance per year.

State of Hawaii AAQS are in some cases considerably more stringent than comparable national AAQS. In particular, the State of Hawaii 1-hour AAQS for carbon monoxide is four times more stringent than the comparable national limit, and the state 1-hour limit for ozone is more than two times as stringent as the federal standard.

Hawaii AAQS for sulfur dioxide were relaxed in 1986 to make the state standards essentially the same as the national limits. In 1993, the state also revised its particulate standards to follow those set by the federal government. It has been proposed in various forums that the state also relax its carbon monoxide standards to the national levels, but at present there are no indications that such a change is being considered.

4.0 REGIONAL AND LOCAL CLIMATOLOGY

Regional and local climatology significantly affect the air quality of a given location. Wind, temperature, atmospheric turbulence, mixing height and rainfall all influence air quality. Although the climate of Hawaii is relatively moderate throughout most of the state, significant differences in these parameters may occur from one location to another. Most differences in

regional and local climates within the state are caused by the mountainous topography.

The site of the proposed roadway project is located near the midpoint of the western coast of the island of Hawaii. The topography of this island is dominated by the great volcanic masses of Mauna Loa (13,653 feet), Mauna Kea (13,796 feet), and of Hualalai, the Kohala Mountains and Kilauea. The island consists entirely of the slopes of these mountains and of the broad saddles between them. Mauna Loa and Kilauea, located on the southern half of the island, are still active volcanoes.

Hawaii lies well within the belt of northeasterly trade winds generated by the semi-permanent Pacific high pressure cell to the north and east. Nearly the entire western coast of the island of Hawaii, however, is sheltered from the trade winds by high mountains, except when unusually strong trade winds sweep through the saddle between the Kohala Mountains and Mauna Kea and reach the areas to the lee. Due to wind shadow effects caused by the terrain, winds in the roadway project area are predominantly light and variable. Local winds such as land/sea breezes and/or upslope/downslope winds tend to dominate the wind pattern for the area. During the daytime, winds typically move onshore because of seabreeze and/or upslope effects. At night, winds generally are land breezes and/or drainage winds which move downslope and out to sea. During winter, occasional strong winds from the south or southwest occur in association with the passage of winter storm systems.

Air pollution emissions from motor vehicles, the formation of photochemical smog and smoke plume rise all depend in part on air temperature. Colder temperatures tend to result in higher

emissions of contaminants from automobiles but lower concentrations of photochemical smog and ground-level concentrations of air pollution from elevated plumes. In Hawaii, the annual and daily variation of temperature depends to a large degree on elevation above sea level, distance inland and exposure to the trade winds. Average temperatures at locations near sea level generally are warmer than those at higher elevations. Areas exposed to the trade winds tend to have the least temperature variation, while inland and leeward areas often have the most. The roadway project site's leeward location results in a larger temperature profile compared to windward locations at the same elevation. At Kainaliu, located a short distance mauka of the roadway project corridor at an elevation of about 1500 feet, average daily minimum and maximum temperatures are 61°F and 79°F, respectively [1]. The extreme minimum temperature on record at this location is 48°F, and the extreme maximum is 89°F. Temperatures along the roadway project corridor are probably somewhat warmer due to the slightly lower elevation.

Small scale, random motions in the atmosphere (turbulence) cause air pollutants to be dispersed as a function of distance or time from the point of emission. Turbulence is caused by both mechanical and thermal forces in the atmosphere. It is often measured and described in terms of Pasquill-Gifford stability class. Stability class 1 is the most turbulent and class 6 is the least. Thus, air pollution dissipates the best during stability class 1 conditions and the worst when stability class 6 prevails. In the Kona area, stability classes 5 or 6 occasionally occur, developing during clear, calm nighttime or early morning hours when temperature inversions form due to radiational cooling or to drainage flow from the mountainous interior of the island. Stability classes 1 through 4 occur during the daytime, depending

mainly on the amount of cloud cover and incoming solar radiation and the onset and extent of the sea breeze.

Mixing height is defined as the height above the surface through which relatively vigorous vertical mixing occurs. Low mixing heights can result in high ground-level air pollution concentrations because contaminants emitted from or near the surface can become trapped within the mixing layer. In Hawaii, minimum mixing heights tend to be high because of mechanical mixing caused by the trade winds and because of the temperature moderating effect of the surrounding ocean. Low mixing heights may sometimes occur, however, at inland locations and even at times along coastal areas early in the morning following a clear, cool, windless night. Coastal areas also may experience low mixing levels during sea breeze conditions when cooler ocean air rushes in over warmer land. Mixing heights in Hawaii typically are above 3000 feet (1000 meters).

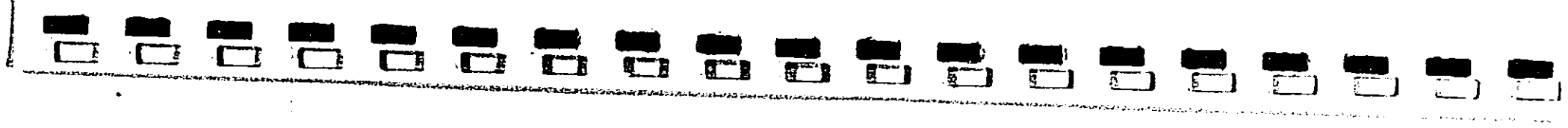
Rainfall can have a beneficial affect on the air quality of an area in that it helps to suppress fugitive dust emissions, and it also may "washout" gaseous contaminants that are water soluble. Rainfall in Hawaii is highly variable depending on elevation and on location with respect to the trade wind. The climate of the roadway project's mauka and southern areas is wetter than might be expected for a leeward location. This is due to the persistent onshore and upslope movement of marine air caused by both eddie and seabreeze or mountain slope effects. Some of the rainfall occurs during summer afternoons and evenings as a result of this onshore and upslope movement of moisture-laden marine air, and some occurs in conjunction with winter storms. At nearby Napoopoo located a few miles to the south of the roadway project site above Kealakekua Bay, average annual rainfall amounts to about 38 inches with each month registering about 2 to 4 inches (1). Rainfall over the

roadway project site is probably somewhere near this amount on the southern end but decreases toward the north.

5.0 PRESENT AIR QUALITY

Present air quality in the roadway project area is mostly affected by air pollutants from natural, industrial, agricultural and/or vehicular sources. Natural sources of air pollution emissions that may affect the roadway project area but cannot be quantified very accurately include the ocean (sea spray), plants (aero-allergens), wind-blown dust, and volcanoes. Of these natural sources of air pollution, volcanoes are the most significant. Volcanic emissions periodically plague the project area. This is especially so since the latest eruption phase of the Kilauea Volcano began in 1983. Air pollution emissions from the Hawaiian volcanoes consist primarily of sulfur dioxide. After entering the atmosphere, these sulfur dioxide emissions are carried away by the wind and either washed out as acid rain or gradually transformed into particulate sulfates. Although emissions from Kilauea are vented on the other side of a mountain barrier more than 50 miles east of the roadway project site, the prevailing wind patterns eventually carry the emissions into the Kona area. These emissions can be seen in the form of the volcanic haze (vog) which persistently hangs over the area.

The major industrial source of air pollution in the roadway project vicinity is Hawaii Electric Light Company's Keahole Power Plant, which is located 22 miles to the north. Air pollution emissions from Keahole Power Plant consist mostly of sulfur dioxide and oxides of nitrogen.



Mamalahoa Highway, running roughly parallel to and about a half mile east of the project corridor, is the region's only major arterial roadway. Prevailing onshore winds during the daytime when traffic is heaviest tend to carry emissions from motor vehicles traversing this roadway away from the project site.

The State Department of Health operates a network of air quality monitoring stations at various locations around the state. Unfortunately, very little data are available for Hawaii Island, and even fewer are available for the Kona area specifically. As indicated in Table 2, the only existing monitoring data in the vicinity of the roadway project site consist of sulfur dioxide and particulate measurements that were made at nearby Kealakekua during 1985 and 1986. During the two-year period, measurements of 24-hour average sulfur dioxide concentration at this location were consistently low with daily mean values ranging from less than 5 $\mu g/m^3$ up to 12 $\mu g/m^3$. No exceedances of the state/national 24-hour AAQS for sulfur dioxide were recorded. The twenty-four hour average particulate concentrations ranged from 4 to 28 $\mu g/m^3$; no violations of the state AAQS were measured during the 1985-86 monitoring period.

At this time, there are no reported measurements of lead, ozone, nitrogen dioxide or carbon monoxide in the project vicinity. These are primarily motor vehicle related air pollutants. Lead, ozone and nitrogen dioxide typically are regional scale problems; concentrations of these contaminants generally have not been found to exceed AAQS elsewhere in the state. Carbon monoxide air pollution, on the other hand, typically is a microscale problem caused by congested motor vehicular traffic. In traffic congested areas such as urban Honolulu, carbon monoxide concentrations have been found to occasionally exceed the state

AAQS. Present concentrations of carbon monoxide in the roadway project area are estimated later in this study based on mathematical modeling of motor vehicle emissions.

6.0 SHORT-TERM IMPACTS OF PROJECT

Short-term direct and indirect impacts on air quality could potentially occur during the construction of the proposed roadway. For a project of this nature, there are two potential types of air pollution emissions that could directly result in short-term air quality impacts during construction: (1) fugitive dust from vehicle movement and soil excavation; and (2) exhaust emissions from on-site construction equipment. Indirectly, there also could be short-term impacts from slow-moving construction equipment traveling to and from the roadway project site and from the disruption of traffic due to road construction.

Fugitive dust emissions may arise from the grading and dirt-moving activities associated with land clearing and preparation work. The emission rate for fugitive dust emissions from construction activities is difficult to estimate accurately because of its elusive nature of emission and because the potential for its generation varies greatly. Fugitive dust emissions generally depend upon the type of soil at the construction site, the amount and type of dirt-disturbing activity taking place, the moisture content of exposed soil in work areas, and the wind speed. The EPA (2) has provided a rough estimate for uncontrolled fugitive dust emissions from construction activity of 1.2 tons per acre per month under conditions of "medium" activity, moderate soil silt content (30%), and precipitation/evaporation (P/E) index of 50. Uncontrolled fugitive dust emissions in the roadway project area would likely be somewhere near this level or possibly lower due

to the rocky nature of the soil in the area. In any case, State of Hawaii Air Pollution Control Regulations [3] prohibit visible emissions of fugitive dust from construction activities at the project boundary, and thus an effective dust control plan for the roadway construction phase is essential.

Adequate fugitive dust control can usually be accomplished by the establishment of a frequent watering program to keep bare-dirt surfaces in construction areas from becoming significant sources of dust. In dust-prone or dust-sensitive areas, other control measures such as limiting the area that can be disturbed at any given time, applying chemical soil stabilizers, mulching and/or using wind screens may be necessary. Control regulations further stipulate that open-bodied trucks be covered at all times when in motion if they are transporting materials that could be blown away. Haul trucks tracking dirt onto paved streets from unpaved areas is oftentimes a significant source of dust in construction areas. Some means to alleviate this problem, such as road cleaning or tire washing, may be appropriate. Paving and/or establishment of landscaping as early in the construction schedule as practical can also lower the potential for fugitive dust emissions.

On-site mobile and stationary construction equipment also will emit air pollutants from engine exhausts. The largest of this equipment is usually diesel-powered. Nitrogen oxides emissions from diesel engines can be relatively high compared to gasoline-powered equipment, but the standard for nitrogen dioxide is set on an annual basis and is not likely to be violated by short-term construction equipment emissions. Carbon monoxide emissions from diesel engines, on the other hand, are low and should be relatively insignificant compared to vehicular emissions on nearby roadways.

Indirectly, slow-moving construction vehicles on roadways leading to and from the roadway project site could obstruct the normal flow of traffic to such an extent that overall vehicular emissions are increased, but this impact can be mitigated by moving heavy construction equipment during periods of low traffic volume. Likewise, road closures during peak traffic periods should be avoided to the extent possible to minimize air pollution impacts from traffic disruption. Thus, with careful planning and attention to dust control, most potential short-term air quality impacts from roadway construction can be mitigated.

7.0 LONG-TERM IMPACTS OF PROJECT

After construction is completed, the proposed bypass road should result in a more efficient flow of motor vehicle traffic on Mamalahoa Highway and will reduce traffic volumes in some areas. At the same time, however, it may bring increased motor vehicle traffic to roadways near the north and south ends of the bypass road, potentially causing long-term impacts on ambient air quality in these areas. Motor vehicles with gasoline-powered engines are significant sources of carbon monoxide, and they also emit nitrogen oxides and other contaminants.

Federal air pollution control regulations require that new motor vehicles be equipped with emission control devices that reduce emissions significantly compared to a few years ago. In 1990, the President signed into law the Clean Air Act Amendments. This new legislation requires further emission reductions be phased in beginning in 1994. The combination of current and new restrictions on emissions from new motor vehicles will lower average emissions on a per vehicle basis each year as more and

more older vehicles leave the state's roadways. Carbon monoxide emissions, for example, will go down by about 15 percent per vehicle on the average during the next 10 years due to the replacement of older vehicles with newer models.

To evaluate the potential long-term ambient air quality impact of roadway traffic, computerized emission and atmospheric dispersion models can be applied to estimate maximum ambient carbon monoxide concentrations. Carbon monoxide is selected for modeling because it is both the most stable and the most abundant of the pollutants generated by motor vehicles. Furthermore, carbon monoxide air pollution is generally considered to be a microscale problem that can be addressed locally to some extent, whereas nitrogen oxides air pollution most often is a regional issue that cannot be addressed by a single project.

For this project, three scenarios were selected for the carbon monoxide modeling study: year 1997 with present conditions, year 2015 without the roadway project, and year 2015 assuming the roadway is complete and fully utilized. To begin the modeling study, critical receptor areas in the vicinity of the roadway project were identified for analysis. Generally speaking, roadway intersections are the primary concern because of traffic congestion and because of the increase in vehicular emissions associated with traffic queuing. For this study, two intersections at or near the endpoints of the proposed bypass road were selected for air quality analysis. These included Mamalahoa Highway at Napoopoo Road, which is presently stop-controlled but will be signalized in the future with-project case, and Kamehameha III Road at Alii Drive, a signalized intersection in all study scenarios. Intersection configurations and traffic conditions at each of these locations are detailed in the traffic impact report for the proposed roadway project [4].

The main objective of the modeling study was to estimate maximum 1-hour average carbon monoxide concentrations for each of the three scenarios studied. To evaluate the significance of the estimated concentrations, a comparison of the predicted values for each scenario can be made. Comparison of the estimated values to the national and state AAQS will provide another measure of significance.

The traffic impact report for the roadway project indicates that traffic volumes will be higher during the afternoon peak hour than during the morning peak period. However, worst-case emission and meteorological dispersion conditions typically occur during the morning hours at most locations. Thus, to ensure that worst-case concentrations were identified, both morning and afternoon peak-traffic hours were examined for each scenario.

The EPA computer model MOBILE5A [5] was used to calculate vehicular carbon monoxide emissions for each year studied. This model is the most recently released version of the EPA mobile emission models. Emission estimates provided by the MOBILE5A model have been updated based on EPA's recent testing of on-road vehicles. This latest series of tests has indicated that emission control equipment deteriorates more rapidly than had been previously thought. Hence, MOBILE5A emission estimates are higher (in some cases as much as twice as high) compared to emission estimates derived from earlier versions of the model, particularly in states like Hawaii that have no inspection and maintenance program for emission control equipment.

One of the key inputs to the MOBILE5A emission model is vehicle mix. Based on recent vehicle registration figures, the present and projected vehicle mix in the project area is estimated to be 91.9% light-duty gasoline-powered vehicles, 5% light-duty gasoline-powered trucks and vans, 0.5% heavy-duty gasoline-powered vehicles, 0.6% light-duty diesel-powered vehicles, 1% heavy-duty diesel-powered trucks and buses, and 1% motorcycles.

Other key inputs to the MOBILE5A emission model are the cold/hot start fractions. Motor vehicles operating in cold- or hot-start modes emit excess air pollution until reaching stabilized operating temperatures. Typically, motor vehicles reach stabilized operating temperatures after about 4 miles of driving. For traffic operating on surface streets around the project area, it was assumed that during both morning and afternoon peak traffic hours about 25 percent of all vehicles would be operating in the cold-start mode and that about 5 percent would be operating in the hot-start mode. These operational mode values were estimated based on a report from the California Department of Transportation [6] and taking into consideration the likely origins of morning/afternoon traffic in the project area.

Ambient temperatures of 59 and 68°F were used for morning and afternoon peak-hour emission computations, respectively. These are conservative assumptions since morning/afternoon ambient temperatures will generally be warmer than this and emission estimates given by MOBILE5A are inversely proportional to the ambient temperature.

After computing vehicular carbon monoxide emissions through the use of MOBILE5A, these data were then input to an atmospheric dispersion model. EPA air quality modeling guidelines [7] currently recommend that the computer model CAL3QHC [8] be used to assess carbon monoxide concentrations at roadway intersections, or in areas where its use has previously been established, CALINE4 [9]. CALINE4 has been used extensively in Hawaii to assess air quality impacts at roadway intersections. Each of these two computer models offers advantages and disadvantages. CAL3QHC has the capability to make vehicle queuing estimates, but it does not simulate modal emissions. CALINE4 has the capability to simulate modal emissions, but it does not have the capacity to make queuing estimates.

Since the use of CALINE4 has previously been established in Hawaii, CALINE4 was used to perform the analyses for the subject project. However, all vehicle queuing estimates involving signalized intersections were made based on the queuing algorithms included in the CAL3QHC model. This approach takes advantage of the best features of both models. Queuing estimates for unsignalized intersections were made based on capacity analysis procedures [10] and transportation queuing theory [11].

CALINE4 was developed by the California Transportation Department to simulate vehicular movement and atmospheric dispersion of vehicular emissions. This model is designed to predict 1-hour average pollutant concentrations along roadways based on input traffic and emission data, roadway/receptor geometry and meteorological conditions.

Input peak-hour traffic data were obtained from the traffic study cited previously. For all scenarios studied, vehicles using Napoopoo Road and Kamehameha III Road west of Alii Drive were assumed to accelerate to 25 mph, while traffic on Mamalahoa Highway and Alii Drive north of Kamehameha III Road was assumed

to move at 30 mph. Vehicles on Kamehameha III Road east of Alii Drive and on Alii Drive south of the Kamehameha III Road intersection were assumed to travel at 35 mph. These are the current posted speed limits. A deceleration/acceleration time of 11 seconds was assumed for vehicles traveling at 25 mph, whereas a value of 14 seconds was assumed for those traveling at 30 mph and a value of 16 seconds was assumed for traffic traveling at 35 mph. A speed of 35 mph and a deceleration/acceleration time of 16 seconds were used for the new Bypass Road in the future with-project case.

Model roadways were set up to reflect roadway geometry, physical dimensions and operating characteristics. Concentrations predicted by air quality models generally are not considered valid within the roadway mixing zone. The roadway mixing zone is usually taken to include 3 meters on either side of the traveled portion of the roadway and the turbulent area within 10 meters of a cross street. For this study, model receptor sites were located at the edges of the mixing zones where the maximum concentrations would likely occur, whether or not sidewalks currently exist. All receptor heights were placed at 1.8 meters above ground to simulate levels within the normal human breathing zone.

Input meteorological conditions for this study were defined to provide "worst-case" results. One of the key meteorological inputs is atmospheric stability category. For these analyses, atmospheric stability category 5 was assumed for morning scenarios and stability category 4 was assumed for afternoon cases. These are the most conservative stability categories that are generally used for estimating worst-case pollutant dispersion at suburban locations. A surface roughness length of 100 cm and a mixing height of 300 meters were used in all cases. Worst-case

wind conditions were defined as a wind speed of 1 meter per second with a wind direction resulting in the highest predicted concentration.

Existing background concentrations of carbon monoxide in the project vicinity are believed to be at relatively low levels. Hence, background contributions of carbon monoxide from sources or distant roadways not directly considered in the analysis were accounted for by adding a small background concentration of 0.5 ppm to all predicted concentrations for 1997. Although at least moderate development and increased traffic are expected to occur within the project area within the next several years, background carbon monoxide concentrations may not change significantly since individual emissions from motor vehicles are forecast to decrease somewhat over time. Hence, a background value of 0.5 ppm was assumed to persist for the 2015 scenarios.

Predicted Worst-Case 1-Hour Concentrations

Table 3 summarizes the final results of the modeling study in the form of the estimated worst-case 1-hour morning and afternoon ambient carbon monoxide concentrations for 1997 and for each of the two 2015 alternatives. The locations of these estimated worst-case 1-hour concentrations all occurred at or very near the indicated intersections.

As indicated in the table, the highest estimated 1-hour concentration within the project vicinity for the present (1997) case was 8.4 mg/m^3. This was projected to occur during the morning peak traffic hour near the intersection of Kamehameha III Road and Alii Drive. The majority of this concentration is attributable to the queuing of eastbound traffic on Kamehameha

III Road. The next highest value, 7.8 mg/m³, was estimated to occur during the afternoon peak traffic hour near the same intersection with the same major contributor. Worst-case concentrations at the other intersection studied, Mamalahoa Highway at Napoopoo Road, were 5.4 mg/m³ during the morning peak hour and 3.3 mg/m³ during the afternoon peak hour. All predicted worst-case 1-hour concentrations for the 1997 scenario were within the national and state AAQS.

In the year 2015 without the proposed roadway project, a worst-case 1-hour concentration of 25.4 mg/m³ was predicted to occur during the morning peak-traffic hour near the intersection of Mamalahoa Highway and Napoopoo Road. Queuing of left turn traffic on Napoopoo Road was the major contributor. This is nearly a 500 percent increase compared to the 1997 concentration at this time and location and is accounted for by greatly increased northbound traffic volume through the intersection and the resulting long delay exiting Napoopoo Road. A concentration of 13.6 mg/m³ was estimated for the afternoon at the same intersection and was attributable again primarily to the eastbound left turn traffic queue on Napoopoo Road. Peak-hour morning and afternoon worst-case values at the Kamehameha III Road/Alii Drive intersection for the 2015 without-project scenario were 11.6 and 9.7 mg/m³, respectively. Predicted worst-case 1-hour concentrations for this scenario exceeded the state AAQS at both locations studied, but remained within the national standard.

With the roadway project in the year 2015, the highest worst-case concentration at the two intersections studied, 17.4 mg/m³, was predicted to occur during the morning at the Kamehameha III Road/Alii Drive intersection. A slightly lower concentration of 16.4 mg/m³ was predicted to occur during the afternoon at this

location. A large portion of both the morning and afternoon concentrations was due southbound traffic queuing on Alii Drive. Predicted concentrations at the the Mamalahoa Highway and Bypass Road/Napoopoo Road intersection for the with-project scenario were 15.0 and 12.5 mg/m³ during the morning and afternoon peak hours, respectively. Compared to the without-project case, the predicted concentrations with the roadway project are higher only at the Kamehameha III Road/Alii Drive intersection where traffic volume is anticipated to increase significantly as vehicles use it to access the new Bypass Road. All of the predicted with-project concentrations meet the national AAQS, but none are projected to comply with the more stringent state standard.

Predicted Worst-Case 8-Hour Concentrations

Worst-case 8-hour carbon monoxide concentrations were estimated by multiplying the worst-case 1-hour values by a persistence factor of 0.5. This accounts for two factors: (1) traffic volumes averaged over eight hours are lower than peak 1-hour values, and (2) meteorological conditions are more variable (and hence more favorable for dispersion) over an 8-hour period than they are for a single hour. Based on monitoring data, 1-hour to 8-hour persistence factors for most locations generally vary from 0.4 to 0.8 with 0.6 being the most typical. One recent study based on modeling [12] concluded that 1-hour to 8-hour persistence factors could typically be expected to range from about 0.4 to 0.5. EPA guidelines [13] recommend using a value of 0.6 to 0.7 unless a locally derived persistence factor is available. Recent monitoring data for Honolulu reported by the Department of Health [14] suggest that this factor may range between about 0.35 and 0.55 depending on location and traffic variability. Considering the location of the roadway project and the traffic pattern for the area, a 1-hour to 8-hour persistence factor of 0.5 will likely yield reasonable estimates of worst-

case 8-hour concentrations. However, it should be noted that the 8-hour concentration estimates are generally less reliable than the 1-hour values due to the prediction methodology involved.

The resulting estimated worst-case 8-hour concentrations are indicated in Table 4. For the 1997 scenario, the estimated worst-case 8-hour carbon monoxide concentrations for the two locations studied were 2.7 and 4.2 mg/m^3. Both are within national and state standards. For the year 2015 without-project scenario, estimated 8-hour values increased to 12.7 mg/m^3 at the Mamalahoa Highway and Bypass Road/Napoopoo Road intersection and 5.8 mg/m^3 at the Kamehameha III Road/Alii Drive intersection. The former exceeds the national 8-hour limit of 10 mg/m^3 but the latter exceeds only the more stringent state limit of 5 mg/m^3. For the 2015 with-project scenario, both predicted 8-hour concentrations were again in excess of the state 8-hour limit, but both comply with the national 8-hour AAQS. With the roadway project, 8-hour concentrations would be substantially lower at the Mamalahoa Highway/Bypass Road/Napoopoo Road intersection.

Conservativeness of Estimates

The results of this study reflect several assumptions that were made concerning both traffic movement and worst-case meteorological conditions. One such assumption concerning worst-case meteorological conditions is that a wind speed of 1 meter per second with a steady direction for 1 hour will occur. A steady wind of 1 meter per second blowing from a single direction for an hour is extremely unlikely and may occur only once a year or less. With wind speeds of 2 meters per second, for example, computed carbon monoxide concentrations would be only about half the values given above. The 8-hour estimates are also conservative in that it is unlikely that anyone would occupy the

assumed receptor sites (within 3 m of the roadways) for a period of 8 hours.

8.0 CONCLUSIONS AND RECOMMENDATIONS

Although very little ambient air quality data are available to characterize existing conditions, it is likely that state and federal ambient air quality standards are currently being met in the roadway project area, except perhaps for occasional exceedances of the state carbon monoxide standards within small areas near traffic-congested locations.

If not mitigated, emissions of fugitive dust during construction of the proposed roadway could cause short-term impacts on air quality in the project vicinity. Uncontrolled fugitive dust emissions from construction activities are estimated to amount to about 1.2 tons per acre per month or more, depending on rainfall. To control dust, active work areas and any temporary unpaved work roads should be watered at least twice daily on days without rainfall. Wind erosion of inactive construction areas can be controlled by mulching or chemical stabilization, if necessary. However, winds in the project area are normally light, and thus wind erosion should not be a problem. Dirt-hauling trucks should be covered when traveling on offsite roadways to prevent windage. A routine road cleaning and/or tire washing program will also help to reduce fugitive dust emissions that may occur as a result of trucks tracking dirt onto paved roadways in the roadway project area. Establishment of landscaping early in the construction schedule will also help to control dust.

During construction phases, emissions from engine exhausts (primarily consisting of carbon monoxide and nitrogen oxides)

will also occur both from on-site construction equipment and from the disruption of normal traffic flow. Increased vehicular emissions due to the disruption of traffic can be alleviated by minimizing road closures during peak traffic hours.

After the roadway project is completed, the most significant long-term impacts on air quality will likely occur near the intersection of Kamehameha III Road at Alii Drive due to the carbon monoxide emissions from added traffic the roadway project will attract to this area. Although projected worst-case concentrations of carbon monoxide in the year 2015 with the roadway project are in compliance with the national AAQS, worst-case concentrations either with or without the roadway project would likely exceed the state AAQS. The air quality at other locations in the roadway project area, such as the intersection of Mamalahoa Highway and Napoopoo Road and intersections north of this, would likely improve with the roadway project.

Due to the low levels at which the state carbon monoxide standards are set, it may not be possible to achieve continuous compliance with the state standards, at least within small hot-spot areas near high-volume intersections included in the roadway project area. Because the state standards are set at such stringent levels, it is likely that they are currently exceeded at many locations in the state, including some locations in the Kailua-Kona area, that have even moderate traffic volumes.

This roadway project is in itself a measure to mitigate traffic and traffic-related impacts of the proposed Villages at Hokukano project. Based on the results of this study, any additional measures to mitigate project-related air quality impacts are probably unwarranted.

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Figure 1 - PROJECT LOCATION

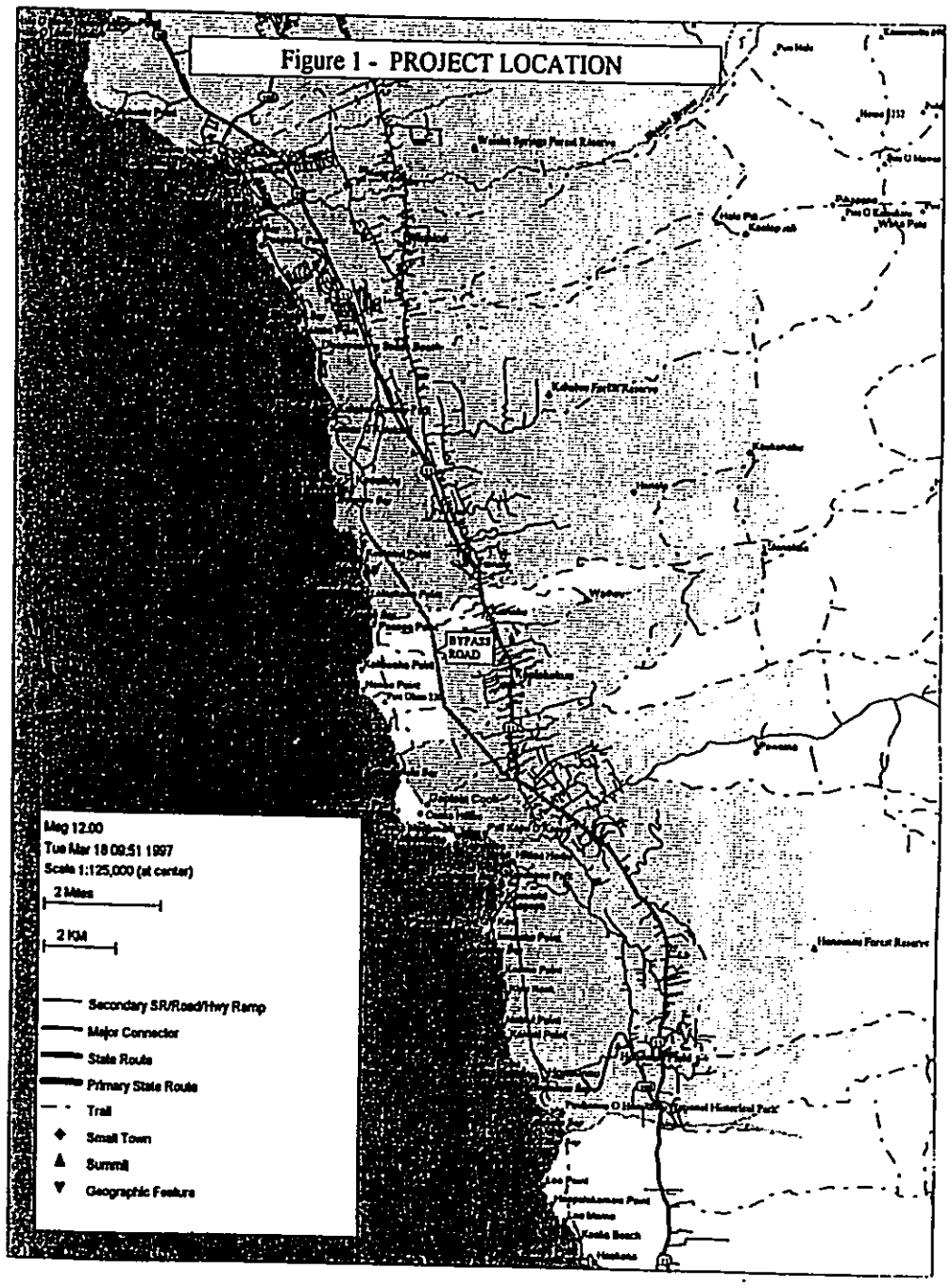

Table 1

SUMMARY OF STATE OF HAWAII AND NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Units	Averaging Time	Maximum Allowable Concentration		
			National Primary	National Secondary	State of Hawaii
Particulate Matter[a]	µg/m³	Annual 24 Hours	50[b] 150[c]	50[b] 150[c]	50 150[d]
Sulfur Dioxide	µg/m³	Annual 24 Hours 3 Hours	80 365[d] -	- - 1300[d]	80 365[d] 1300[d]
Nitrogen Dioxide	µg/m³	Annual	100	100	100
Carbon Monoxide	mg/m³	8 Hours 1 Hour	10[d] 40[d]	- -	5[d] 10[d]
Ozone	µg/m³	1 Hour	235[c]	235[c]	100[d]
Lead	µg/m³	Calendar Quarter	1.5	1.5	1.5
Hydrogen Sulfide	µg/m³	1 Hour	-	-	35[d]

[a] Particles less than or equal to 10 microns aerodynamic diameter.
[b] Standard is attained when the expected annual arithmetic mean is less than or equal to 50 µg/m³.
[c] Standard is attained when the expected number of exceedances is less than or equal to 1.
[d] Not to be exceeded more than once per year.

Table 2

ANNUAL SUMMARY OF AIR QUALITY MEASUREMENTS FOR MONITORING STATIONS NEAREST MAMALAHOA HIGHWAY BYPASS PROJECT

Parameter / Location	1985	1986
Sulfur Dioxide / Kealakekua, Kona		
Period of Sampling (months)	7	8
No. of 24-Hr Samples	31	40
Range of 24-Hr Values (µg/m³)	<5-8	<5-12
Average Daily Value (µg/m³)	<5	<5
No. of State AAQS Exceedances	0	0
Particulate / Kealakekua, Kona		
Period of Sampling (months)	7	8
No. of 24-Hr Samples	34	40
Range of 24-Hr Values (µg/m³)	6-22	4-28
Average Daily Value (µg/m³)	12	16
No. of State AAQS Exceedances	0	0

Source: State of Hawaii Department of Health, "Hawaii Air Quality Data for the Period of January 1985 to December 1987"

Table 3

ESTIMATED WORST-CASE 1-HOUR CARBON MONOXIDE CONCENTRATIONS
NEAR INTERSECTIONS IN VICINITY OF
MAMALAHOA HIGHWAY BYPASS PROJECT
(milligrams per cubic meter)

Roadway Intersection	Year/Scenario					
	1997/Present		2015/Without Project		2015/With Project	
	AM	PM	AM	PM	AM	PM
Mamalahoa Highway at Napoopoo Road	5.4	3.3	25.4	13.6	15.0	12.5
Kamehameha III Rd. At Alii Drive	8.4	7.8	11.6	9.7	17.4	16.4

Hawaii State AAQS: 10
National AAQS: 40

Table 4

ESTIMATED WORST CASE 8-HOUR CARBON MONOXIDE CONCENTRATIONS
NEAR INTERSECTIONS IN VICINITY OF
MAMALAHOA HIGHWAY BYPASS PROJECT
(milligrams per cubic meter)

Roadway Intersection	Year/Scenario		
	1997/Present	2015/Without Project	2015/With Project
Mamalahoa Highway At Napoopoo Road	2.7	12.7	7.5
Kamehameha III Road at Alii Drive	4.2	5.8	8.7

Hawaii State AAQS: 5
National AAQS: 10

Appendix H
Archaeological Inventory Survey
(Ogden Environmental)

Draft Report

Archaeological Inventory Survey of the Proposed Mamalahoa Bypass Road Corridor in the Ahupua`a of Keauhou 2, Honalo, Ma'ihi 1-2, Kuamo'o 1-3, Kawanui 1-2, Lehu'ula 1-2, Honua'ino 1-4, Hokukano 1-2, Kanaueue, 1-2, Haleki'i, Ke'eke'e 1-2, 'Ilikahi, Kanakau 1-2, Kalukalu, Onouli 1-2, Keopuka 1-2, & Ka'awaloa, Districts of North and South Kona, Island of Hawai'i, Hawaii

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February1999

OGDEN

Archaeological Inventory Survey of the Proposed Māmalahoa Bypass Road Corridor
in the *Ahupua'a* of Keauhou 2, Honalo, Mā'ihi 1-2, Kuamo'o 1-3, Kawanui 1-2, Lehu'ula 1-2,
Honua'ino 1-4, Hōkūkano 1-2, Kanāueue 1-2 , H aleki'i, Ke'eke'e, 1-2, 'Ilikahi,
Kanakau 1-2, Kalukalu, Onouli 1-2, Keōpuka, and Ka'awaloa,
North and South Kona Districts, Island of Hawai'i, Hawaii

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ABSTRACT

This report presents the results of an archaeological inventory survey of the proposed Māmalahoa Bypass Road Corridor extending from the south end of Ali'i Drive in Kailua-Kona to Kealakekua. The project corridor passes through 17 *ahupua'a* in the North and South Kona Districts of Hawai'i Island.

During the course of the inventory survey the route of the proposed road corridor was repeatedly realigned and re-surveyed among four sections of the corridor. This was done in an effort to avoid potential disturbance to a number of archaeological sites considered eligible for preservation. The final road alignment selected for the proposed road corridor contains 47 archaeological sites.

The site inventory identified in the proposed road corridor reflects a typical pattern of traditional Hawaiian settlement and land use in the lower and upper elevations (50 ft to 1350 ft amsl) of the slope above the Kona Coast of Hawaii Island. The sites include evidence of habitation, intensive, dryland agriculture (e.g., Kona Field System) and animal husbandry. Non-traditional, post-Contact sites were also identified within the proposed corridor, including boundary and cattle paddock walls, a railroad trestle, and commercial sugarcane features.

All of the 47 sites were evaluated as being significant under criterion d of the National Register of Historic Places and Chapter 6E of the Hawaii Revised Statutes. The railroad trestle, built by the Kona Sugar Co. in the early 1900s, was evaluated as significant under criterion a, c, and d.

ACKNOWLEDGEMENTS

The inventory survey of the proposed Māmalahoa Bypass Road Corridor required the cooperation and assistance of a number of individuals. The authors are grateful for their contribution to this project.

The field work was completed with the diligent assistance of the Ogden field crew consisting of Steve Clark, David Nichols, and Tara Moorman. Figures presented in this report were drafted by Tony Torres and Uilani Nakaahiki. Kathleen Mattiello assisted in the word processing of this report.

Mr. Robert Stuit, from Oceanside 1250 Partners, provided continual assistance in the coordination of this project and determined the GPS locations for some of the sites. Cultural Surveys Hawaii, Inc. compiled historical background data relevant to the project area and graciously supplied Ogden with an electronic version of the data. Dr. Patrick McCoy, from the State Historic Preservation Division helped in determining the status of previous studies in the project and offered advice on proposed mitigation of the project sites.

The authors are especially grateful to the number of local informants who contributed invaluable oral histories associated with the project area lands. These oral histories were compiled by Kepā Maly and Helen Wong-Smith for the assessment of cultural impacts component of the project.

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INTRODUCTION

The inventory survey of the proposed Māmalahoa Bypass Road corridor was conducted by Ogden Environmental and Energy Services Co., Inc. (Ogden), under contract to Oceanside 1250 Partners. The project corridor begins at the southern end of Ali'i Drive in Kailua, North Kona, and extends south and gradually *mauka* or east to the junction of Māmalahoa Road and Nāpoopoo Road, in Kealakekua, South Kona (Figures 1 and 2). The proposed road corridor extends through 17 *ahupua'a* in the North and South Kona Districts, on the Island of Hawai'i. These *ahupua'a* (from north to south) are Keauhou 2, Honalo, Mā'ihi 1-2, Kuamo'o 1-3, Kawanui 1-2, Lehu'ula 1-2, Honua'ino 1-4, Hōkūkano 1-2, Kanāueue 1-2 in the South Kona District; and Halekiʻi, Ke'eke'e, 1-2, 'Ilikahi, Kanakou 1-2, Kalukalu, Onouli 1-2, Keōpuka, and Ka'awaloa in the South Kona District.

The proposed road corridor is approximately 120 feet wide and extends for a distance of roughly 5.5 miles in length. During the course of the inventory survey, the route of the proposed road was repeatedly, realigned and re-surveyed among four sections of the corridor. This was done in an effort to avoid potential disturbance to a number of archaeological sites that possibly warranted preservation treatment. Overall, 62 sites were identified within the surveyed areas of the previous alignments and final alignment of the proposed road corridor. Forty-seven (47) of these sites are situated within the final alignment of the proposed road corridor.

The inventory survey field work conducted by Ogden occurred during three time periods: March 31 through April 18, 1997; October 5 through 10, 1998; and January 7 and 8, 1999. The project was directed by Ogden Project Archaeologists Richard Nees and Jennifer Robins, under the overall supervision of Scott Williams and Stephan Clark. The field crew at different times consisted of Stephan Clark, David Nichols, and Tara Moorman

This report provides the details and evaluations of the 47 sites in the proposed road corridor. Appendix A contains the descriptions, select plan maps and site locations of the remaining 15 sites identified outside of the proposed road corridor.

Portions of the proposed road corridor, comprising a combined length of approximately 2 miles, have been subjected to previous archaeological inventory surveys (see Previous Archaeological Investigation section of this report). Therefore, these portions of the corridor were not included in the ground survey of the present study. An effort was made, however, to locate the previously

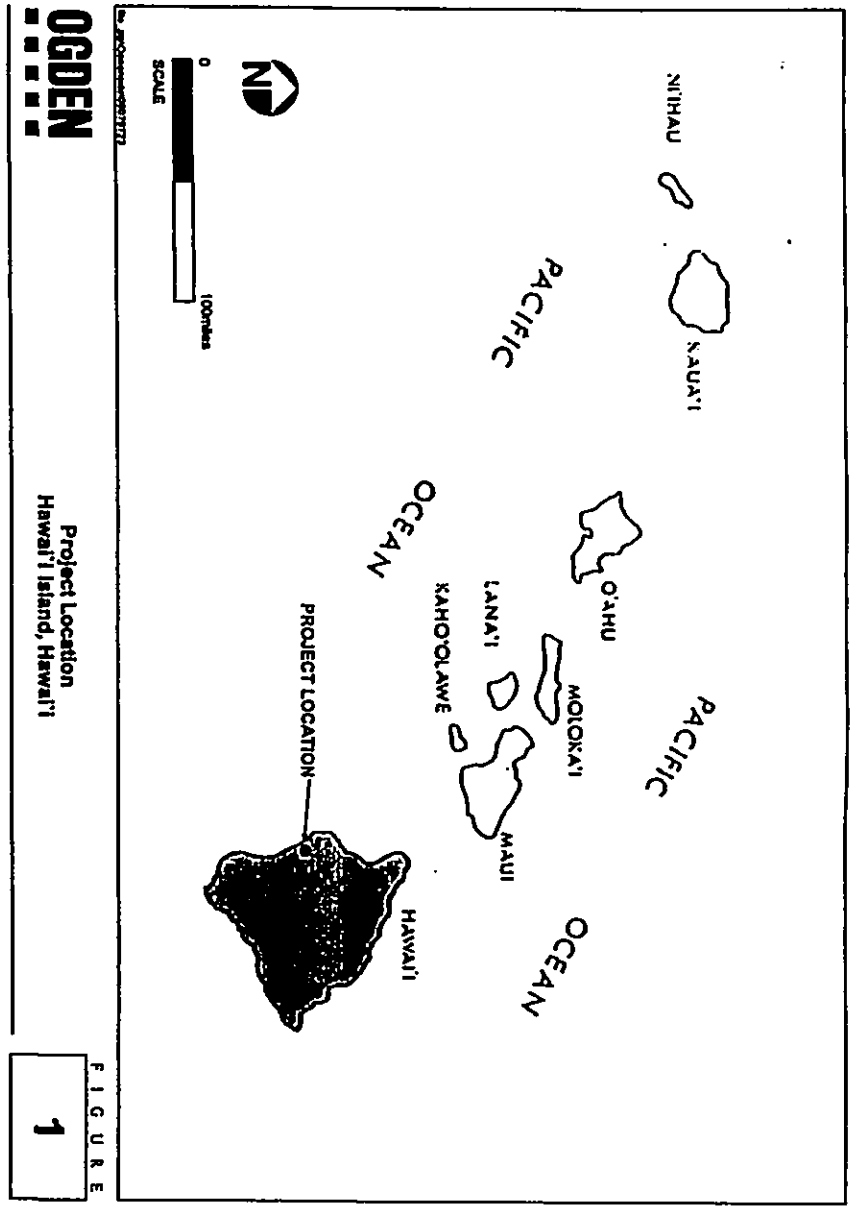
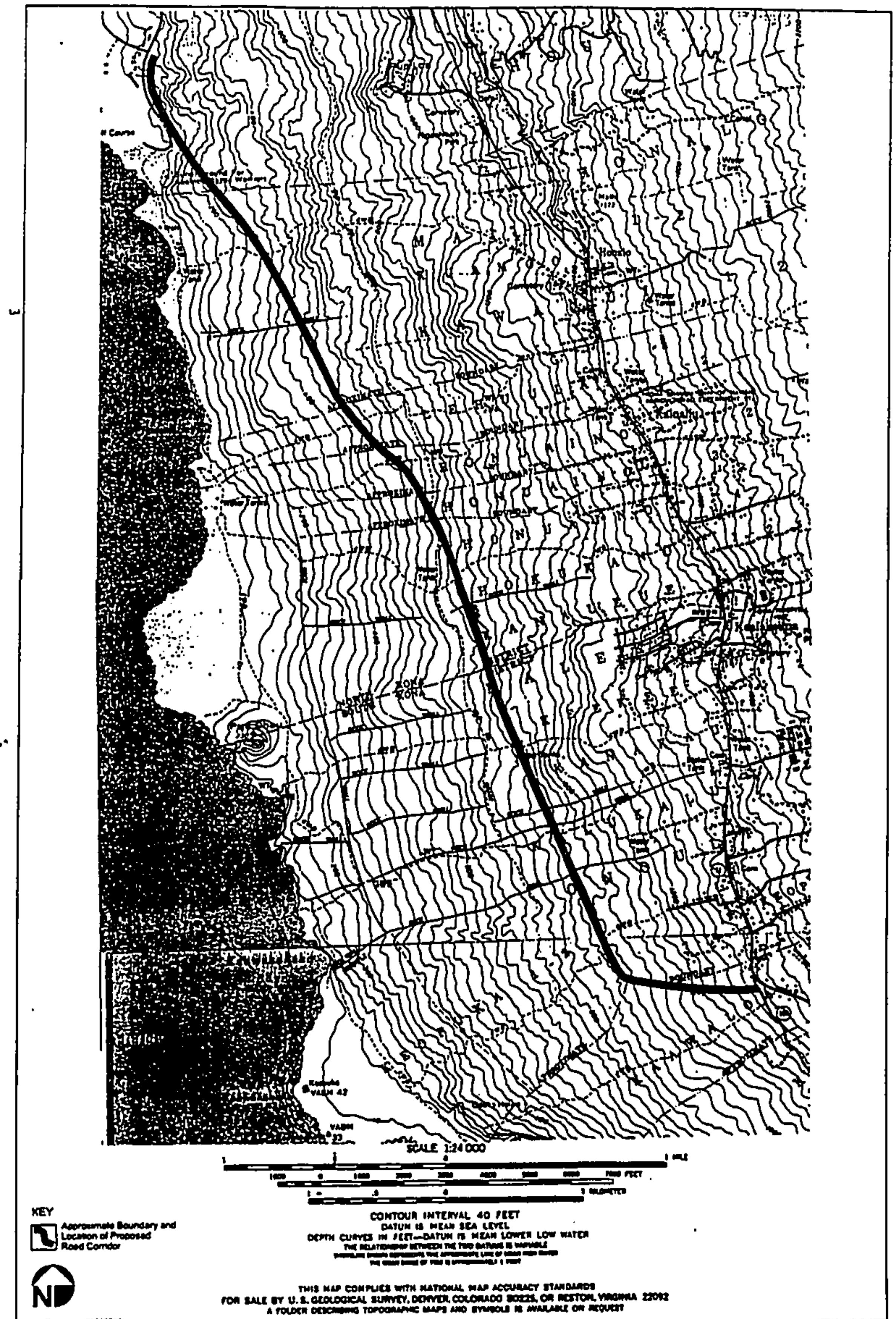


FIGURE 1



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Location of Proposed Mamalahoa Bypass Road Corridor
(U.S. Geological Survey 1984)

FIGURE 2

identified sites within the proposed road corridor using the project maps included in the respective archaeological reports (i.e., Rosendahl and Jensen 1989, Barrera 1990, and Hammatt et al 1997). A summary of the previously identified sites are included in the overall site inventory table presented in this report (see Table 1 – Surveys Results). Excerpts of the previously recorded site descriptions are also provided in the Survey Results section of this report.

BACKGROUND

Environment

There are six soil series, Kaimu (rKED), Kainaliu (KDD and KEC), aa Lava flows (rLV), pahoehoe Lava flows (rLW), and Punaluu (rPYD). The Kaimu series (rKED) is represented by "a well-drained, thin organic soil over Aa lava" which is not suitable for cultivation but can be used for pasture, growing macadamia nuts, papaya, and citrus fruits (Sato et al. 1973:22). The Kainaliu series (KDD and KEC) consists of a well-drained silty clay loam that forms in volcanic ash. This soil is suitable for pasture, and certain orchard crops. KEC is extremely stony and is found in the lower elevations on Hualālai and Mauna Loa. KDD is less stony than KEC and is found in isolated areas and surrounded by recent lava flows. The aa Lava flow series (rLV) is a miscellaneous land type with no soil covering and bare of vegetation, with the exception of ferns, lichens, mosses, and 'ohia trees. The pahoehoe lava flow (rLW) is another miscellaneous land type, which also has no soil covering and is, for the most part, bare of vegetation. The Punaluu series (rPYD) is represented by "well-drained, thin organic soils over pahoehoe lava rock" and are generally used for pasture (Sato et al. 1973:48).

Elevation within the project area ranges from 50 to 1,350 feet above mean sea level. The elevation rises gradually as the corridor ascends the slope from north to south. The project area experiences an annual median rainfall of 40-50 inches, and mean temperature is 78 degrees Fahrenheit (Armstrong 1983:63-64).

The vegetation observed within the proposed road corridor consists mainly of exotic species of plants, such as hibiscus (*Hibiscus* sp.), *kiawe* (*Prosopis pallida*), *Koa haole* (*Leucaena glauca*), guinea grass (*Panicum maximum*), sleeping grass (*Mimosa pudica*), cat's claw (*Macfadyena unglis-cati*), and lantana (*Lantana camara*). Only a few indigenous or Polynesian introduced species were observed; they included *kukui* (*Aleurites moluccana*) and *'ilima* (*Sida fallax*).

Historical Background

The proposed bypass road corridor extends through a multitude (n=17) of *ahupua'a* or traditional Hawaiian land divisions, encompassed within the two districts of North and South Kona. An extensive amount of historical research has been previously done for these *ahupua'a* by Cultural Surveys Hawaii, Inc., and Helen Wong-Smith for the Hōkūkano Project (Hammatt et al 1997) and by Helen Wong Smith and Kepā Maly (1999) in conjunction with the Environmental Impact Statement for the proposed Māmalahoa Bypass Road corridor (Appendix B).

Traditional Hawaiian settlement and land use practices are often intimated through oral histories, ethnographies, early western accounts, and historic documentation. The following is a brief summary of the historical background data compiled and summarized in the Hōkūkano Project report (Hammatt et al. 1997) and in the proposed road corridor project presented in Appendix B (Wong Smith and Maly 1999).

Oral Histories

Most of the oral histories and place name definitions associated with the project *ahupua'a* highlight traditional events and valued resources associated with the coast; such as the battle and burial grounds of Liholiho and Kekuakalanis' warriors at coastal locales between Keauhou and Mā'ihi (Wong Smith and Maly 1999); a rock named "Lanai o Kauhi" at the Hōkūkano coast where a chief by that name would watch his fishing canoes come to shore (Hammatt et al. 1997:28); or human affiliations with sharks at Nāwāwā Bay (Hammatt et al. 1997:35) and references to the shark god Keopulupulu (Wong Smith and Maly 1999:B-1:166). A mythological reference to Onouli, translated as "rations for Uli" with Uli being the grandmother of Kana (Pukui et al. 1974:171), is found in the Kana Legend (Beckwith 1970:464-477). The legend suggests that Onoili provided a plentiful food supply as Kana the demigod, apparently stretched "to Kona to Uli, to our Grandmother, for food and fish".

Keauhou, the most northern of the project *ahupua'a*, is associated with the Kamehameha lineage and it was the birthplace of Kamehameha III (Kauikeaouli) (Wong Smith and Maly 1999:B-1:24). Ka'awaloa, the most southern of the project *ahupua'a*, was a comparable place of political significance, as it was also a preferred residence for the *ali'i* (Keawe-nui-a-'umi, Kalaniopu'u among others) and popular canoe landing for visiting *ali'i*, as well as a sheltered harbor for foreign voyagers during the post-Contact period. Captain James Cook was ultimately slain at the

Ka'awaloa coast and his body taken upland to a place *mauka* called Puhinaolono or Kapuhiolono where it was burned and stripped of flesh (Wong Smith and Maly 1999:B-I:53).

Oral histories obtained from residents and owners of the project *ahupua'a* indicate that traditional Hawaiian subsistence practices were perpetuated during the 19th and 20th centuries, particularly with the procurement of marine goods (fishing and gathering of *limu*) and collection native plants for medicinal purposes (Wm. Paris interview, in Wong Smith and Maly 1999:B-II). Many local informants are aware of the existence of numerous cultural sites in the project *ahupua'a*, (including but not limited to) several *heiau*, the battle and burial grounds of Lekeleke and Kuamo'o (between Keauhou and Mā'ihi), a holding area for leprosy victims at Kahoe'e in Keauhou, 19th and 20th century residences at the coast of Kālināliu, Hōkūkano , and Nāwāwā Bay and, immigrant homesteads and truck farming in the uplands. Mr. William Paris Jr., whose family's ranch lands extend from Mā'ihi to Hōkūkano , recalled that the cattle pastures were often cleared of stone, with the stone refuse piled into indiscrimate mounds or around existing trees (Wm. Paris interview, in Wong Smith and Maly 1999:B-II).

Some of the present owners of the *ahupua'a* are descendents of a long line of ranching dynasties (e.g., Greenwells, Ackermans, Paris, among others) whom originally obtained large tracts of land following the mid-19th century Māhele period. Their personal and ancestral accounts included in Wong Smith and Maly (1999) attest to the changes experienced by the Hawaiian residents once occupying this region of Kona, as the upland agricultural land was gradually converted to pasture land and commercial agriculture crops.

In general, the oral histories intimate that the *ahupua'a* lands between Ka'awaloa and Keauhou were highly valued by Hawaiians for their abundance of food resources from the sea and land. Sizable Hawaiian settlements existed at the coast and important chiefly centers of Kona were established at Ka'awaloa and Keauhou.

Early Post-Contact Accounts

Early historic accounts of foreign voyagers described the uplands of the Kona coast as a verdant landscape that was cultivated in different crops at certain elevations of the Kona slope. This agricultural exploitation of the leeward slopes of Kona has been recognized as part of an agricultural field system (termed the Kona Field System) which was patterned in accordance to four distinct ecological subzones that extended from the coast to the upland forests (cf. Newman 1970, 1972 and 1974; Kelly 1983 and Schilt 1984). The four subzones were established through

the correlation of mid-19th century Land Commission Award (LCA) testimonies, with archaeological remains, and modern climatic data. In *Subsistence and Conflict in Kona, Hawaii* (1984:6), Rose Schilt summarizes the field system subzones based on a prototype developed by T. Stell Newman (1970) with later contributions by Marion Kelly (1983):

Kula Subzone/Coastal Area
- Elevation: Sea level to 500 ft. AMSL
- Annual Rainfall: Ca. 30-50 inches
- Late Prehistoric Crops: Sweet potatoes, gourds, and wauke.

Kalu'ulu Subzone/Seaward Slope
- Elevation: 500-1000 ft. AMSL
- Annual Rainfall: Ca. 40-55 inches
- Late Prehistoric Crops: Breadfruit, sweet potatoes interspersed, mountain apple, and taro.

'Apa'a Subzone/Upland Slope
- Elevation: 1000-2500 ft. AMSL
- Annual Rainfall: Ca. 55-80 inches
- Late Prehistoric Crops: Taro, sweet potatoes, ti, and sugarcane.

Ama'u Subzone/Upland Jungle
- Elevation: 2500-4000 ft AMSL
- Annual Rainfall: Ca. 80 inches
- Late prehistoric Crops: Bananas and plantains

Mid-19th century LCA testimonies indicate that traditional crops continued to be cultivated in at least nine of the project *ahupua'a*, between approximately 1,200 ft and 1,500 ft amsl (Hammatt et al 1997:38). Land Commission Awards were also claimed in parcels in Hōkūkano as low as 400 ft amsl (Hammatt et al 1997:57). Unfortunately these lower LCA's, including LCA No. 8157-O crossed by the proposed road corridor, lack testimonies describing land use at these elevations.

The LCA data also specifies that permanent residences were claimed along the coast of the *ahupua'a*, especially in embayments, such as Nāwāwā Bay and adjacent to accessible shorelines, such as at Hōkūkano and neighboring Honua'ino

Post-Contact Settlement and Land Use

Tomonari-Tuggle (1985:34-35), as cited in Burtchard (1993:48), summarize the post-Contact settlement pattern of Kona. A marked change in the traditional settlement pattern is discernable as a result of foreign occupation in the region and the development of market-based enterprises:

> By the turn-of-the-century, the Kona uplands were developing into an agricultural haven for small farmers, nurtured by the family-oriented coffee industry (Lind 1967). Settlements strung out and grew along the Belt Highway in the lush uplands, leaving the dry and rocky coastline to few hardy individuals.
>
> The Kona settlement pattern was an array of small towns, each servicing an integrated community. Main towns...were located at Kailua, Keauhou, Napoopoo, and Honaunau along the coast, and at Kealakekua, Kainaliu, Holualoa, and Captain Cook along the Belt Highway. Each town had it stores, churches, and schools. Post offices were located at Keauhou, Holualoa, Kailua, Napoopoo, and Kealakekua town (Donn 1901).
>
> Along the coast, Keauhou was the literal "end of the road" from Kailua; the road continued further south as only a trail. Kahalu'u was merely a cluster of houses along the way. But perhaps more important than the coastal road were the carriage roads and paths which connected the coast with the uplands. The changing focus of community life to the uplands is reiterated in a visitor's description of Keauhou Bay as "miles off the beaten path...a place where few people used to live in numbers and now live no more" (Schenck 1931:80).

Concurrent with the post-Contact settlement shift from the coast to the uplands of the project *ahupua'a*, large tracts of land were acquired by foreigners and used primarily as ranch lands and smaller parcels for commercial agriculture (e.g., sugarcane and coffee). Presently, much of the *ahupua'a* land is still utilized as pasture land, particularly within the elevations crossed by the proposed road corridor.

In sum, the early historical accounts and 19th century documentation (supplemented by modern archaeological research) indicate that the upland elevations of the project *ahupua'a* were under intensive cultivation during pre- and post-Contact times. Cultivation of the uplands developed into a systematic field system (commonly termed the Kona Field System) where certain crops were cultivated within distinct environmental zones. The project corridor crosses through two of these zones: the Kalu'ulu subzone, where breadfruit, interspersed with sweet potatoes, mountain apple and taro, were cultivated; and in the upper *'āpa'a* subzone where taro, sweet potatoes, *ti* and sugarcane were cultivated.

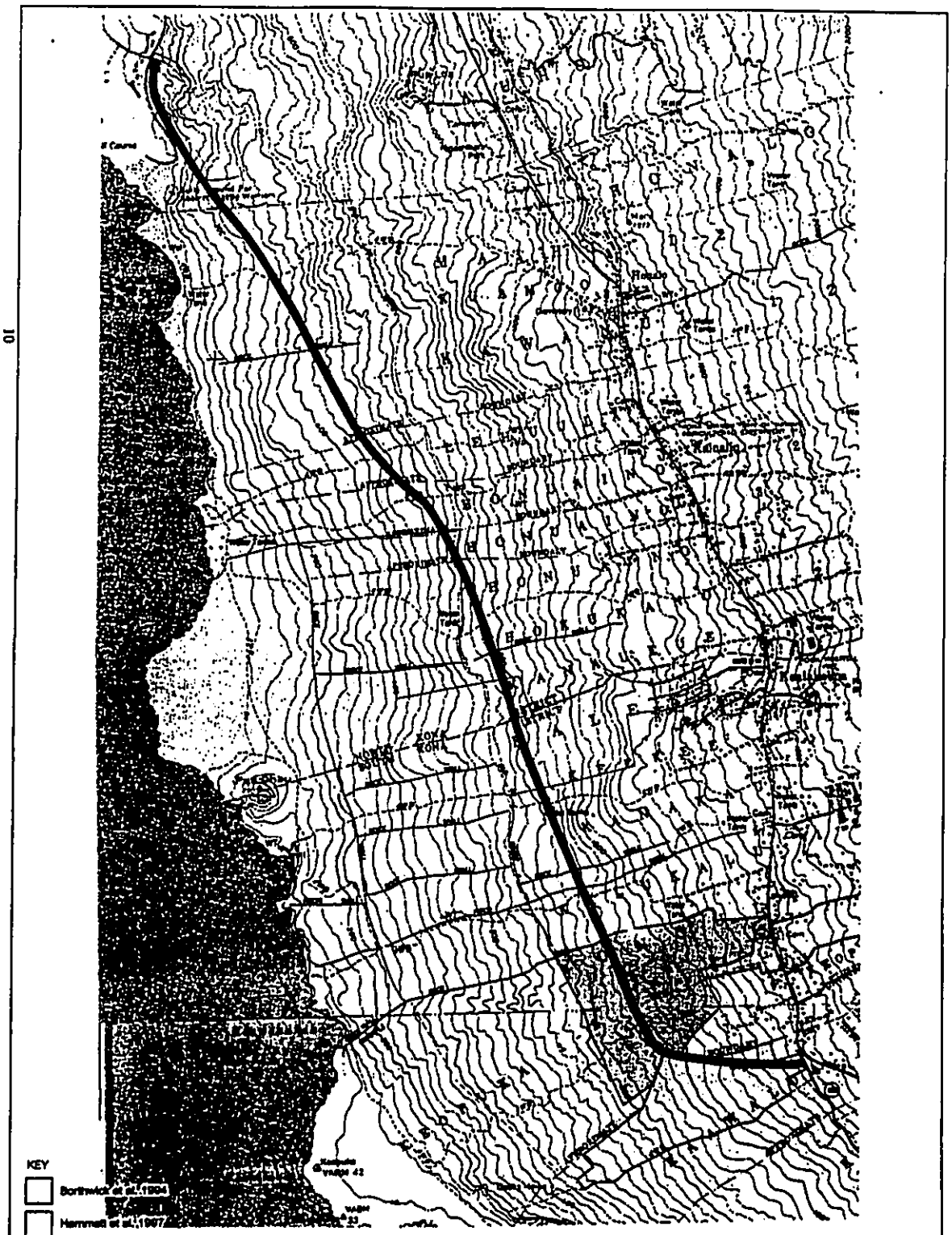
PREVIOUS ARCHAEOLOGICAL INVESTIGATIONS

Over 12 archaeological investigations have been conducted within the 17 *ahupua'a* in the proposed road corridor, most of which focused on the coast. The reader is referred to the Hammatt et al Report (1997:75-86) for a detailed discussion on the previous studies conducted outside of the proposed road corridor.

Three of the 12 previous archaeological studies were inventory-level surveys that included portions of the proposed road corridor (Barrera 1990; Rosendahl and Jensen 1989; and Hammatt et al. 1997) (Figure 3). It is Ogden's understanding that the Department of Land and Natural Resources, State Historic Preservation Division (DLNR/SHPD) has previously approved the site evaluations and recommended mitigation measures of these inventory surveys, including those previously recorded sites currently located in the proposed road corridor (P. McCoy, pers. comm.).

William Barrera (1990) conducted an archaeological survey of a parcel at the south end of the proposed road corridor (TMK 8-1-09-03). The parcel is situated in Ka'awaloa Ahupua'a, between approximately 600 and 1,300 ft amsl, and is adjacent to Napoopoo Road on the east and the northern boundary of Ka'awaloa (with Keōpuka) on the north. Two sites were recorded during the inventory survey: Site 13173, a stone wall, and Site 13174, a stone mound. Based on Barrera's site location map (Barrera 1990:3) Site 13174 may be located within the proposed bypass road corridor (see Figure 7 – in Survey Results). Site 13174 is a stone mound probably attributable to historic agriculture or ranching activities (Barrera 1990:3). Site 13174 was originally recommended for data recovery work. However, the current landowner elected to preserve the sites in current development plans using a 30-foot buffer zone around the sites (P. McCoy, pers. comm).

Paul H. Rosendahl, Inc. (PHRI) conducted an archaeological inventory survey of an approximately 248-acre parcel located in the Onouli and Keōpuka *ahupua'a* (Rosendahl and Jensen 1989). The project area was located between 800 and 1350 ft amsl. A total of 57 sites (Sites 11272-11328) were recorded in the project area, which included both pre-Contact and post-Contact sites. Roughly half of the sites were interpreted as habitation and agricultural features associated with the Kona Field System, while the remainder of the site inventory was interpreted as historic ranching and agricultural sites (Rosendahl and Jensen 1989:14). Based on a site location map included in the Rosendahl and Jensen Report (1989:8), four sites may be situated within the proposed road corridor (Sites 11272, 11274, 11301, 11307) (see Figure 7 – in Surveys Results). These sites consist of two historic ranch walls (Sites 11272 and 11274), 50 to 100 agricultural pits (Site 11301), and a habitation enclosure (Site 11307). All of the identified sites were recommended for data recovery.



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Locations of Previous Archaeological Inventory Surveys
In Proposed Mamalahoa Bypass Road Corridor
(U.S. Geological Survey 1984)

FIGURE 3

Cultural Surveys Hawaii, Inc. conducted an archaeological inventory survey of a 1540-acre parcel overlapping nine of the *ahupua'a* crossed by the proposed road corridor, including Honua'ino, Hō kūkano, Kanāueue, Haleki'i, Ke'eke'e, 'Ilikahi, Kanakau, Kalukalu, and Onouli (Hammatt et al. 1997). The project area, commonly referred to as the Hōkūkano Project, extended between the coast (sea level) and approximately 1,240 ft amsl. The inventory survey identified over 408 sites which Hammatt et al. (1997) attribute to traditional Hawaiian use during the pre- and post-Contact periods and non-traditional use during the post-Contact period.

The traditional Hawaiian sites consist of a wide range of functional types, including expansive complexes of agricultural features (components of the Kona Field System), temporary and permanent habitations, *heiau*, refuge caves, burials, animal pens, trails, *ahupua'a* boundary walls, the Kuakini Wall, and a section of the Government Road. Petroglyphs, konane, bait cups, and salt pans were found in association with these sites. Post-Contact house sites correlating to mid-1800s LCAs were also identified along the coast.

The non-traditional sites consisted of features associated with 19th and 20th century ranching, such as boundary walls forming cattle paddocks, wells, and pig traps, but also included historic homesteads, agricultural features associated with commercial or homestead agriculture, and the Kona and Kona Sugar Co. railroad bed. A 19th century warehouse used by H.N. Greenwell for the storage of wool was also identified along the coast (Hammatt et al 1997:45).

Hammatt et al. (1997:290) postulate that traditional occupation of the nine *ahupua'a* was concentrated in village-like settings on the coast and interspersed ("not congregated") among the upland agricultural fields. In contrast, temporary habitation sites were established among both the coastal and upland regions of the *ahupua'a* in proximity to subsistence resources (marine and agricultural goods) (Hammatt et al. 1997:130). Potential burial sites were identified throughout the elevations of the Hōkūkano Project *ahupua'a*. A burial testing study was recently conducted by Cultural Surveys Hawaii, Inc. to confirm or dispute the potential burial functions of these sites (Colin et al. 1998, in progress).

Based on the site location map in the Hammatt et al. Report (1997:4; at original scale), a total of 12 sites are located within the proposed bypass road corridor (Sites 7214, 16599, 16666, 16787, 16788, 16789, 16791, 16792, 16796, 16797, 16799, and 16800). Nine of the sites were interpreted as historic boundary and cattle walls (including ahupua'a walls), two as agricultural

sites (Site 16666), including an agricultural site with a temporary habitation (Site 16599), and the remaining site is the Kona Sugar Co. railroad trestle (Site 7214/10302).

Results of two of the previous archaeological studies discussed above (i.e., Rosendahl and Jensen 1989 and Hammatt et al. 1997) indicate that traditional, agricultural features associated with intensive, dryland agriculture (components of the Kona Field System) and associated habitation sites are present within the southern and central portions of the proposed road corridor. Post-Contact ranching and commercial agricultural features were also identified in the elevation zones of the proposed road corridor.

The inventory survey conducted by Barrera (1990) suggests that the southern end of the proposed corridor crosses through previously disturbed terrain where only two sites remain intact. One of these sites, a stone mound (Site 13174), possibly related to historic land use, may exist within the proposed road corridor.

SETTLEMENT PATTERNS

The historical background and results of previous archaeological research discussed above suggest a general pattern of traditional Hawaiian settlement and land use in the project *ahupua'a* during the pre-Contact and early post-Contact period.

Permanent occupation of the project *ahupua'a* was centered on the coast, with Ka'awaloa and Keauhou, becoming major political centers of Kona. Village-like concentrations were established between the two political centers, typically adjacent to embayments, such as Nāwāwā Bay at the coast of Ke'eke'e and Kanakou, and other ocean-accessible localities at Hōkūkano, Honua'ino (Kainaliu), with smaller hamlets located between Honalo and Kuamo'o. The coastal settlements contained major *heiau* and structures with features characteristically associated with the Hawaiian *ali'i* (e.g., *holua*, *kapu* stone, substantial house sites).

The ascending slope above the coastal settlements was utilized for intensive, dryland agriculture, with different elevational zones of the *ahupua'a* systematically cultivated in certain crops. This method of dryland agriculture, commonly termed the Kona Field System, is characterized in the archaeological record as a diverse concentration of agricultural features that modify existing terrains from sea level to approximately 2,500 ft amsl. The proposed corridor extends through at least two of the elevational zones: the Kula Subzone (sea level to 500 ft amsl), where sweet potatoes, gourds and wauke were allegedly cultivated; and the Kalu'ulu Subzone (500 to 1000 ft

amsl), where breadfruit trees and sweet potatoes were the primary crops interspersed with mountain apple trees and taro. The previous archaeological record suggests that temporary habitation was the primary settlement mode among the Kona Field System. Permanent residences were eventually established among the uplands of the *ahupua'a*, but the distribution of residences was dispersed and not clustered in village-like settings.

The traditional settlement and land use pattern was transfigured during the post-Contact era in direct response to foreign contact. In addition to a rapid decrease in native populations due to foreign diseases, demographic shifts occurred within the *ahupua'a* and districts, as people were drawn to the major ports (e.g., Kailua-Kona) and upland villages for commerce and trade activities. New population centers arose along the upper elevations of some of the *ahupua'a* (i.e., along the current Mamalahoa Highway) in proximity to environments conducive for commercial agriculture, such as coffee and sugarcane. The remaining lands between the coast and developing upland villages (including elevations crossed by the proposed road corridor) were eventually purchased by private landowners and most converted to pasture land. The majority of the elevations crossed by the proposed road corridor continue to be utilized for pasture land.

METHODS

The field surveys of the proposed road corridor were conducted using crews of three archaeologists, spaced between 10 to 20 meters apart. Prior to the ground surveys, the center line of the proposed road corridor was flagged, under the direction of Oceanside 1250 Partners, with pink surveyors tape. During the field work the survey transects were aligned according to the flagged center lines.

Each site was described in detail and mapped using tape and compass. All sites were photographed using 35 mm color film. Temporary site numbers and feature designations were assigned in the field with site numbers placed on pink and blue flagging tape. Each site and individual features were recorded on standard archaeological forms. Functional interpretations of site features were based on structural characteristics, artifactual evidence, historical documentation, and previous archaeological interpretation of similar sites. Significance and recommendations for each site were determined on the basis of site complexity, apparent function, and, in the case where previous archaeological investigations were conducted, the previous investigators' significance evaluation and recommendations.

Because this survey is a proposed road corridor, only the portions of the site or features that were directly within the corridor were recorded in detail. Site portions that extended outside the corridor were examined to determine the function and significance of the site or feature, but were not recorded in detail.

Subsurface testing was conducted at one site (Site 21236) within the proposed survey and at one site (21247) in a previous alignment of the road corridor (see Appendix A). All test units were excavated with trowels, with the excavated materials screened through nested 1/4- and 1/8-inch mesh screens. The test units were excavated by natural soil layers with arbitrary levels not exceeding 10 cm depths. Descriptions of soil/sediment layers identified during test excavations were recorded both in the field and in the laboratory following U.S. Soil Conservation standards. Bulk soil samples were collected to aid in recording soil/sediment data and for charcoal collection. Soil color was recorded using Munsell notations. Profiles were drawn of each unit, and color photographs were taken.

All field notes, photographs, and artifacts are filed at the office of Ogden Environmental and Energy Services in Honolulu.

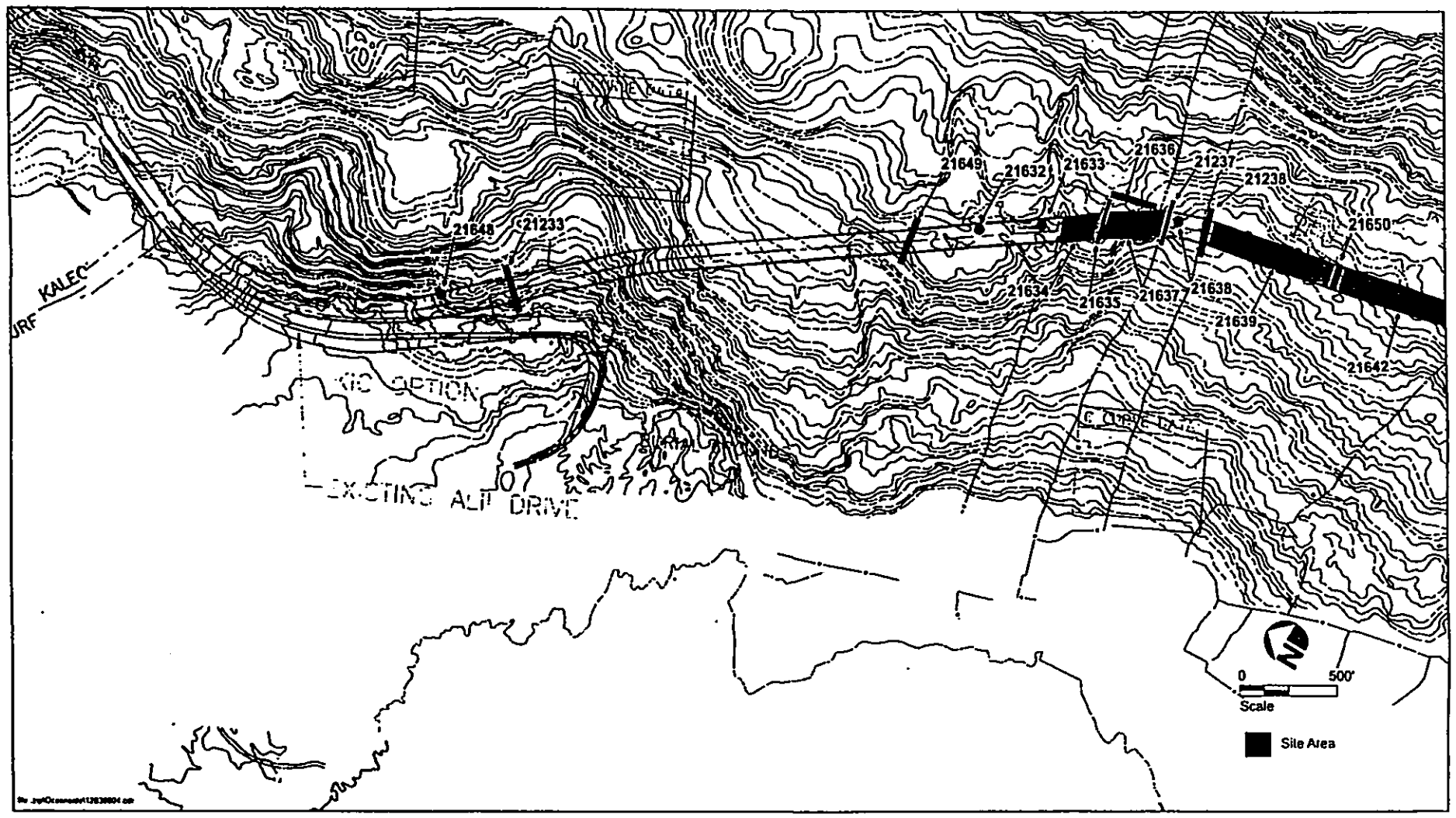
SURVEY RESULTS

As a result of the inventory surveys conducted by Ogden and previous archaeological studies overlapping the central and south portion of the project corridor (Barrera 1990; Rosendahl and Jensen 1989; and Hammatt et al. 1997), a total of 47 sites have been identified within the proposed bypass road corridor (Figures 4 through 7; Table 1). An additional 15 sites were identified outside of the present course of the proposed road project corridor. Site locations and brief descriptions of these 15 sites are presented in Appendix A. Site descriptions and interpreted functions of the 47 sites are presented below.

SITE DESCRIPTIONS

Site 50-10-37-11272

Site 11272 was previously recorded as a linear wall (Rosendahl and Jensen 1989) which appears to be situated in the *ahupua'a* of Onouli, at approximately 930 ft amsl (see Figure 7). The site is



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Section 1: Archaeological Site Locations In Proposed Mamalahoa Bypass Road Corridor

FIGURE 4

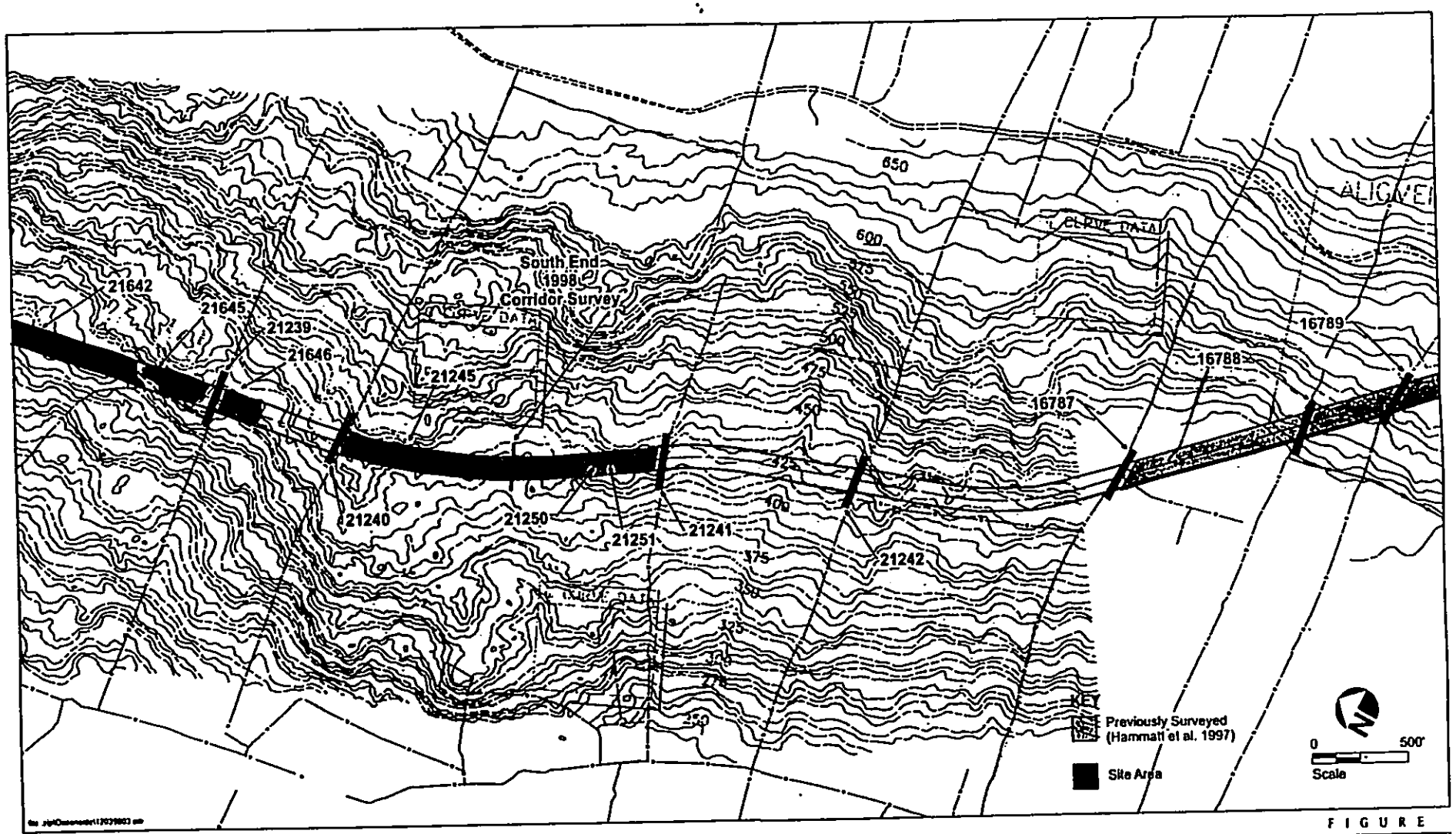

FIGURE 5

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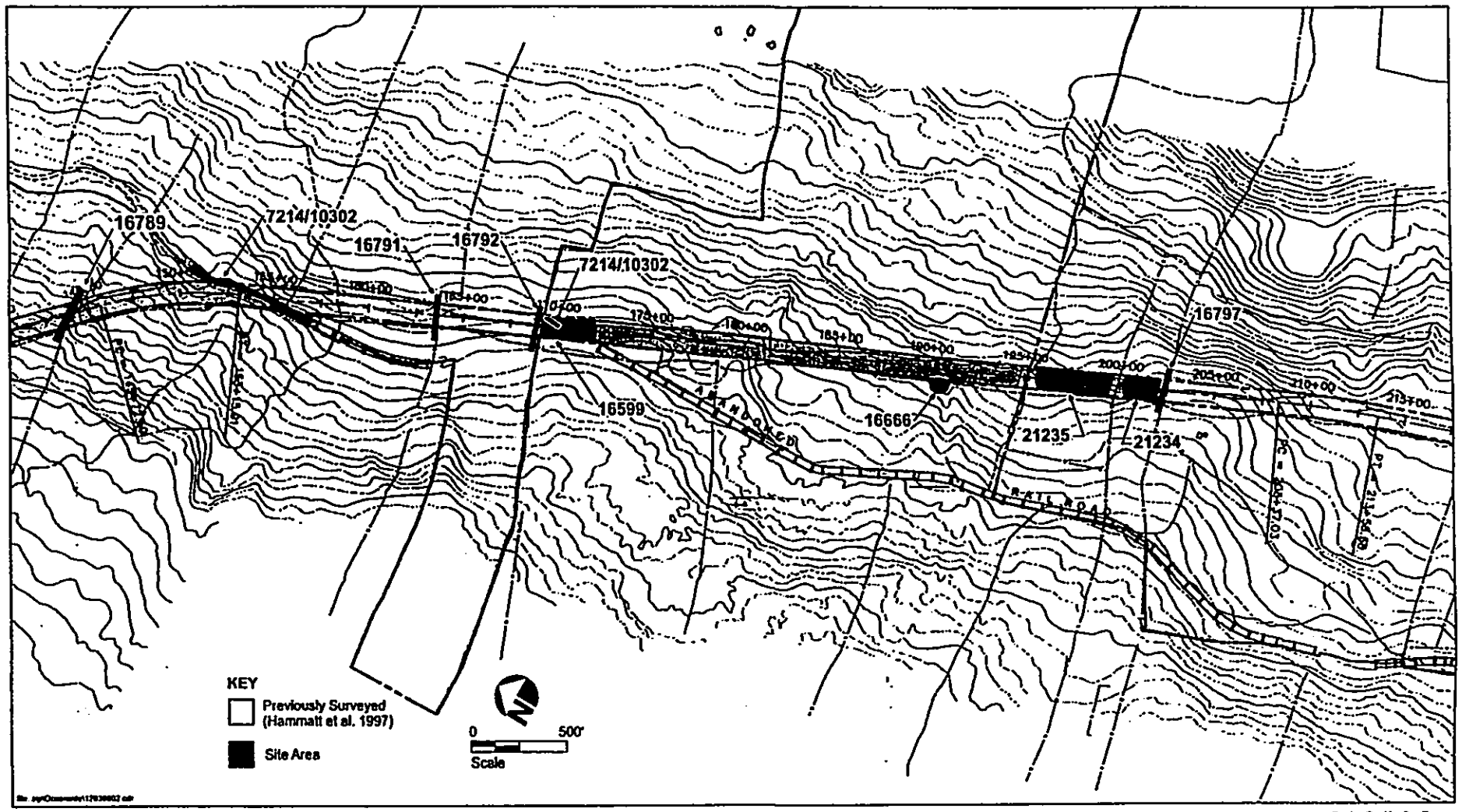
Section 2: Archaeological Site Locations in Proposed Mamalahoa Bypass Road Corridor and Previously Surveyed Areas



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Section 3: Archaeological Site Locations in Proposed Mamalahoa Bypass Road Corridor and Previously Surveyed Areas

FIGURE 6

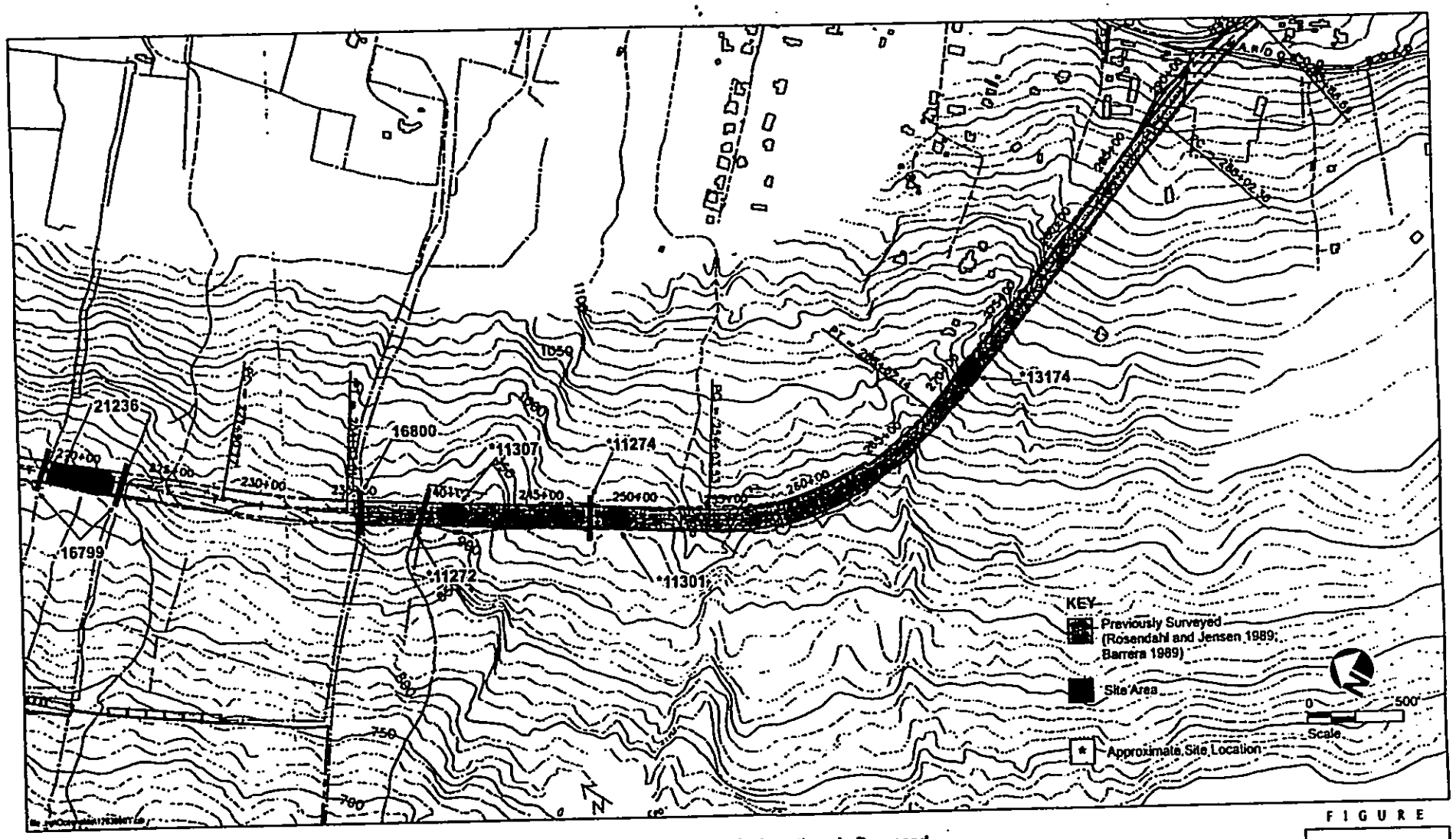

FIGURE 7

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Section 4: Archaeological Site Locations in Proposed Mamalahoa Bypass Road Corridor, Excluding Site Locations in Previously Surveyed Areas

Table 1 (Continued)

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
16787	Honuaino 2-Honuaino 3		Wall	Boundary/agriculture	Prehistoric/Historic
16788	Honuaino 3-Honuaino 4		Wall	Boundary/agriculture	Prehistoric/Historic
16789	Honuaino 4		Wall	Boundary	Historic
16791	Hōkūkano 1-2		Wall	Boundary	Historic
16792	Hōkūkano 2-Kanāueue 1		Wall	Boundary/agriculture	Prehistoric/Historic
16796	Ke'eke'e 1-2		Wall	Boundary/agriculture	Prehistoric/Historic
16797	Ke'eke'e-Kanaknu		Wall	Boundary/agriculture	Prehistoric/Historic
16799	Kalukalu-Onouli 1		Wall complex	Boundary/ Agriculture/ranching	Prehistoric/Historic
		1	Wall		
		2	Wall		
		3	Wall		
		4	Wall		
		5	Wall		
16800	Onouli 1		Parallel walls	Historic boundary/ranching	Prehistoric/Historic
21233	Keauhou		Wall-enclosure complex	Historic boundary/Ranching?/ agriculture	Prehistoric/Historic

Table 1 (Continued)

Table 1: Summary of Archaeological Sites in Proposed Mānalahoa Bypass Road Corridor

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
11272	Onouli 2		Wall	Boundary/ranching	Historic
11274	Onouli 2-Keōpuka		Wall	Ahupua'a boundary/ranching	Prehistoric/Historic
11301	Keōpuka		Complex of a'a pits	Agriculture	Prehistoric
11307	Onouli 2		Enclosure	Habitation	Prehistoric
13174	Ka'awaloa		Mound	Historic agriculture/ranching	Historic
7214/10302	Hōkūkano		Berm	Railroad bed	Historic
16599	Kanāueue		Wall-enclosure complex	Agriculture/temporary habitation/storage	Prehistoric/Historic
		1	Enclosure	Temporary habitation/storage	
		2	Wall	Historic boundary	
		3	Wall	Agriculture	
		4	Wall	Agriculture	
		5	Wall	Agriculture	
		6	Enclosure	Temporary habitation/storage	
16666	Ke'eke'e		Enclosure	Agriculture	Prehistoric

Table 1 (Continued)

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21235 (cont.)		1	Mound		
		2	Mound		
		3	Mound		
		4	Mound		
		5	Mound		
		6	Wall		
		7	Wall segment		
		8	Wall		
		9	Terrace remnant		
		10	Terrace remnant		
		11	Terrace remnant		
		12	Terrace		
		13	Terrace		
		14	Mound		
		15	Mound		

Table 1 (Continued)

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21233 (cont.)		1	Wall	Historic boundary/ranching	Historic
		2	Wall	Historic boundary/ranching	Historic
		3	Wall	Historic boundary/ranching	Historic
		4	Modified pahoehoe depression	Agriculture	Prehistoric
		5	Pahoehoe depression	Agriculture	Prehistoric
21234	Ke'eke'e		Terrace-wall complex	Agriculture/poss. habitation	Prehistoric/Historic
		1	Terrace	Habitation?	
		2	Wall	Agriculture	
		3	Terrace	Agriculture	
		4	Wall segment	Agriculture	
		5	Wall remnant	Agriculture	
		6	Terrace	Agriculture	
		7	Terrace	Agriculture	
		8	Rocky slope	Agriculture	
21235	Ke'eke'e		Terrace-mound-wall complex	Agriculture	Prehistoric/Historic

Table 1 (Continued)

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21235 (cont.)		31	Mound		
		32	Mound		
		33	Mound		
		34	Mound		
		35	Mound		
		36	Mound		
		37	Mound		
		38	Mound		
		39	Mound		
		40	Mound		
21236	Kalukalu		Wall-terrace complex	Agriculture	Prehistoric
		1	Wall		
		2	Wall		
		3	Terrace		
		4	Wall		

Table 1 (Continued)

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21235 (cont.)		16	Wall		
		17	Terrace		
		18	Mound		
		19	Mound		
		20	Mound		
		21	Mound		
		22	Wall		
		23	Terrace		
		24	Mound		
		25	Terrace remnant		
		26	Mound		
		27	Terrace		
		28	Mound		
		29	Mound		
		30	Terrace		

Table 1 (Continued)

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21248 (cont.)		2	Wall section	Agriculture	
21250	Kawanui		Lava blister-modified sink	Temporary habitation	Prehistoric
21251	Kawanui		Terrace-wall complex	Agriculture/work area?	Prehistoric
		1	L-shaped wall		
		2	Terrace		
		3	Wall		
		4	Mound		
21632	Honalo		Wall-mound complex	Animal pen	Prehistoric/Historic
		1	Wall		
		2	Mound		
21633	Honalo		Wall section	Historic/modern boundary	Historic
21634	Mā'ihi		Terrace-mound complex	Agriculture	Prehistoric
21635	Mā'ihi		Wall	Historic boundary/ranching	Historic
21636	Mā'ihi		Wall	Historic boundary/ranching	Historic
21637	Mā'ihi		Terrace-mound-enclosure complex	Agriculture	Prehistoric

Table 1 (Continued)

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21236 (cont.)		5	Circular alignment		
		6	Circular alignment		
		7	Circular alignment		
		8	Terrace		
		9	Terrace		
		10	Walled sink		
21237	Mā'ihi 1-2		Wall	Ahupua'a boundary/ranching	Prehistoric/Historic
21238	Mā'ihi 2 – Kuamo'o		Wall	Ahupua'a boundary/ranching	Prehistoric/Historic
21239	Kuamo'o- Kawanui 1-2		Wall	Ahupua'a boundary/ranching	Prehistoric/Historic
21240	Kawanui 1-2		Wall	Boundary/ranching	Historic
21241	Kawanui 2- Lehuula		Wall	Ahupua'a boundary/ranching	Prehistoric/Historic
21242	Lehu'ula – Kawanui		Wall	Ahupua'a boundary/ranching	Prehistoric/Historic
21245	Kuamo'o		Modified outcrop-mound terrace complex	Agriculture	Prehistoric
21248	Kawanui		Enclosure-wall complex	Animal pen/agriculture	Prehistoric/Historic
		1	Enclosure	Animal pen	

Table 1 (Continued)

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21638	Mā'ihi		Walls	Historic road/cattle run?	Historic
21639	Kuamo'o		Modified outcrop-terrace complex	Agriculture	Prehistoric
21642	Kuamo'o		Modified outcrop-enclosure-terrace	Agriculture	Prehistoric
21645	Kuamo'o		Modified outcrop complex	Agriculture	Prehistoric
21646	Kawaihae		Mound-modified outcrop complex	Agriculture	Prehistoric
21648	Kawaihae		Pahoehoe excavations	Agriculture/mining?	Historic?
21649	Keauhou-Honalo		Wall	Ahupua'a boundary/ranching	Prehistoric/Historic
21650	Kuamo'o		Wall	Agriculture (boundary?)	Prehistoric
21652	Kawaihae	1	Lava blister-wall complex	Temporary habitation	Prehistoric
		2	Lava blister		
			L-shaped wall		
21662	Kawaihae		Enclosure	Temporary habitation	Prehistoric

interpreted as an historic boundary and ranching wall. The following site description is provided in the Rosendahl and Jensen Report (1989.A-1):

> Wall/alignment of basalt boulders, well faced on one side, averaging three courses high. Historic construction indicated by near-vertical sides, association with a leveled road/corridor, and the extension of the wall from Mamalahoa Highway to the shoreline. Some bulldozing and small accumulations of historic debris (including broken bottles and wire) noted in the vicinity.

Site 50-10-37-11274

Site 11272 was previously recorded as a linear wall (Rosendahl and Jensen 1989) which appears to extend along the *ahupua'a* boundary between Onouli 2 and Keōpuka at approximately 960 ft amsl (see Figure 7). The site is interpreted as a wall or historic boundary wall. The following site description was provided in Rosendahl and Jensen (1989: A-1):

> Consists of aa boulders and cobbles stacked six to eight courses high. Probable age cannot be determined on the basis of reconnaissance data. Site 11274 includes what had previously been designated Site T-17 (PHRI Temp. No.).

Site 50-10-37-11301

Site 11301 was previously recorded as a complex of 50-100 pits located on a flat a'a flow (Rosendahl and Jensen 1989) which appears to be situated in the proposed road corridor, in Keō puka Ahupua'a (see Figure 7). The site is situated around 950 ft amsl. The site is interpreted as an agricultural complex that is a component of the Kona Field System. Rosendahl and Jensen (1989:A-19) provide the following site description:

> The pits are oval to circular in plan view and are 0.5-2.0 meters in diameter by 0.4-1.1 meters deep. The pits closely resemble those recorded at Sites T-102 and -109, except they are generally larger. The pits probably represent components of the Kona Field System.

Site 50-10-37-11307

Site 11307 was previously recorded as an enclosure (Rosendahl and Jensen 1989) which appears to be located within the proposed road corridor, in Onouli 2 Ahupua'a. The site is situated around 920 ft amsl (see Figure 7). The site is interpreted as a pre-Contact habitation site that may have been utilized during the post-Contact era by ranchers. Rosendahl and Jensen (1989:A-20,21) provide the following site description and functional interpretation:

> Consists of basalt boulders stacked four to six courses high and wide. The walls of the enclosure average 0.9 high and 1.0 meter wide. The enclosure overall measures 25.0 m north-south by 20.0 m east-west. Portions of the south end of the enclosure have collapsed. The floor of the enclosure has been partly paved with cobbles and other fill material. Some soil has accumulated within the southwest corner of the enclosure; however the soil does not evidence prehistoric midden. Site 11307 is believed to have been used/occupied prehistorically. It is also possible the site was used historically for ranching.

Site 50-10-37-13174

Site 13174 was previously recorded as a mound (Barrera 1990) in Ka'awaloa Ahupua'a. The site may be located in the proposed road corridor at approximately 1,060 ft amsl (see Figure 7). Barrera 1989:3 provides the following site description and functional interpretation of the site:

> This is a rectangular stone mound measuring 1.7 by 2.0 meters [2.6 square meters] and standing to a height of 1.0 meter. It is constructed of multiple-stacked boulders and cobbles. No midden or artifacts are present.
>
> The site's function is problematical, but its form does not distinguish it from other features common in the Kona Field System which probably served a dual purpose. In the first place they provided a convenient way of stacking up rocks removed from agricultural fields, and, in the second, they would themselves have provided a situation for planting economic cultigens. There is also the possibility that the feature marks a grave.

In the recommendations section of Barrera's report (1990:3) he speculates that Site 13174 may have been associated with historic agricultural or ranching activities since the natural landscape was not conducive for cultivations in the Kona Field System.

Site 50-10-37-7214/10302

Site 7214/10302 is a railroad berm, previously recorded by Rosendahl (Site K-2), Burtchard (as Site 7214), and Hammatt et al. (as Site 10302). The railroad berm crosses all the *ahupua'a* comprising the project corridor. However, only two sections of the site berm crosses the proposed bypass road corridor. These sections are in the *ahupua'a* of Hōkūkano and Kanāueue around 690 ft amsl (see Figure 6). The following is the site description provided in Hammatt et al. (1995:23):

> State site -10302 is a historic railroad bed which delineates the majority of the mauka or east boundary of the project area. The site correlates with Paul H. Rosendahl Inc. site K-2. It is constructed of large fitted boulders with a rock fill. The top surface consists of a layer of small cobbles and/or soil fill. The railroad bed measures approximately 3.2 m. (10.5 ft.) in width and a maximum of 4.5 m. (14.8 ft.) in height. A number of railroad spikes were observed along with rail ties

> with spikes still in place (used presently as fence posts). The causeway sections of the berm are in excellent condition and are massively constructed.

The construction style of Site 7214/10302 described in Hammatt et al (1995) is similar to the site sections observed in the proposed road corridor during the present study (Figures 8 and 9).

Site 7214/10302 Summary

Historic background research indicates that Site 7214/10302 represents a railroad trestle constructed by the Kona Sugar Co. in 1901 to haul cane from the surrounding cane fields (Hammatt et al.1997:206).

Site 50-10-37-16599

Site 16599 was previously recorded by Hammatt et al. (1997) as an agricultural enclosure, located in the *ahupua'a* of Kanāueue, at approximately 690 ft amsl (see Figure 6). The site description presented in Hammatt et al. (1995:5) follows:

> State site -16599 is a semi-rectangular enclosure situated on a gentle slope of well-grazed grassland and surrounded by scattered koa haole trees. There is a fairly abundant soil with a scattering of cobbles. This enclosures [sic] measures 9.9 m. (32.5 ft.) N/S by 5.9 m. (19.4 ft.) E/W and is constructed of piled boulders and cobbles. The wall ranges from 0.5 (1.6 ft.) to 0.6 m. (2.0 ft.) high. The enclosure is flush with the slope on the west side and there is a mounded wall on the east. The central area is deep, fairly level soil with numerous scattered cobbles (probably from the walls). No artifacts or midden were observed. State site -16599 is in fair condition and offers fair excavation potential.

Additional features were observed around Site 16599 enclosure, including a wall (Feature 2), three low, wall sections (Features 3, 4, and 5) and a second enclosure (Feature 6) (see Figure 9). The original enclosure recorded by Hammatt et al. (1997) is referred to as Feature 1 in this study. Site 16792 wall extends in an east-west direction to the north of the site; a section of Site 7214/10302 railroad berm is also present in the site area and abuts the south side of Site 16792.

Subsurface testing was conducted at Feature 1 enclosure, the original site feature recorded by Hammatt et al. (1997). These testing results follow:

Site 16599, Feature 1 Testing

A 1.0 by 0.5 m test unit (TU-1) was excavated near the enclosure's interior northeast corner. A portion of the surface rock in TU-1, assumed to be associated with wall tumble, was removed prior

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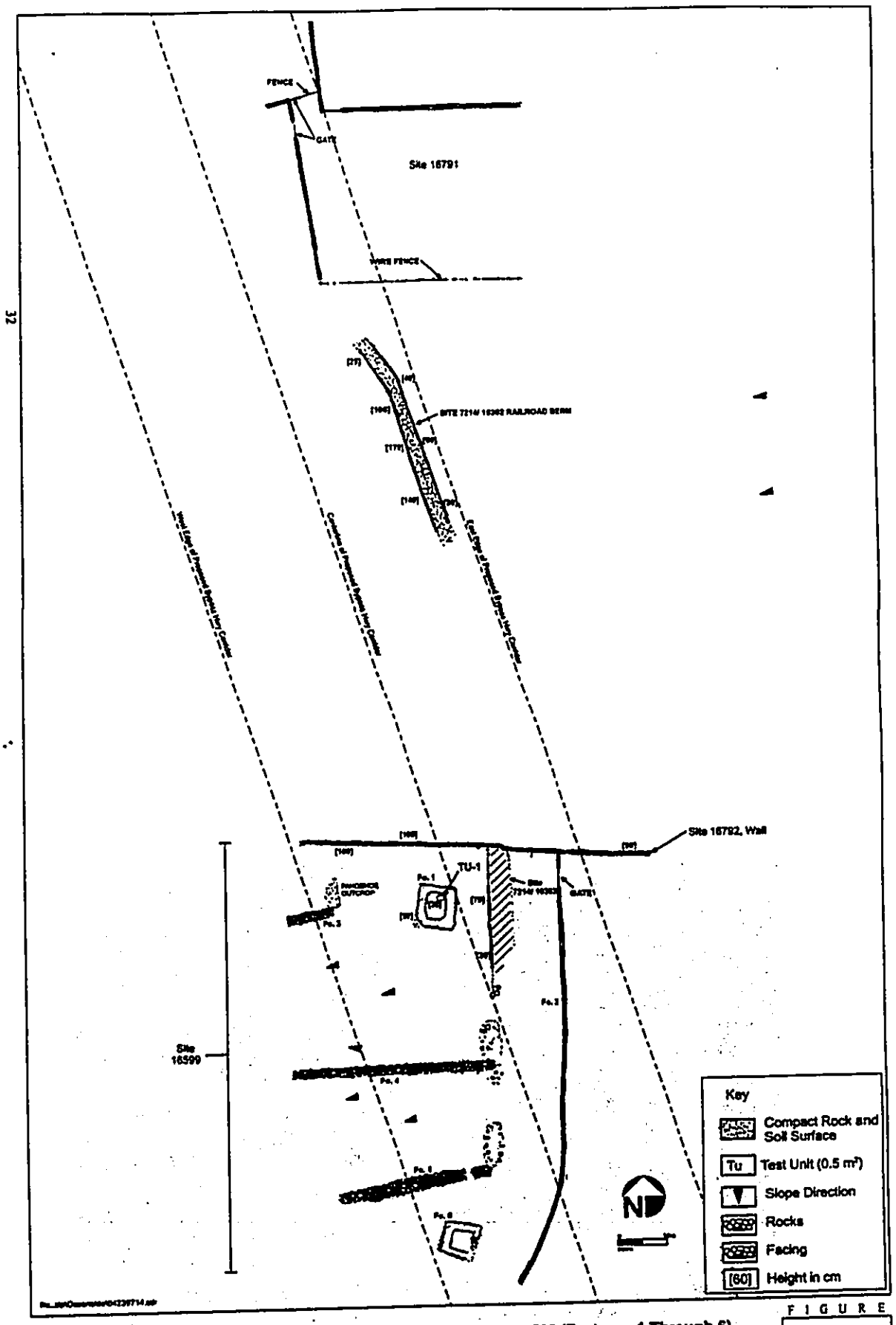
Two Views of Kona Sugar Co. Railroad Berm
(Site 50-10-37-7214)

FIGURE



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Site 50-10-37-7214/ 10302 Railroad Berm, Site 16599 (Features 1 Through 6), Site 16791 Wall Complex, and Site 16792 Wall; Plan View

FIGURE 9

to excavations. Three stratigraphic layers (Layers I, II, and III), and a possible hearth (Feature 1.1) were identified in TU1 (Figure 10). The loose, silt loam underlying surface rocks was designated as Layer I and determined to be non-cultural. The underlying Layer II very dark brown silt loam deposits were similar in color to Layer I, but contained sparse faunal remains (marine shell and bone remains of a small mammal and fish) and wood charcoal. Excavation in Layer II revealed a strong, granular soil structure not present in the overlying and underlying deposits. Excavation in Layer III, a fine-textured silt deposit with no visible soil structure, yielded sparse faunal remains (bone remains of a small mammal bone and a fish scale), as well as wood charcoal.

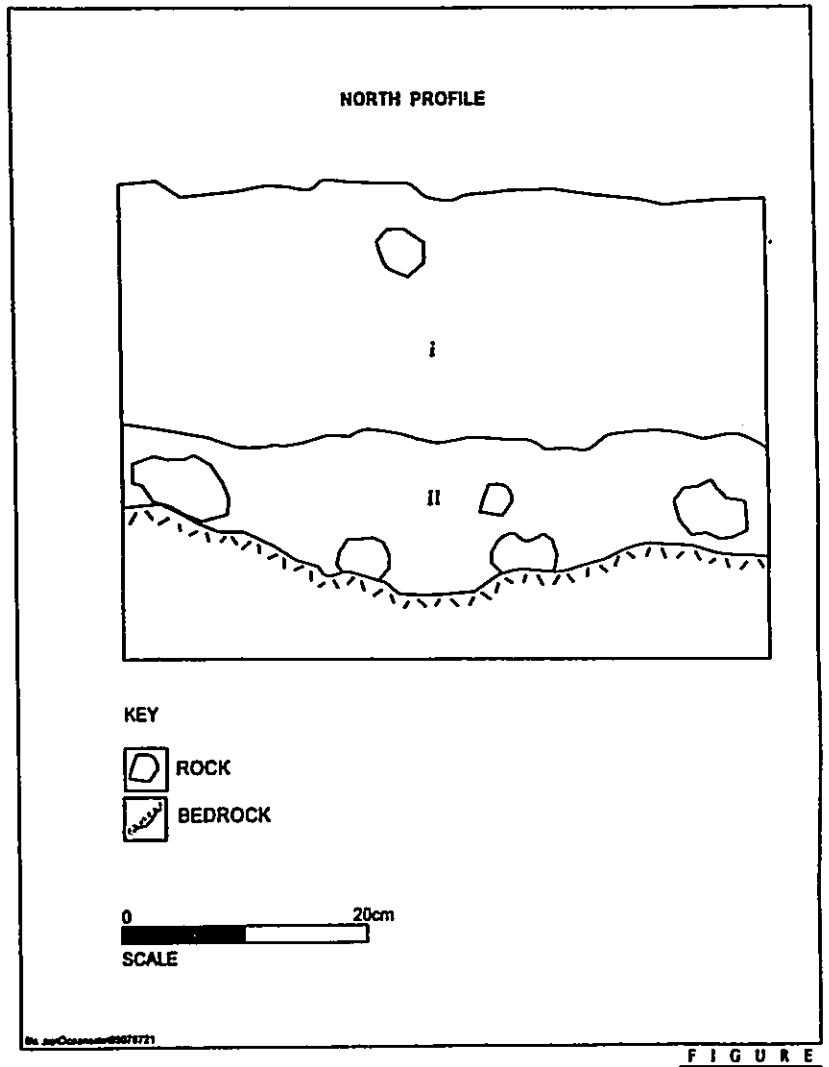
Feature 1.1, a possible hearth, was first recognized when concentrations of wood charcoal and charcoal-stained soil was observed at the base of Layer II at approximately 23 cm below surface. As excavations proceeded, it was noted that charcoal-staining extended into underlying Layer III deposits, affecting the color of the dark brown silts. At approximately 25 cm below surface the excavated horizontal extent of the charcoal-rich matrix measured 0.53 m by 0.24 m, and consisted of fine-textured dark brown silt mottled with gray, black and dark gray charcoal-stained areas. Subsequently two cobbles, covered by the charcoal-stained deposits were revealed.

The silt deposits associated with this feature were cross-sectioned in the area adjacent to (north) the larger cobble showing the thickness of charcoal-stained deposits to be 1.5 to 2.0 cm. The position of the cobbles in TU1 and thickness of the charcoal-rich deposits indicated that a majority of the feature probably extended to the south and west, beyond the limits of the test unit. A bulk sample of the cross section was collected for laboratory processing; the remainder was screened in the field. Faunal remains were recovered from Feature 1.1. Layer descriptions for TU1 are presented below.

Layer I 5-11 cm thick; very dark brown (10YR 2/2, moist) silt loam with high humic content; no soil structure visible; loose when dry, very slightly sticky when wet, non-plastic; no roots present; abrupt, smooth boundary; non-cultural.

Layer II 20-30 cm thick; very dark brown (10YR 2/2, moist) silt loam; strong, fine to very fine, granular soil structure; firm when dry, slightly sticky when wet, non-plastic; few, fine to very fine, interstitial roots; abrupt, smooth boundary; contains marine shell, bone remains of mammals and fish, wood charcoal.

Layer III 25 + cm thick; dark brown (7.5YR 3/4, moist) fine-textured silt; massive soil structure; loose when dry, nonsticky to very slightly sticky when wet, non-plastic; few, fine to medium tubular roots; less than 5%, by volume,



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South Profile TU-1
(Site 16599, Feature 1)

FIGURE 10

subangular pahoehoe pebbles and cobbles; lower boundary undetermined; contains cultural materials including marine shell, mammal bone, charcoal.

Feature 1.1 14+ cm thick; dark brown (7.5YR 3/4, moist) silt loam with common, fine to medium mottles of gray (10YR 5/1, moist), dark gray (10YR 4/1, moist), and black to very dark brown (10YR 2/1.5, moist) silt loam; loose when dry, slightly sticky to very slightly sticky when wet, non-plastic; lower boundary undetermined; contains marine shell.

The formal type of the feature (enclosure), the presence of a possible hearth (Feature 1.1) and cultural materials (marine shell, bone remains of mammal and fish), suggest that Feature 1 was used for habitation. The lack of concentrated midden is a strong indicator that the structure was used as a short-term or seasonal habitation site.

Feature 2 wall extends in a northwest/southeast direction on the east side of the other site features (see Figure 9). The wall intersects Site 16792 wall located to the north of the site. Feature 2 wall is bifaced with roughly 7 courses of pahoehoe boulders and cobbles and measures over 80.0 meters in length inside the proposed road corridor. The wall has a width of 0.9 meters and an average height of 1.0 m. A wooden gate, about 2 m wide, is located in the north end of the wall near its intersection with Site 16792.

Feature 3 is a low wall section located approximately 17 m west of Feature 1 enclosure (see Figure 9). The wall is constructed of piled cobbles and boulders and extends in a *mauka/makai* direction. It measures at least 15.0 m in length and is 1.0 m wide; the *makai* end of the wall extends outside the proposed bypass road corridor.

Feature 4 is low, wall section located 40 m south of Feature 3 (see Figure 9) The wall is constructed of piled cobbles and boulders and extends in a *mauka/makai* direction. The wall measures over 40 m in length and has a width of 1 m; the west end of the wall extends outside the proposed bypass road corridor. The east end of Feature 4 wall abuts a pile of rock and soil, which is probably remnant construction material of the railroad berm (Site 7214/10302).

Feature 5 is a low, wall located approximately 23 m south of Feature 4 (see Figure 9) As with Features 3 and 4, the wall extends in a *mauka/makai* direction and is constructed of piled cobbles and boulders. It measures approximately 40.0 m in length and has a width of 1.0 m. The east end abuts a pile of rock and soil which is probably remnant construction materials of Site 7214/10302 railroad berm.

Feature 6 is an enclosure located 10 m south of Feature 5 (see Figure 9). The enclosure wall has a boulder and cobble perimeter and interior cobble and pebble fill. The walls are low and similar to Feature 1. The southeast corner of the enclosure is disturbed; all the rock has been removed, probably during the construction of the nearby railroad berm.

The site contains features that are likely associated with dryland agriculture (Features 3 through 5) and temporary habitation (for shelter and storage) (Features 1 and 6). These features typify features associated with the Kona Field System. Features 3 through 5 are probably remnant sections of *kuaiwi* or field boundaries which predominated large soil expanses in the Kona Field System. Feature 2 is an historic cattle wall constructed to form cattle paddocks among the pasture land.

Site 50-10-37-16666

Site 16666 was previously recorded by Hammatt et al. (1997) as an enclosure situated within the *ahupua'a* of Halelki'i, at approximately 760 ft amsl (see Figure 6). The site was interpreted as an agricultural enclosure. An excerpt of the site description from Hammatt et al. (1995: 44) is as follows:

The enclosure measures approximately12.0 m. (39.4 ft) E/W by 8.0 m. (26.2 ft.) N/S. It is bi-faced with basalt cobbles and boulders. Only one side corner of the enclosure was accessible because of the thorny vegetation. No artifacts or midden were observed.

Site 50-10-37-16787

Site 16787 was previously recorded by Hammatt et al. (1997) as a boundary/agriculture wall extending in a *mauka/makai* direction along the *ahupua'a* boundary between Honua'ino 2 and 3. The site wall crosses through the proposed road corridor. (see Figure 5). The following site description and functional interpretation is presented in Hammatt et al. (1995:161):

State site -16787 is a large mauka-makai wall extending between the northern boundary Honua'ino 3 ahupua'a.

The wall measures 2,225.6 m. (7,300.0 ft.) E/W, 1.0 m. (3.3-6.6 ft) wide and reaches a maximum height of 1.5 m (4.9 ft.). It is constructed of large to small boulder facing with small boulder and cobble fill. A majority of the wall remains intact. However, portions of the wall have been altered due to cattle disturbance and recent road construction.

The wall is a historic cattle wall which also delineates the ahupua'a boundary. It is possible that this wall was originally part of the Kona Field System and that it historically modified for its use as a cattle wall and land boundary

Site 50-10-37-16788

Site 16788 was previously recorded by Hammatt et al. (1997) as a boundary/agriculture wall extending in a *mauka/makai* direction along the *ahupua'a* boundary between Honua'ino 3 and 4. The site wall crosses through the proposed road corridor at approximately 520 ft amsl (see Figure 5). The following is the site description and functional interpretation presented in Hammatt et al. (1995:161):

> State site -16788 is a mauka-makai wall extending along the boundary of Honuaino 3 and Honuaino 4 ahupua'a. It measures 2,073.2 m. (6,800 ft.) E/W long, 1.0 m. (3.3-6.6 ft) wide and reaches a maximum height of 1.5 m (4.9 ft.). It is constructed of large to small boulder facing with small boulder and cobble fill.
>
> A majority of the wall remains intact. However, portions of the wall have been altered due to cattle disturbance and recent road construction.
>
> The wall is a historic cattle wall which also delineates the ahupua'a boundary. It is possible that this wall was originally part of the Kona Field System and that it was historically modified for its use as a cattle wall and land boundary

Site 50-10-37-16789

Site 16789 was previously recorded by Hafftmatt et al. (1997) as a boundary/agriculture wall extending in a *mauka/makai* direction along the *ahupua'a* boundary between the Hōkūkano 1 and Honuaino *ahupua'a*. The site wall crosses the width of the proposed road corridor at approximately 580 ft amsl (see Figure 5). The following is the site description and functional interpretation presented in Hammatt et al. (1995:162):

> State site -16789 is a mauka-makai wall extending along the boundary of Hokukano 1 and Honuaino ahupua'a. It measures 1,981.7 m. (6,500.0 ft.) E/W long, 1.0 m. (3.3-6.6 ft) wide and reaches a maximum height of 1.5 m (4.9 ft.). It is constructed of large to small boulder facing with small boulder and cobble fill. A majority of the wall remains intact. However, portions of the wall have been altered due to cattle disturbance and recent road construction.
>
> The wall is a historic cattle wall which also delineates the ahupua'a boundary. It is possible that this wall was originally part of the Kona Field System and that it was historically modified for its use as a cattle wall and land boundary

Site 50-10-37-16791

Site 16791 was originally recorded by Hammatt et al. (1997) as a boundary/agricultural wall extending in a *mauka-makai* direction along the boundary between Hōkūkano 1 and 2. The site crosses the width of the proposed road corridor at approximately 720 ft amsl (see Figure 6). The following is the site description and functional interpretation provided in Hammatt et al. (1995:163):

> State site -16791 is a mauka/makai running wall extending between Hokukano 1 and Hokukano 2 ahupua'a. It measures 2,713.4 m. (8,900.0 ft.) E/W long, 1.0 m. (3.3 ft.) wide and reaches a maximum height of 1.5 m. (4.9 ft.). It is constructed of large to small boulder facing with small boulder and cobble fill. A majority of the wall remains intact. However, portions of the wall have been altered due to cattle disturbance and recent road construction.
>
> The wall is a historic cattle wall which also delineates the ahupua'a boundary. It is possible that this wall was originally part of the Kona Field System and that it was historically modified for its use as a cattle wall and land boundary.

The portion of the site wall recorded by Hammatt et al. (1997) that extends through the proposed bypass road corridor has been modified to form cattle or animal pens (see Figure 9). The modifications include the attachment of barbed-wire fencing and a cross-slope wall to the *mauka-makai* site wall. A gate was also constructed at the junction of the *mauka-makai* and cross-slope wall sections.

Site 50-10-37-16792

This site was previously recorded by Hammatt et al. (1997) as a boundary/agriculture wall extending in a *mauka-makai* direction along the *ahupua'a* boundary of Hōkūkano 2 and Kanāueue. The site wall extends across the width of the proposed road corridor at approximately 720 ft amsl (see Figure 6). The following site description is presented in Hammatt et al. (1995:163):

> State site -16792 is a mauka/makai running wall extending between Hokukano 2 and Kanaueue ahupua'a. It measures 823.2 m. (2,700.0 ft.) E/W long, 1.0 m. (3.3 ft.) N/S wide and reaches a maximum height of 1.5 m. (4.9 ft.). It is constructed of large to small boulder facing with small boulder and cobble fill. A majority of the wall remains intact. However, portions of the wall have been altered due to cattle disturbance and recent road construction.
>
> The wall is a historic cattle wall which also delineates the ahupua'a boundary. It is possible that this wall was originally part of the Kona Field System and that it historically modified for its use as a cattle wall and land boundary.

At the center line of the road corridor there are two "notches" in the wall. These "notches" appear to line up with a remnant of the railroad berm (Site 7214/10302) that intersects the wall (see Figure 9).

Site 16792 Summary

Site 16792 wall was previously recorded by Hammatt et al. (1997) as a boundary and agricultural wall constructed along the *ahupua'a* boundary between Hōkūkano 2 and Kanāueue. The notched construction conforming with the orientation of the Kona Sugar Co. railroad bed suggests that the wall, or at least notched modifications, post-date construction of the railroad bed. As suggested by Hammatt et al. (1995) above, since the wall follows the *ahupua'a* boundary, it may overlie a pre-existing agricultural wall associated with the Kona Field System.

Site 50-10-37-16796

Site 16796 was previously recorded by Hammatt et al. (1997) as a boundary/agriculture wall extending in a *mauka/makai* direction along the *ahupua'a* boundary of Ke'eke'e 1 and 2. The site wall crosses over the width of the proposed road corridor at approximately 820 ft amsl (see Figure 6). The following site description is presented in Hammatt et al. (1995:163):

> State site -16796 is a mauka-makai running wall extending between the ahupua'a of Ke'eke'e 1 and Ilikahi. It measures 1,524.4 m. (5,000.0 ft.) E/W long, 1.0 m. (3.3-6.6 ft) wide and reaches a maximum height of 1.5 m (4.9 ft.). It is constructed of large to small boulder facing with small boulder and cobble fill. A majority of the wall remains intact. However, portions of the wall have been altered due to cattle disturbance and recent road construction.
>
> The wall is a historic cattle wall which also delineates the ahupua'a boundary. It is possible that this wall was originally part of the Kona Field System and that it historically modified for its use as a cattle wall and land boundary

Site 50-10-37-16797

This site was previously recorded by Hammatt et al. (1997) as a boundary/agriculture wall extending in a *mauka/makai* direction along the *ahupua'a* boundary of Hōkūkano 2 and Kanāueue. The site wall crosses over the width of the proposed road corridor at approximately 800 ft amsl (see Figure 6). The following site description is presented in Hammatt et al. (1995:163):

> State Site -16797 is a mauka-makai running wall extending between the ahupua'a of Ilikahi and Kanaka'u. It measures 1,509.1 m (4,950.0 ft) E/W by 1.0 m. (1.0 ft.) wide and reaches a maximum height of 1.5 m. (4.9 ft.). It is constructed of large to small boulder facing with small boulder and cobble fill. A majority of the

> wall remains intact. However, portions of the wall have been altered due to cattle disturbance and recent road construction.
>
> The wall is a historic cattle wall which also delineates the ahupua'a boundary. It is possible that this wall was originally part of the Kona Field System and that it historically modified for its use as a cattle wall and land boundary.

Site 50-10-37-16799

This site was previously recorded by Hammatt et al. (1997) as a boundary/agriculture wall extending in a mauka-makai direction along the *ahupua'a* boundary between Kalukalu and Onouli 1. The site wall crosses over the proposed road corridor at approximately 870 ft amsl (see Figure 7). The following site description and functional interpretation is provided in Hammatt et al. (1995:166):

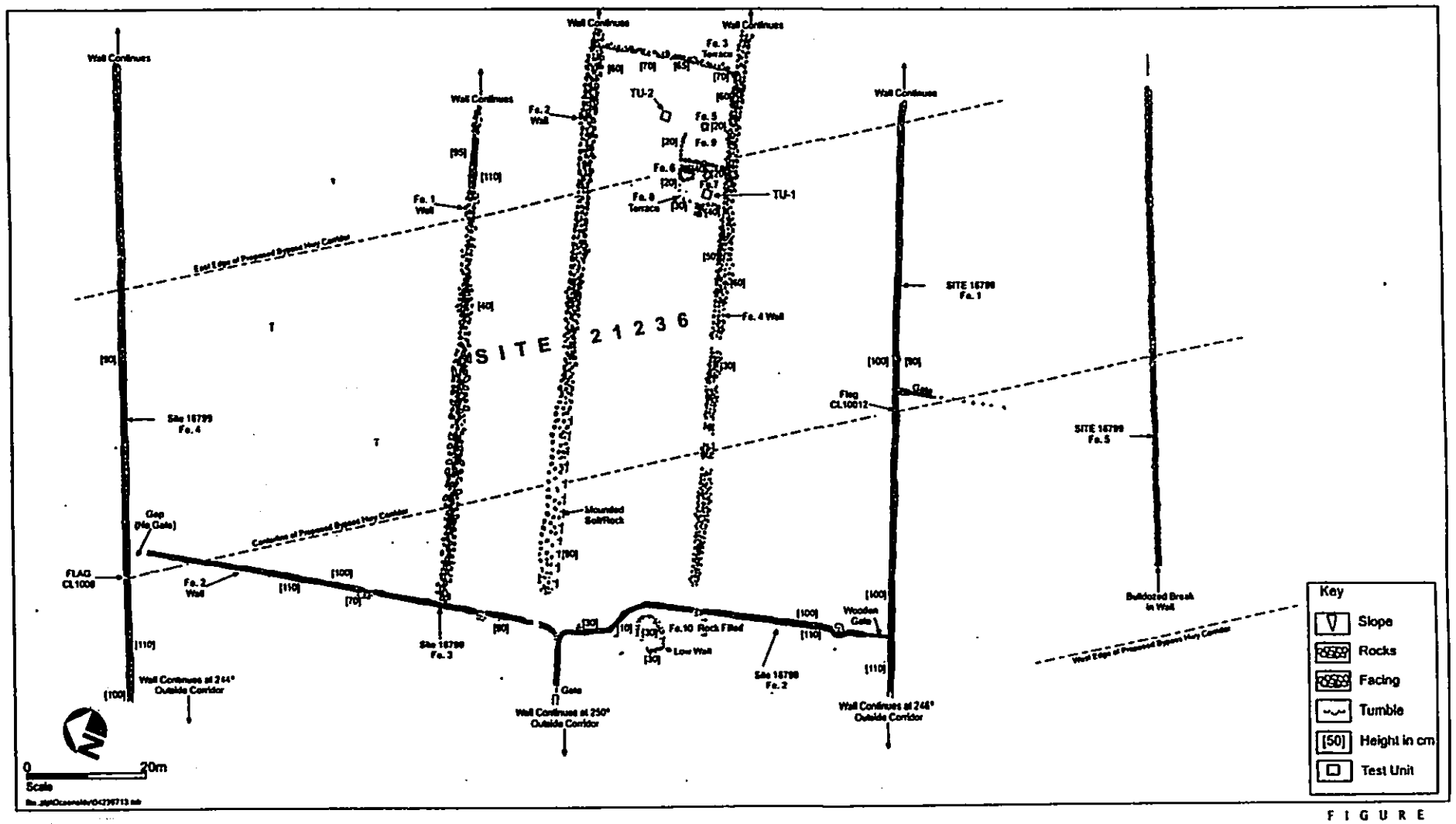
> State site -16799 is a *mauka/makai* running wall extending between the ahupua'a of Kalukalu and Onouli 1. It measures 2,103.7 m. (6,900.0 ft.) E/W long, 1.0 m. (3.3 ft.) wide and reaches a maximum height of 1.5 m. (4.9 ft.). It is constructed of large to small boulder facing with small boulder and cobble fill. A majority of the wall remains intact. However, portions of the wall have been altered due to cattle disturbance and recent road construction.
>
> The wall is a historic cattle wall which also delineates the ahupua'a boundary. It is possible that this wall was originally part of the Kona Field System and that it was historically modified for its use as a cattle wall and land boundary.

During the Ogden survey, additional walls were identified in the proposed road corridor contiguous to or in the vicinity of Site 16799 wall. These walls are tentatively assigned feature designations under Site 16799, and include three *mauka-makai* wall sections (Features 1, 4 and 5) and two cross-slope wall sections (Features 2 and 3) (Figure 11). The wall constructions are similar to those recorded by Hammatt et al. (1995:166) with some of the walls being less than 1.5 m high.

Feature 1 shown in Figure 11 refers to the site wall originally recorded by Hanumatt et al (1997) along the *ahupua'a* boundary between Kalukalu and Onouli 1.

Features 2 and 3 extend across the slope between Feature 1 wall on the south and Feature 4 wall on the north. The two contiguous wall sections merge at the center and diverge to the west at a point beyond the west boundary of the proposed road corridor.

Features 4 and 5 are wall sections extending *mauka-makai*, to the north and south of Feature 1, respectively. Feature 5 is not contiguous to any of the site features in the proposed road corridor.



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Sites 50-10-37-16799 and -21236; Plan View

FIGURE

11

Site 16799 Summary

The series of walls identified under the Site 16799 designation were constructed to form cattle paddocks and historic land and ranch boundaries. As suggested in Hammatt et al. (1997) the wall running along the *ahupua'a* boundary (Feature 1) may have been constructed along the course of a pre-existing agricultural wall associated with the Kona Field System.

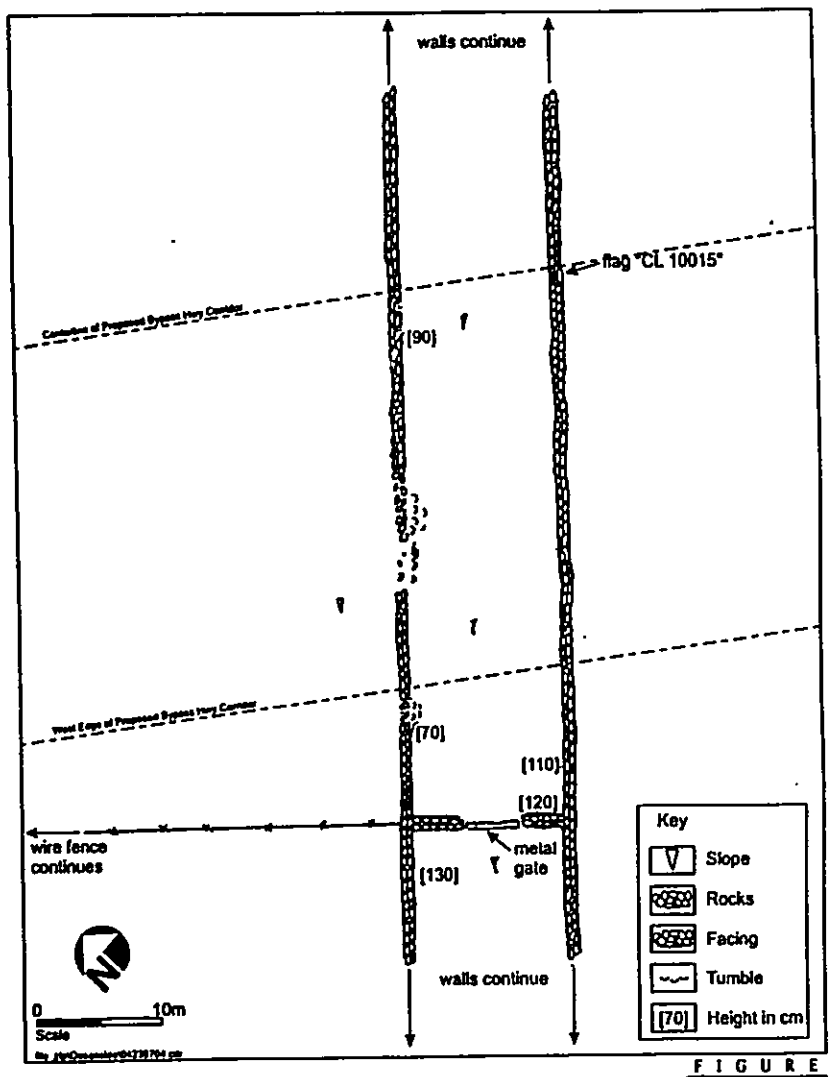
Site 50-10-37-16800

Site 16800 was previously recorded by Hammatt et al. (1997) as a boundary/agriculture wall extending in a *mauka-makai* along the *ahupua'a* boundary Onouli 1. The site wall crosses over the proposed road corridor at approximately 930 ft amsl (see Figure 7). The following site description and functional interpretation is provided in Hammatt et al. (1995:166-167):

> State site -16800 is a mauka/makai running wall extending along the southern boundary of the ahupua'a of Onouli 1. It measures 3,018.3 m. (9,900.0 ft.) E/W long, 1.0 m. (3.3 ft.) wide and reaches a maximum height of 1.5 m. (4.9 ft.). It is constructed of large to small boulder facing with small boulder and cobble fill. A majority of the wall remains intact. However, portions of the wall have been altered due to cattle disturbance and recent road construction.
>
> The wall is a historic cattle wall which also delineates the ahupua'a boundary. It is possible that this wall was originally part of the Kona Field System and that it was historically modified for its use as a cattle wall and land boundary.

The portion of Site 16800 extending through the proposed road corridor consists of two parallel, *mauka-makai* walls (Features 1 and 2) spaced approximately 13.0 meters apart (Figure 12). The site walls have similar construction styles as recorded by Hammatt et al. (1995) and measure an average of 0.7 m in height and 1.0 m wide. Feature 1 is the location of the proposed road corridor flagging marked 10015, which corresponds with the southern boundary of the Ogden survey area and northern boundary of the previous PHRI survey area (Rosendahl and Jensen 1989). Several portions of both walls are collapsed due to fallen trees and roaming cattle.

A stone wall and a wooden gate, measuring 13.0 meters in length, extends perpendicular to Features 1 and 2. The stone wall has a total length of approximately 10.0 meters and the wooden gate measures 3.1 meters in length.



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Site 50-10-37-16800; Plan View

FIGURE 12

Site 16800 Summary

The wall features of Site 16800 identified in the proposed road corridor probably functioned as a "cattle run" component of the ranching paddocks in the area. As suggested in Hammatt et al. (1997) the wall(s) running along the *ahupua'a* boundary may have been constructed along the course of a pre-existing agricultural wall associated with the Kona Field System

Site 50-10-37-21233

Site 21233 is a complex of five features (Features 1 through 5) (Figure 13) located in the northern portion of the proposed road corridor, just east or up slope of Ali'i Drive (see Figure 4).

The site is situated in the *ahupua'a* of Keauhou at approximately 125 ft amsl. The landscape is a rocky slope of intersecting a'a and pahoehoe lava flows, in the north and south, respectively. Features 2 and 3 walls extend along the juncture between the two flows.

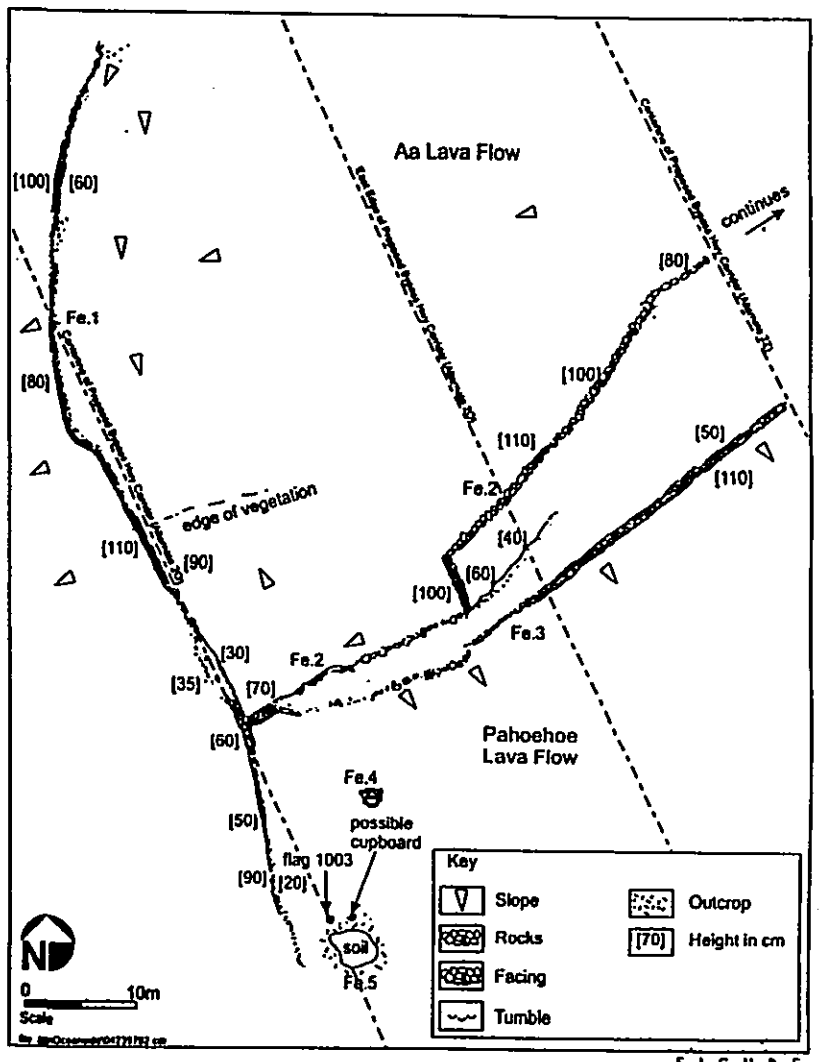
Feature 1 is a wall extending across the slope (north-south) in the south portion of the site and diverting parallel to the slope (roughly east-west) in the north. The wall is bifaced with a'a boulders and cobbles and measures between 0.55 and 1.0 m in wide with an average height of 0.7 m.

Feature 2 is a wall extending east of Feature 1. The wall is also bifaced with a'a cobbles and boulders and ranges in width from 0.6 to 1.0 m with an average height of 0.9 m. Some sections of the west end of Feature 2 retain the pahoehoe outcrop to the south.

Feature 3 is a wall extending east of Feature 1 just south of Feature 2 wall. This wall is also bifaced with a'a cobbles and boulders, and ranges in width from 0.7 to 0.9 m, with an average height of 0.85 m.

Feature 4 is a walled depression located approximately 8.0 m south of Feature 3. The wall is defined by a cobble-boulder alignment with some stone stacking that encircles an approximately 1.0 by 0.6 m depression in the surrounding pahoehoe outcrop.

Feature 5 is a soil-filled depression in the pahoehoe outcrop measuring approximately 3.7 m in diameter.



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Site 50-10-37-21233, Features 1 Through 5, Showing Boundaries of Bypass Highway Corridor Alternate 2O and 2Z

FIGURE 13

Site 21233 Summary

The walls of Site 21233 (Features 1, 2, and 3) probably functioned as boundary walls associated with historic ranching in the lands to the north of the site. Features 4 and 5 may pre-date the historic boundary walls and have been used as cultivation plots during the pre-Contact or early post-Contact era.

Site 50-10-37-21234

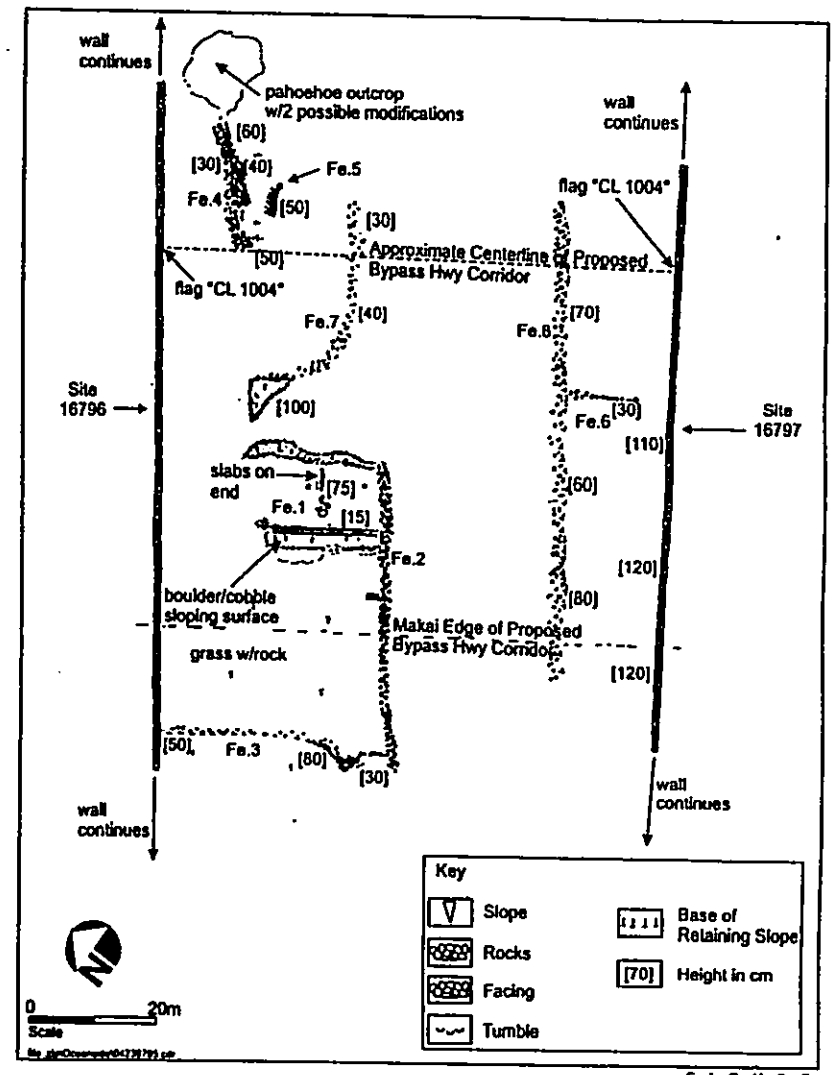
Site 21234 is a complex of eight features (Features 1 through 8) (Figure 14) which spans the width of 'Ilikahi Ahupua'a between the *mauka-makai* boundary walls of Sites 16796 and 16797 (see Figure 6). The complex covers the entire width of the proposed road corridor at approximately 810 ft amsl.

Feature 1 is a two-tiered terrace that is located approximately 30.0 m off the centerline of the proposed road corridor (see Figure 14). The upper terrace (*mauka*) is constructed of faced angular basalt boulders and cobbles and measures 15.0 m in length. The upslope side (*mauka*) of the terrace has a height of 0.1 m and the downslope side (*makai*) has an average height of 0.5 m. The lower terrace of Feature 1 measures approximately the same length as the upper terrace and is constructed of a rough alignment of small basalt boulders and cobbles. The area between the upper and lower terraces is approximately 1.5 m wide and consists of scattered boulders and cobbles on a sloping surface.

The area behind (*mauka*) the upper terrace of Feature 1 contains a leveled soil surface and scattered basalt boulders with five basalt slabs placed on end (see Figure 14). The slabs form an alignment that extends in a *mauka-makai* direction for 3.0 m. The slabs on average are 0.6 in height and 0.6 m thick. A possible terrace exists east of the slabs. It extends across the slope in a northwest-southeast direction and measures approximately 20.0 m in length. An historic bottle was observed on Feature 1's upper terrace.

Feature 2 is a wall section oriented *mauka-makai* parallel to the slope. The wall is constructed of angular basalt boulders and cobbles. The recorded portion of the feature measures approximately 45.0 m in length by 1.0 m wide; the wall extends further *makai*.

Feature 3 is a terrace oriented in a northwest-southeast direction and is located approximately 16.0 m outside, or *makai*, of the proposed road corridor. The terrace measures approximately 35.0 meters in length and has an average height of 0.6 meters. The southeast section of the terrace



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Site 50-10-37-21234, Features 1 Through 8;
Site 16796 Wall on North and Site 16797 Wall on South

FIGURE 14

is constructed of piled rock, while the northwest portion is soil and scattered rock. The feature extends from Feature 2 and joins with Site 16796 to the northwest.

Feature 4 is a wall segment that is oriented in a *mauka-makai* direction. It is constructed of a low concentration of angular basalt boulders and cobbles with some of the base stones placed on end (see Figure 14). The wall starts on the centerline for the proposed road corridor and extends upslope (*mauka*) for approximately 18.0 meters and terminates at a modified rock outcrop. The modified outcrop has a *pahoehoe* surface with piled angular basalt boulders and cobbles.

Feature 5 is a wall remnant located approximately 2.0 m south of Feature 4 (see Figure 14). The remnant measures 5.0 m in length by 1.0 m wide and has a height of 0.5 m. It is constructed of piled angular basalt cobbles.

Feature 6 is a terrace oriented in a northwest/southeast direction and is constructed of an alignment of angular basalt small boulders and cobbles (see Figure 14). The terrace measures approximately 10.0 m in length and has a height of 0.3 m. The northwest end terminates at Feature 8 (see Figure 14).

Feature 7 is a terrace that is oriented in a general *makai/mauka* direction and is constructed of scattered angular basalt small boulders and cobbles. The terrace measures 30.0 m in total length, the *makai* end of the terrace bends towards the west and terminates at a pile of angular basalt boulders and cobbles. The terrace has an average height of 0.4 m and the pile of boulders and cobbles has a height of 1.0 m.

Feature 8 is a rocky slope (or possibly a linear mound) area that extends in a *mauka/makai* direction parallel with the slope (see Figure 14). The rocky slope measures over 70.0 m in length. The west end terminates beyond the proposed road corridor. Feature 6 joins the rocky slope approximately 17.0 m *makai* of the centerline.

Site 21234 Summary

Site 21234 is in fair condition. It is interpreted as a dryland agricultural complex with a possible habitation or ceremonial component (Feature 1). The dryland agricultural features are considered to be part of the overall Kona Field System and includes possible *kuaiwi* or agricultural boundary walls (e.g., Feature 2, 7 and 8) that typify cultivations in soil areas. Feature 1, with its alignment of "uprights" (slabs on end), may suggest a ceremonial function of the terrace or simply a more formalized architectural element of a habitation structure. Based on the remnant nature of the

21234 features, the site was probably altered during the post-Contact period, perhaps as a result of rock removal for the construction of the adjacent boundary walls and pasture improvements.

Site 50-10-37-21235

Site 21235 is a complex of over 40 features (Features 1 through 40) (Figure 15) extending across the width of Ke'eke'e 2 Ahupua'a. The site is located at approximately 810 ft amsl and is bounded by a wire fence line on its north boundary and Site 16796 *mauka-makai* wall on the south (see Figure 6). The surrounding landscape is primarily a soil expanse with a pahoehoe outcrop knoll present on the east side of the complex.

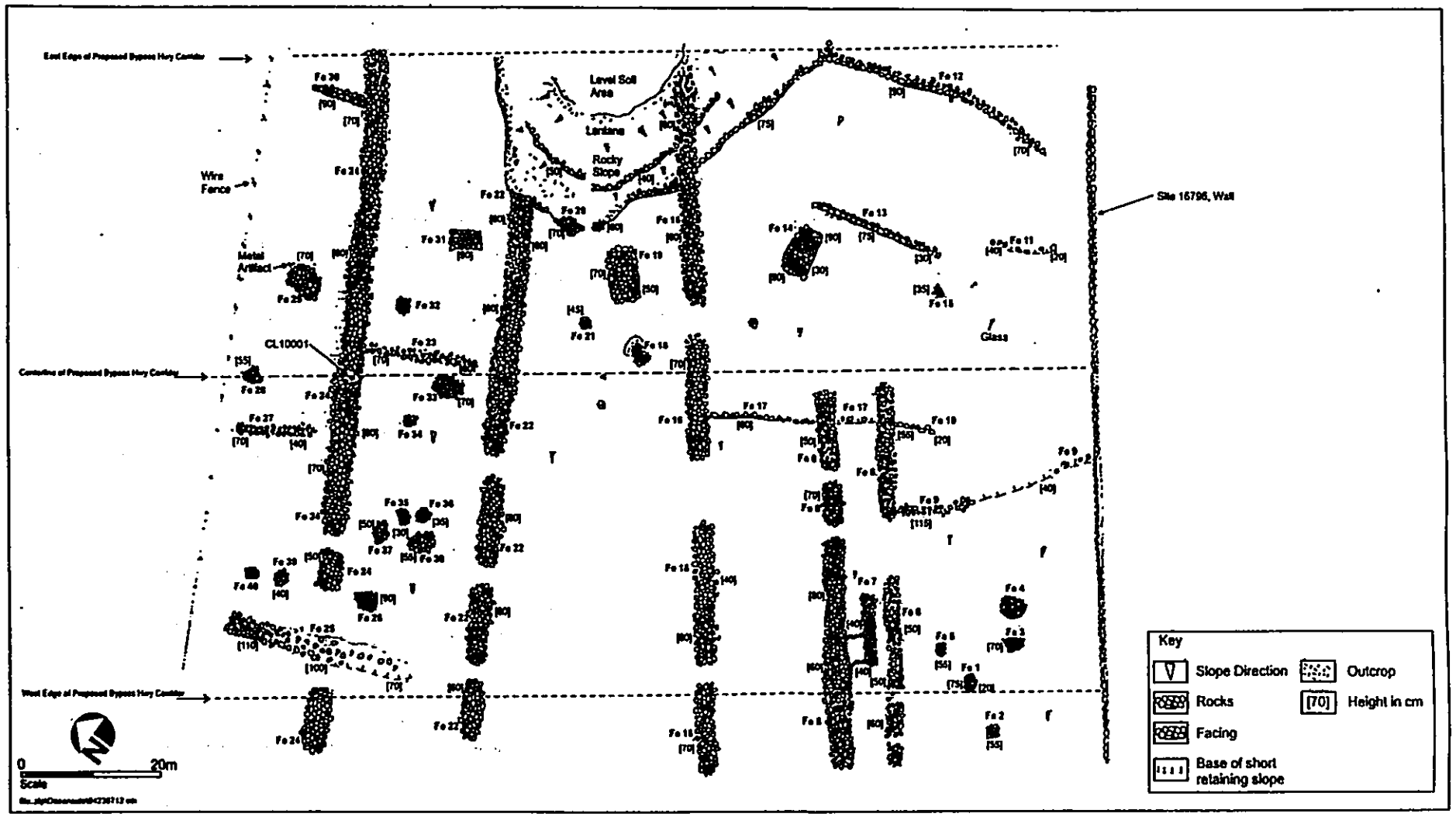
Twenty-five of the site features (Features 1-5, 14-15, 18-19-21, 26, 28-29, and 31-40) are rock mounds. The rock mounds are constructed of either piled or stacked angular basalt cobbles and boulders and range in size from 1.0 in diameter to 8.0 m by 2.0 m. The mounds vary in height from 0.2 m to 0.9 m. At least one mound contained metal fragments mixed within the rocks. The mounds are distributed among the soil areas of the site.

Features 6, 8, 16, 22, and 24 are low, mounded walls oriented in a *mauka/makai* direction. The walls are constructed of piled angular basalt cobbles and small boulders and range in lengths from 30.0 m to 95.0 m, with average heights of 0.7 m, and widths of 1.5 m. There are at least two gaps or breaks in each of the walls.

Feature 7 is a short wall segment located between Features 6 and 8. The wall is constructed of piled angular basalt cobbles and small boulders and extends in a *mauka/makai* direction. The wall measures approximately 10.0 m in length, 1.0 m wide, and has an average height of 0.4 m. The *makai* end of the wall has two short rock alignments that adjoin the feature to Feature 8.

At least 10 terrace features (Features 9-13, 17, 23, 25, 27 and 30) are located within the site complex. The terraces generally extend across the slope and retain soil on the up slope or east sides.

Feature 9 is possibly the remnants of a terrace that extends in a north-south direction for approximately 30.0 m between Feature 6 and Site 16796 wall. The terrace is constructed of piled angular basalt cobbles at the northern end and soil and scattered (probably buried) rock in the middle and southern end. The northern end has an average height of 1.1 m, while the southern end has a height of 0.4 m.



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Site 50-10-37-21235, Features 1 Through 30; Plan View

FIGURE 15

Feature 10 is a terrace that extends in a north-south direction for approximately 4.0 m. The terrace is constructed of piled angular basalt cobbles and has an average height of 0.4 m. The north end of the terrace joins with Feature 6.

Feature 11 is a terrace located approximately 30.0 northeast of Feature 9's south end and 1.5 m north of Site 16796. The terrace is constructed of scattered angular basalt cobbles and measures approximately 9.0 m in length and has an average height of 0.3 m.

Feature 12 is a L-shaped terrace located approximately 13.0 m northeast of Feature 11. The terrace is constructed of stacked angular basalt cobbles and small boulders and measures over 60.0 m in length and has an average height of 0.8 m. One axis of the terrace is oriented in a north-south direction and the other in a east/west direction. The east-west axis is situated along a rock outcrop and is retaining soil. The western end of the terrace terminated at Feature 16 wall.

Feature 13 is terrace located 7.0 m northwest of Feature 11. The terrace is constructed of stacked and faced angular basalt cobbles and small boulders. The terrace is oriented in a north-south direction and measures approximately 20.0 m in length and has an average height of 0.5 m.

Feature 17 is a terrace extending across the slope between Features 10 and 16. It measures 30 m (N/S); it is flush to ground surface on the east side and raised 0.8 m high on the west side.

Feature 23 is a terrace located on the south side of Feature 24 and northeast of Feature 33. The terrace is constructed of piled angular basalt cobbles and small boulders and measures approximately 15.0 m in length, 1.0 m wide, and has an average height of 0.8 m.

Feature 25 is a terrace remnant extending across slope in a gap of Feature 24. The terrace is constructed of piled angular basalt cobbles and small boulders and is oriented in a north-south direction. The terrace measures approximately 28.0 m in length, 1.5 m wide, and has an average height of 0.9 m.

Feature 27 is a terrace located on the northern side of Feature 24 and west of the centerline. The terrace is constructed of piled angular basalt cobbles and small boulders and oriented in a northwest/southeast direction. The terrace measures 10.0 m in length, 1.0 m wide, and has an average height of 0.5 m.

Feature 30 is a terrace located at the *mauka* end of Feature 24, on the north side. The terrace is constructed of stacked and faced angular basalt cobbles and small boulders and is oriented in a

north/south direction. The terrace measures approximately 9.0 m in length, 1.0 m wide, and has an average height of 0.8 m.

Site 21235 Summary

Site 21235 is in fair condition. It is interpreted as an agricultural complex characteristic of cultivation in the Kona Field System among the more expansive soil areas. Gaps observed among the *kuaiwi* suggest that the field system features had been modified during the post-Contact era for the cultivation of commercial sugarcane and to provide access of cane hauling machinery into the cane fields (cf. Hammatt et al. 1997). This same site characteristic evidencing historic modification was observed at Site 10305, located in the adjacent lands to the north of Site 21235 (Hammatt et al. 1997). Thus, Site 21235 is likely a southern expansion of Site 10305.

Site 50-10-37-21236

Site 21236 is a complex of at least 10 features (Features 1 through 10) (see Figure 11) located within Kalukalu Ahupua'a at approximately 870 ft amsl (see Figure 7). The cattle and boundary walls of Site 16799 roughly enclose the site area. The landscape is characterized by an expansive soil area. The site features consist of low, mounded wall sections oriented *mauka-makai* (Features 1, 2, and 4) with cross-slope terraces (Features 3, 8, and 9) and circular alignments (Features 5-7) interspersed among the walls, particularly in the eastern portion of the site.

Feature 1 is a low, mounded wall extending in a *mauka-makai* direction for over 80.0 m, with its east end terminating at Site 16799's Feature 3 wall. The wall is in remnant condition but retains sections are stacked with cobbles and small boulders. In these preserved sections, Feature 1 wall is approximately 1.0 wide and has an average height of 1.0 m.

Feature 2 is a low, mounded wall that extends in a *mauka-makai* direction for over 90.0 m. The *makai* end of the wall begins approximately 5.0 m *mauka* of Site 16799's Feature 2 wall and the *mauka* end extends outside the proposed road corridor. The wall, constructed of piled angular basalt small boulders and cobbles, has a width of 1.0 m and an average height of 0.8 m.

Feature 3 is a terrace that extends off of the south side of Feature 2 at its *mauka* end and continues south and joins with Feature 4. The terrace, constructed of a raised edge of angular basalt cobbles and small boulders mixed with soil, measures approximately 24.0 m in length and has an average height of 0.7 m. The terrace extends across slope between Feature 2 and 4 walls.

Feature 4 is a low, mounded wall extending in a *mauka-makai* direction for over 90.0 m. Feature 4 is similar to Feature 1 and 2 in its construction and has an average height of 0.5 m.

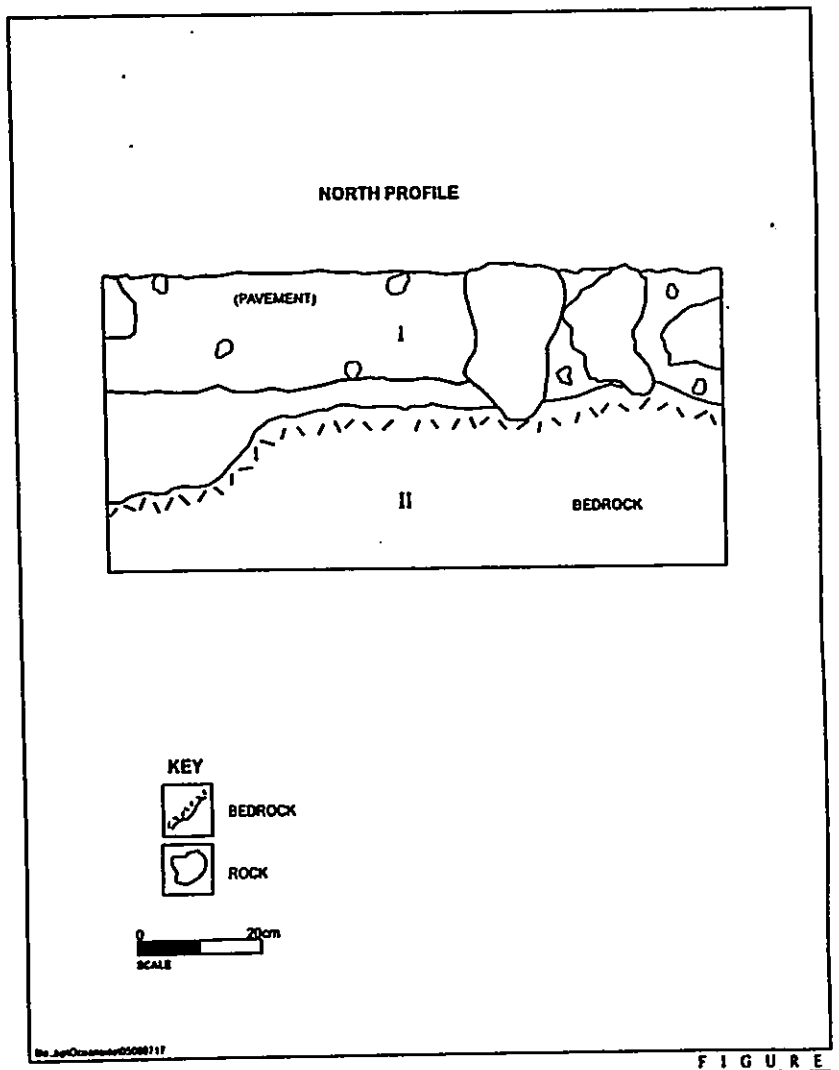
Feature 5, a circular alignment located approximately 5.0 m north of Feature 4 and 9.0 m *makai* of Feature 3. The feature is constructed of a single alignment of angular basalt cobbles and small boulders that encircle small soil areas. The outside diameter of the feature measures approximately 1.0 and the alignment has a height of 0.2 m.

Feature 6 is a circular alignment located approximately 7.0 m north of Feature 4 and 15.0 m *makai* of Feature 3. The feature is constructed of a single alignment of cobbles and small boulders with some piling on the *mauka* side. It encircles a small soil area. The outside diameter of the feature measures approximately 2.5 m and the alignment has an average height of 0.3 m.

Feature 7 is a circular alignment located approximately 1.0 m south of Feature 6. The feature is constructed of a single alignment of angular basalt cobbles encircling a small soil area. Feature 8 is a terrace located *makai* of Features 6 and 7. The terrace extends in a north-south direction for approximately 8.0 m before bending towards the east for 5.0 m where it terminates at Feature 6. The terrace is constructed of a roughly raised edge of scattered cobbles and boulders and soil, which retains a level soil surface on the up slope side. A 0.5 by 0.5 m test unit was excavated at Feature 8. The testing results are presented below.

Site 21236, Feature 8 Testing Results

Subsurface testing was conducted at Site 21236's Feature 8 to attempt determining the function and temporal affiliation of the feature. A 0.5 m test unit was placed in the roughly level, soil surface of the terrace (see Figure 11) and excavated to a maximum depth of roughly 35 cm below surface, where bedrock was encountered. Two stratigraphic layers (Layers I and II) were observed in the excavation (Figure 16). Layer I, a very dark brown silt loam, contained dispersed, sparse charcoal and was noticeably free of cobbles and pebbles. The underlying dark reddish brown, cobbly silt loam deposits of Layer II were determined non-cultural. The soil descriptions of Layers I and II are as follows:



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Site 21236, Feature 8, Test Unit 1 Profile

FIGURE 16

Layer I 18-20 cm thick; very dark brown (10YR 2/2, moist) silt loam with a estimated small percentage (10% or less) of organic material; loose when dry, slightly sticky when wet, non-plastic; many, fine interstitial roots (grass); abrupt, smooth boundary; contains sparse charcoal.

Layer II 10+ cm thick; dark reddish brown (5YR 3/3.5, moist) cobbly silt loam; loose when dry, nonsticky to very slightly sticky when wet, non-plastic; few, medium, tubular roots; upper 10 cm contains approximately 15%, by volume, subangular pahoehoe cobbles; lower boundary undetermined; non-cultural.

Given the presence of charcoal and lack of rocks in the soil matrix, Layer I is probably associated with the use of Feature 8 terrace. The absence of cultural material in Layer I in combination with the context of Feature 8 within an agricultural complex, suggests that it was utilized as a planting area, with the raised edge of stone and soil retaining the soil planting matrix.

Feature 9 is a terrace located *mauka* of Features 6 and 7 and *makai* of Feature 5. The terrace extends in a north/south direction for approximately 8.0 m before bending towards the east for 5.0 m where it terminates. The terrace, with a height of 0.4 m, is constructed of angular basalt cobbles and small boulders.

Feature 10 is a natural sinkhole, with some modification, located approximately 10.0 m west (*mauka*) of the *makai* end of Feature 4. The sink opening measures 5.0 m in length by 3.0 m in width and has an average depth of 0.3 m. The interior of the sink is rock filled and exhibits signs of standing water. At the *makai* end of the sink is a low stone wall that extends the width of the sink. The wall is constructed of stacked angular basalt cobbles and has an average height of 0.3 m.

Site 21236 Summary

Site 21236 is in fair condition. Its is interpreted as an agricultural complex of the Kona Field System that typifies cultivation among the more expansive soil areas, which include the utilization of *kualwi* (suggested by the existence of Features 1, 2, and 4) as planting matrices and crop boundaries. The cross-slope terraces constructed perpendicular to the *kualwi* are common components of the Kona Field System as a means of retaining soil on slopes. Other site components, such as circular alignments (Features 5-7) and the modified lava blister (Feature 10), may represent individual planting venues.

The presence of historic cattle and boundary walls (Site 16799) also suggests that a portion of the site may been altered during the post-Contact era as a result of the wall constructions, as well as land clearing associated with pasture improvements.

Site 50-10-37-21237

Site 21237 is a wall extending in a *mauka-makai* direction possibly along the boundary between Ma'ihi 1 and 2 . The site crosses the entire width of the proposed road corridor at approximately 325 ft amsl (see Figure 4). The wall is bifaced with small boulders and contains a small boulder and cobble fill. The wall remains mostly intact, except for small sections of collapse.

Site 21237 Summary

Site 21237 is interpreted as an historic boundary and cattle wall that, akin to other *ahupua'a* walls in the region (cf. Hammatt et al 1997), may have been constructed along the course of a pre-existing agricultural wall associated with the Kona Field System.

Site 50-10-37-21238

Site 21238 is a wall extending *mauka-makai* along the *ahupua'a* boundary of Ma'ihi 2 and Kuamo'o. The site crosses the entire width of the proposed road corridor at approximately 325 ft amsl (see Figure 4). The wall is bifaced with small boulders and contains a small boulder and cobble fill. It measures an average width of 0.7 m and height of 1.0 m.

Site 21238 is interpreted as an historic boundary and cattle wall that, akin to other *ahupua'a* walls in the region (cf. Hammatt et al 1997), may have been constructed along the course of a pre-existing agricultural wall associated with the Kona Field System.

Site 50-10-37-21239

Site 21239 is a wall extending *mauka-makai* along the *ahupua'a* boundary of Kuamo'o and Kawanui . The site crosses the entire width of the proposed road corridor at approximately 410 ft amsl (see Figure 5). The wall is bifaced with small boulders and contains a small boulder and cobble fill. It measures an average width of 0.7 m and height of 1.0 m.

Site 21239 Summary

Site 21239 is interpreted as an historic boundary and cattle wall that, akin to other *ahupua'a* walls in the region (cf. Hammatt et al 1997), may have been constructed along the course of a pre-existing agricultural wall associated with the Kona Field System.

Site 50-10-37-21240

Site 21240 is a wall extending *mauka-makai* through the *ahupua'a* of Kawanui. The site crosses the entire width of the proposed road corridor at approximately 450 ft amsl (see Figure 5). The wall is bifaced with small boulders and contains a small boulder and cobble fill. It measures an average width of 0.7 m and height of 1.0 m.

Site 21240 Summary

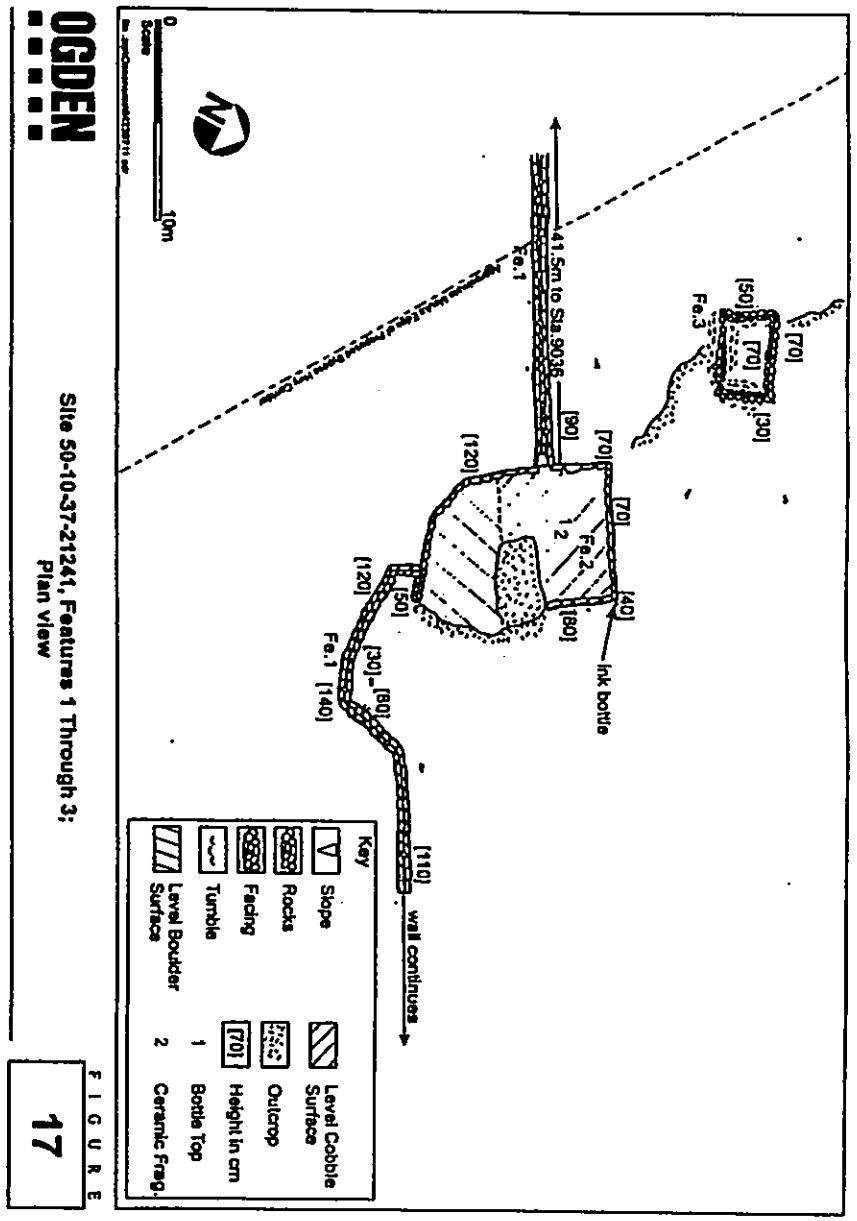
Site 21240 is interpreted as an historic boundary and cattle wall that bisects the *ahupua'a* of Kawanui into two main cattle paddocks and land boundaries.

Site 50-10-37-21241

Site 21241 consists of a wall (Feature 1) extending *mauka-makai* along the *ahupua'a* boundary of Kawanui and Lehu'ula 1. Feature 1 wall crosses the entire width of the proposed road corridor at approximately 425 ft amsl (see Figure 5). Two additional features are associated with Feature 1 wall, including a terrace (Feature 2) incorporated into the construction of Feature 1 wall, and Feature 3, a rectangular enclosure situated roughly 6 m to the northwest of Feature 2 (Figure 17). These features are located beyond the eastern boundary of the proposed road corridor, and thus, are not considered as part of the project corridor's site inventory. Their descriptions are presented below merely for informational purposes.

Feature 1 wall is bifaced with small boulders and contains a small boulder and cobble fill. It measures an average width of 0.7 m and height of 1.0 m.

Feature 2 terrace is rectangular shaped. It is constructed against a pahoehoe outcrop knoll on its east side and is attached to Feature 1 wall on its west and south sides (see Figure 17). The terrace measures roughly 10.0 m N/S by 7.0 m E/W. It has a faced perimeter ranging from 0.4 m to 1.2 m high. The surface of the terrace is defined by two pavements: a cobble pavement in the southern half and a boulder pavement in the northern half.



Several artifacts were observed on the surface of and around the perimeter of Feature 1 terrace. These included a ceramic fragment, a fragment of an aqua colored bottle top, one complete ink bottle (collected), and several pieces of marine shell.

Feature 3, an enclosure located approximately 6.0 m northwest of Feature 2, measures approximately 5.0 m E/W by 3.0 m N/S. The wall has an average height of 0.6 m. The enclosure wall is constructed of stacked angular basalt cobbles and small boulders; wall collapse is present along the south and east sides.

Site 21241 Summary

Feature 1 of Site 21241 is interpreted as an historic boundary and cattle wall that, akin to other *ahupua'a* walls in the region (cf. Hammatt et al 1997), may have been constructed along the course of a pre-existing agricultural wall associated with the Kona Field System

Feature 2 is interpreted as a permanent house foundation that, based on the presence of western-introduced items (bottles and ceramics) was probably utilized primarily during the post-Contact era. Feature 3 may represent an animal pen associated with permanent occupation of Feature 2. The fact that Feature 1 wall incorporates the Feature 2 terrace into its construction insinuates the terrace was occupied or was under other uses when the historic wall was built.

Site 50-10-37-21242

Site 21242 is a wall extending *mauka-makai* along the *ahupua'a* boundary of Lehu'ulu and Honua'ino. The site crosses the entire width of the proposed road corridor at approximately 425 ft amsl (see Figure 5). The wall is bifaced with small boulders and contains a small boulder and cobble fill. It measures an average width of 0.7 m and height of 1.0 m.

Site 21242 Summary

Site 21242 is interpreted as an historic boundary and cattle wall that, akin to other *ahupua'a* walls in the region (cf. Hammatt et al 1997), may have been constructed along the course of a pre-existing agricultural wall associated with the Kona Field System.

Site 50-10-37-21245

Site 21245 is a complex of modified outcrops, terraces, and mounds located within the *ahupua'a* of Kawanui, at an approximate elevation of 405 ft amsl (see Figure 5). The complex features

generally cover the width of the project corridor, although the intensity of feature distribution varies depending on the underlying landscape. In general the site area consists of an undulating landscape dominated by pahoehoe outcrop knolls and linear ridges with adjacent soil pockets.

The outcrop modifications of the site consist of a wide variety of formal types, such as terracing along the edges of outcrops, mounds on top of outcrops, and stone in-filling of collapsed lava blisters. The modifications appear to have been constructed to create planting basins as well as clear adjacent soil areas. The terraces and mounds of the site are typically within the larger soil pockets. Some of the terrace and mound features appear more formally constructed with rough vertical faces and leveled surfaces.

Site 21245 Summary

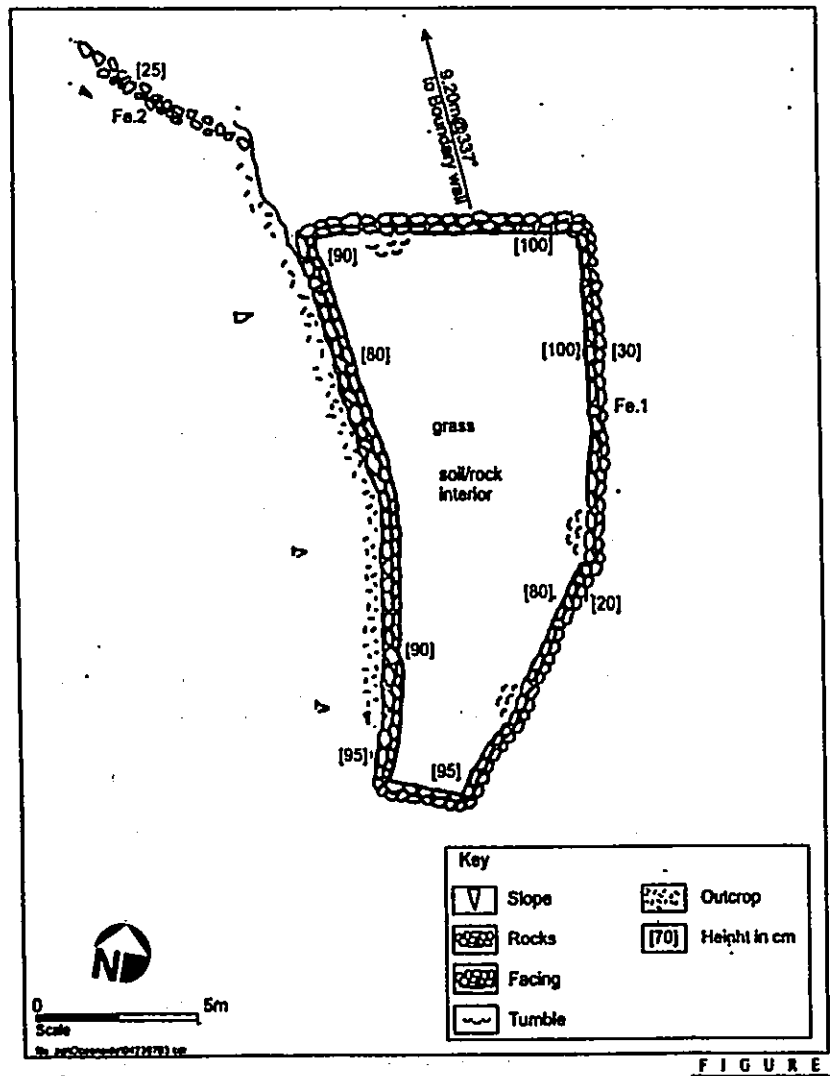
Site 21245 is interpreted as an agricultural complex that typifies cultivation in the more rocky and undulating landscapes of the Kona Field System. Some of the more formal site features with faced edges and leveled surfaces may represent agricultural work and/or storage areas.

Site 50-10-37-21248

Site 21248 is a complex of two features (Features 1 and 2) located in the *ahupua'a* of Kawanui, at approximately 400 ft amsl (see Figure 5). The site consists of a two features, an irregular rectangular enclosure (Feature 1) and a wall section (Feature 2) (Figure 18). Mounds were observed within the site area. Site 21230 wall is situated roughly 10 m to the north.

Feature 1 enclosure measures approximately 17.0 m in length and between 2.5 m and 7.5 m in width. The walls, constructed of stacked angular basalt cobbles and small boulders, have an average width of 0.9 m and height of 0.8 m. The west wall is constructed against a pahoehoe knoll. The interior of the enclosure consists of soil and rock.

Feature 2 wall is located approximately 2.0 m northwest of the northwest corner of Feature 1. The wall is constructed of piled angular basalt cobbles and small boulders and measures approximately 5.0 m in length, 0.7 in width, and has an average height of 0.3 m. It is built along the perimeter of the pahoehoe knoll.



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Site 50-10-37-21248; Plan View

FIGURE 18

Site 21248 Summary

Site 21248 is in good condition. The primary feature, Feature 1, is interpreted as an animal pen. This is based on the high-walled construction of the enclosure and lack of entrance. Feature 2 is probably the result of land clearing associated with either traditional agricultural activities or ranching pasture improvements.

Site 50-10-37-21250

Site 21250 is a modified sink (Feature 1) and a lava blister with two overhangs (Features 2 and 3) (Figure 19), located in the *ahupua'a* of Kawanui. The site is situated at approximately 425 ft amsl (see Figure 5).

Feature 1 modification is defined by a leveled surface of cobbles and boulders at the center of the sink. This leveled area measures approximately 7.0 m by 6.0 m.

Feature 2 is an overhang in the southern portion of the lava blister. The overhang measures 8.5 m by 4.0 m in the interior and has a maximum ceiling height of 1.0 m. Cultural material was observed on the floor of the overhang including: a cut conus shell fragment, cowrie shell fragments, volcanic glass flakes, coral fragments, and *kukui* nut shells. The sink floor outside of the overhang is terraced to form three steps ascending to Feature 1 at the center of the sink.

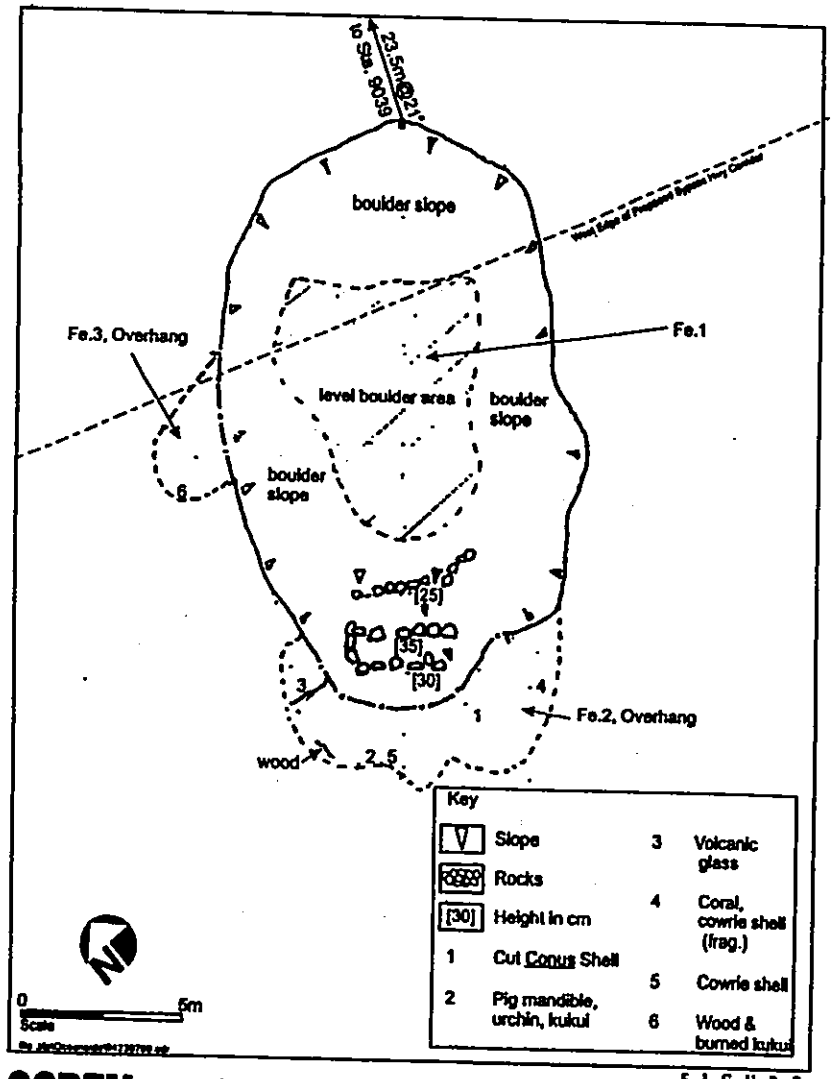
Feature 3 is an overhang in the west side of the lava blister. The interior measures 4.0 m by 3.0 m with a ceiling height of 1.0 m. The interior floor is soil and rock surface with wood fragments and burnt *kukui* nut shells.

Site 21250 Summary

Site 21250 is in fair condition. It is interpreted as a temporary shelter that was probably occupied while tending to crops in the surrounding Kona Field System. The presence of traditional artifacts and marine midden suggests that the site was occupied during the pre-Contact period.

Site 50-10-37-21251

Site 21251 is a complex of four features (Features 1 through 4) (Figure 20) located in the *ahupua'a* of Kawanui. The site lies at approximately 425 ft amsl (see Figure 5).



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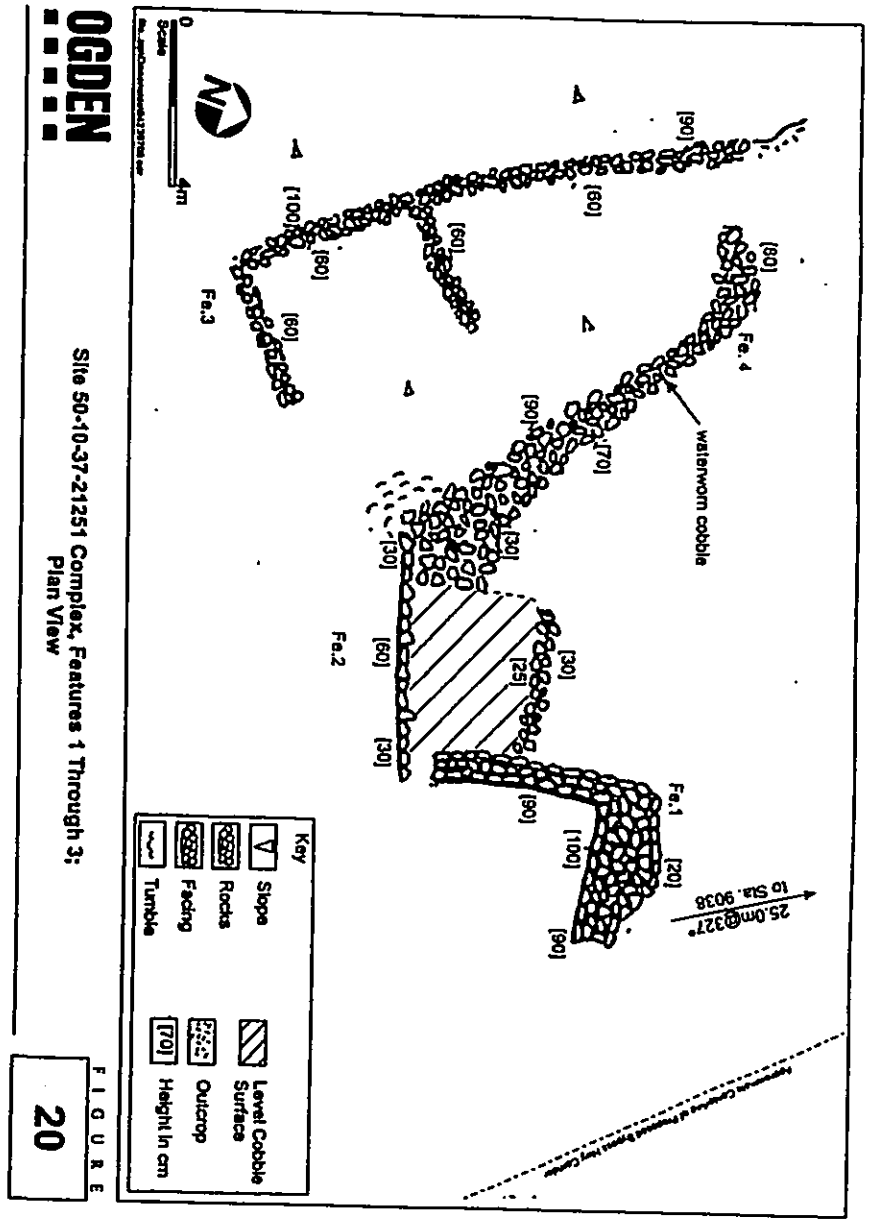
Site 50-10-37-21250 Lava Blister, Features 1 Through 3; Plan View

FIGURE 19



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Site 50-10-37-21251 Complex, Features 1 Through 3; Plan View

FIGURE 20

Feature 1 is an L-shape wall that utilizes a pahoehoe outcrop in its construction. The L-shape measures approximately 5.0 m N/S by 4.0 m E/W. The walls are constructed of stacked angular basalt cobbles and small boulders and are faced on the interior portion of the structure. The wall along the long axis of the L-shape is approximately 1.0 m thick and has an average height of 0.9 m. The wall along the short axis is between 1.0 m and 1.5 m in thickness and has an average interior height 0.9 m and exterior height of 0.2 m. The short axis is constructed on top of a natural rock outcropping.

Feature 2 is a terrace which begins at the south end of the long axis of the L-shape and extends in a southwest direction for 6.0 m. The terrace face is constructed of stacked and faced angular basalt cobbles and has an average height of 0.4 m. The area behind (northwest) of the terrace face is a leveled cobble surface with a rock wall defining its northwest boundary.

Feature 3 is a wall approximately 4.0 m south of the southern end of Feature 2. There are three walls that comprise Feature 3: the first wall is oriented in a northwest/southeast direction and measures approximately 12.0 m in length, 0.9 m wide, and has an average height of 0.8 m. The second wall is located at the southeastern end of Feature 3 and measures approximately 4.0 m in length, 0.7 m wide, and has an average height of 0.6 m. The third wall is located approximately 4.5 m northwest of the second wall. The wall measures 3.0 m in length, 0.6 m wide and has an average height 0.6 m. All the walls are constructed of stacked angular basalt cobbles and small boulders.

Feature 4 is a linear mound located between Features 2 and 3. The mound measures approximately 11.0 m in length, between 1.0 m and 1.9 m in width and has an average height of 0.6 m. Some stacking occurs at the northwest end of the pile. One waterworn cobble was observed in the pile. This feature may be a remnant of wall, but has been disturbed historically.

Site 21251 Summary

Site 21251 is in fair condition. The site is interpreted as an agricultural complex that is constructed more formally (with facing and surface pavements) than the surrounding agricultural features associated with the Kona Field System. Thus, parts of the site may have been utilized as agricultural work areas for the processing and storage of agricultural goods.

Site 50-10-37-21632

Site 21632 is a complex consisting of two features, a wall (Feature 1) and a mound (Feature 2) (Figure 21). The site is within the *ahupua'a* of Honalo, at approximately 335 ft amsl (see Figure 4). The site is situated within a pahoehoe lava flow with intermittent soil areas. A more recent a'a lava flow intersects the site area on the east side.

Feature 1 wall is roughly C-shaped in configuration and encircles a level soil area due to its abutment to a roughly 2-meter high a'a outcrop face on the east. The enclosed soil area measures roughly 15 m in diameter and contains Feature 2 mound at its center. Feature 1 wall is bifaced with small pahoehoe boulders and large cobbles and contains a cobble mix fill. The wall is almost flush (0.2 m high) to pahoehoe outcrop on its west side and raised to an average height of 0.9 m on the east side. The north portion of the wall is freestanding on a soil surface to a height of 0.8 m. The wall measures is an average of 0.7 m wide.

Feature 2 mound is located on a level soil surface at the center of the enclosure formed by Feature 1. The mound is constructed of piled cobbles and boulders and measures roughly 3 m in diameter, with a height of 0.6 m.

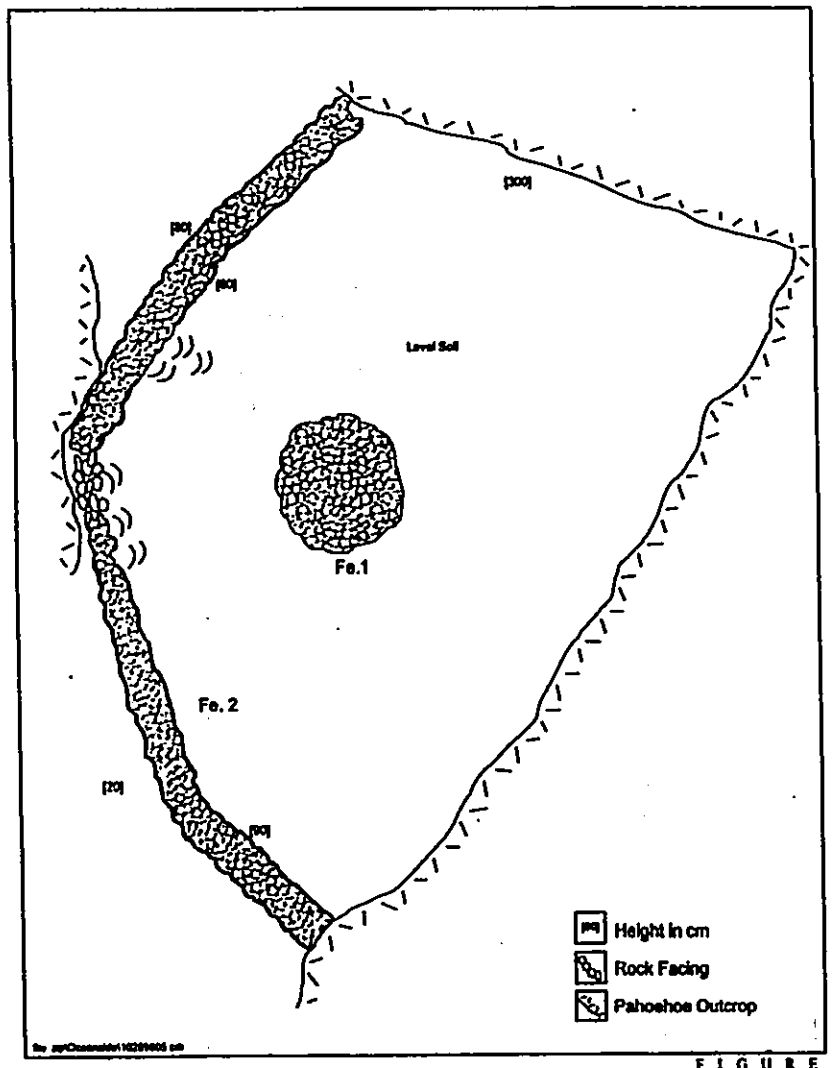
Site 21632 Summary

Site 21632 complex is in good condition. Based on the lower wall height on the exterior side of the enclosure, the site is interpreted as an animal pen, possibly for the containment of pigs. Feature 2 may be a clearing mound associated with maintenance of the pen. Because the site is in good condition compared to other sites in the region, it was probably utilized during the post-Contact period.

Site 50-10-37-21633

Site 21633 is a remnant wall located within the *ahupua'a* of Honalo, at approximately 325 ft amsl (see Figure 4). The wall extends across an undulating, a'a lava flow. The western end of the site wall is situated near the center line of the proposed road corridor.

Site 21633 wall extends approximately 60 m to the northeast until intersecting a well-constructed north-south oriented wall. The site wall is defined by a single row of small boulders and cobbles stacked 3 courses high (Figure 22). It measures an average width of 0.4 m and maximum height of 0.7 m. A barbed wire extends along the top of the wall.



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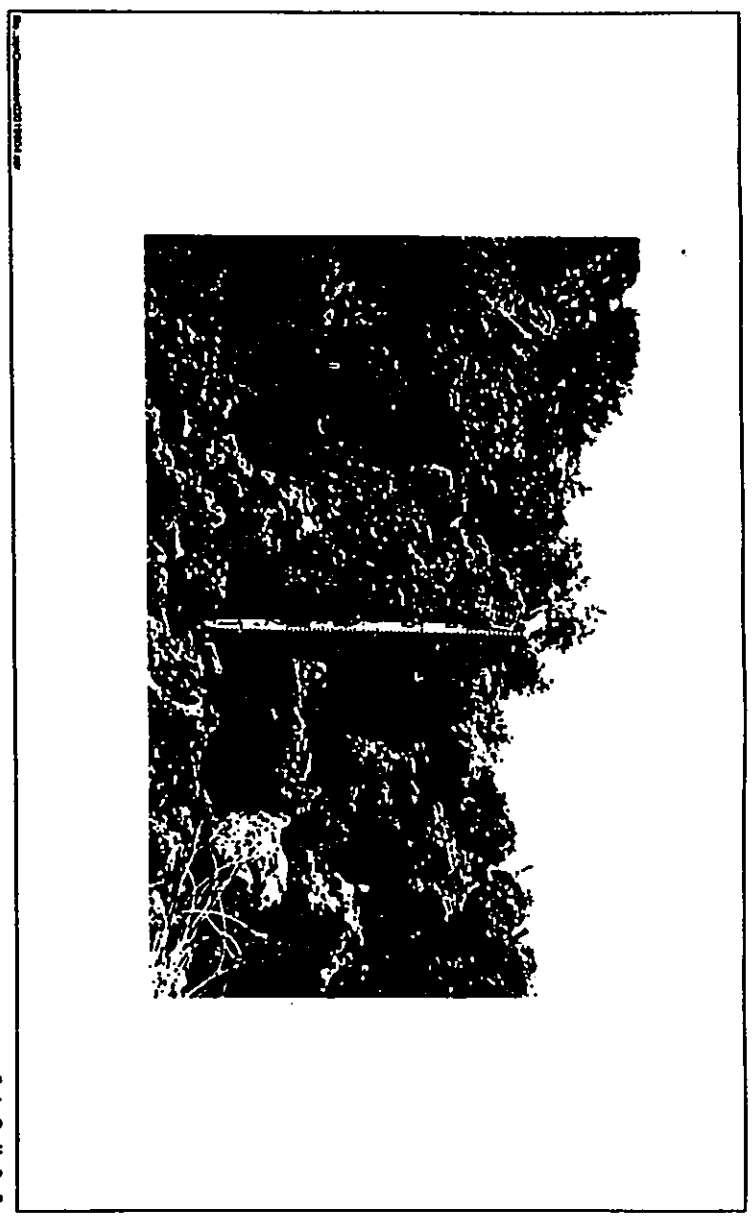
Site 50-10-37-21632, Feature 1 and 2; Plan View

FIGURE 21



Site 50-10-37-21633 Wall; View South

FIGURE 22

Site 21633 Summary

Site 21633 is in fair condition. It is interpreted as an historic boundary and cattle wall that, as suggested by the barbed wire attachment, was modified during modern times.

Site 50-10-37-21634

Site 21634 is a complex of features situated within the *ahupua'a* of Mā'ihi at approximately 340 ft amsl (see Figure 4). The site features cover the entire width of the proposed road corridor. The site modifies an undulating landscape composed of moderately sloped soil areas at the base of pahoehoe knolls and *mauka-makai* ridges. A drainage is situated at the northern edge of the site at the base of an a'a lava flow to the north.

The site features consist mainly of mounds and terraces extending both parallel and perpendicular to the slope. The terraces retain level soil areas, with some of the linear terraces paralleling the slope appearing similar to the more formal *kuaiwi* identified elsewhere in the project (e.g., Site 21236). The pahoehoe knolls and ridges in the site area are extensively terraced, both along the base of the outcrops and on top.

Site 21634 Summary

Site 21634 is in fair condition. The site is interpreted as a complex of dryland agricultural features that characterizes cultivation in the Kona Field System among sloping and undulating landscapes with sizable soil areas and intermittent pahoehoe outcrops.

Site 50-10-37-21635

Site 21635 is a wall located within the *ahupua'a* of Ma'ihi at approximately 325 ft amsl (see Figure 4). The site crosses the width of the proposed road corridor, in an east-west direction. The site extends along pahoehoe flow sloping moderately to the west.

The site wall is bifaced with small and medium pahoehoe boulders and a cobble fill (Figure 23). It is 5 to 10 course high, and measures 0.9 m wide by 1.0 m high.

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Site 50-10-37-21635 Wall; View south

FIGURE 23

Site 21635 Summary

Site 21635 is in fair to good condition. It is interpreted as an historic boundary and cattle wall. It intersects a north-south wall (Site 50-10-37-21636) along the east boundary of the proposed road corridor, thus forming a cattle paddock.

Site 50-10-37-21636

Site 21636 is a wall situated in the *ahupua'a* of Ma'ihi at approximately 350 ft amsl (see Figure 4). The wall runs roughly north to south and intersects a small portion of the eastern boundary of the proposed road corridor. The site extends across a roughly level landscape encompassed in pahoehoe outcrop rubble.

The site wall is bifaced with small and medium pahoehoe boulders and contained a cobble fill. It measures an average of 1.3 m high by 0.7 m wide, and is wider at the base. The site wall joins Site 21635 wall on the north. A gap exists between the site wall and another wall (Site 50-10-37-21237) to the south, running perpendicular to the site wall. An old road passes through this gap.

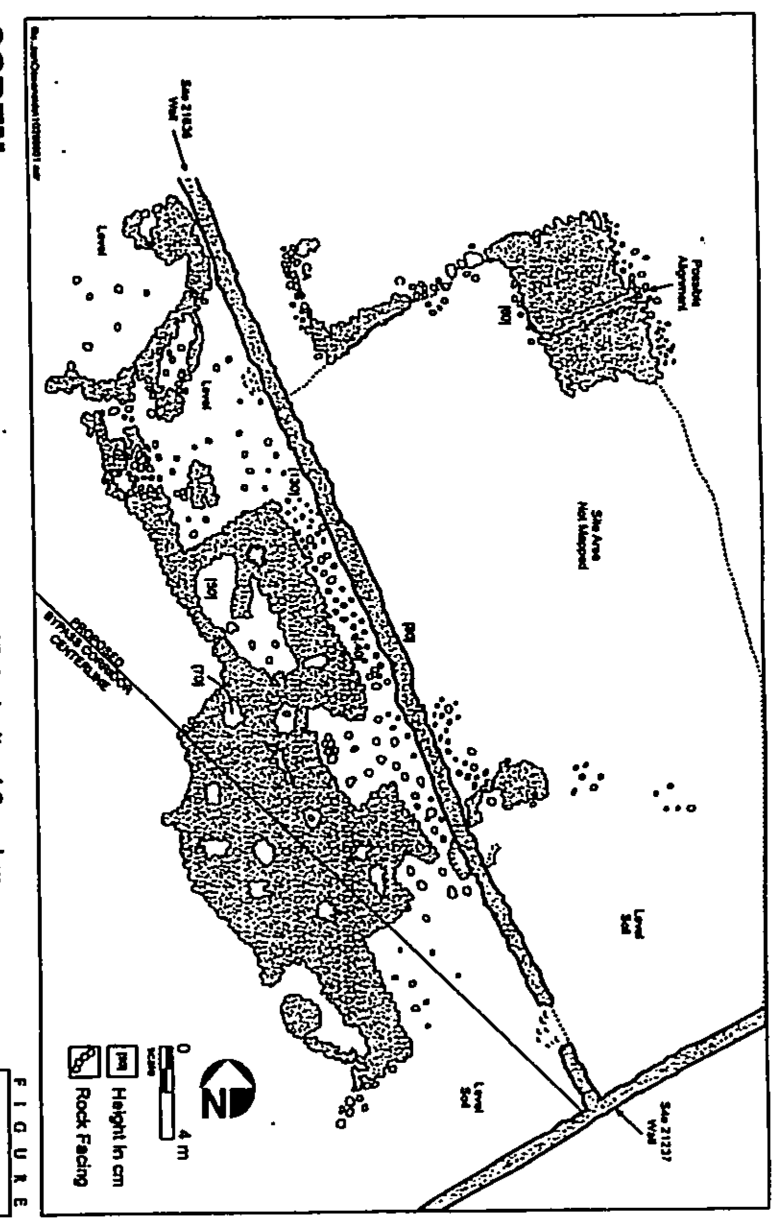
Site 21636 Summary

Site 21636 is in good condition. It is interpreted as an historic boundary and cattle wall. Its intersection with other cattle walls forms cattle paddocks in the pasture land.

Site 50-10-37-21637

Site 21637 is a complex of features situated in the *ahupua'a* of Ma'ihi at approximately 325 ft amsl (see Figure 4). The site features cover the entire width of the proposed road corridor and modify a raised surface of dense, pahoehoe rubble (Figure 24). Site 21636 wall extends through the center of the recorded complex. An extensive soil area is situated to the south of the site beyond another wall, Site 50-10-37-21237. Habitation sites were observed just beyond the eastern boundary of the proposed corridor.

The site features consist generally of terraces, mounds, and enclosures that are constructed among the outcrop rubble. Enclosures in the complex are typically circular, 1 to 2 m in diameter, and formed by excavating depressions in the surrounding outcrop rubble. Terraces are generally configured along the perimeter of the outcrop rubble and defined by stacked faces adjacent to soil areas. Mounds occur in exposed soil areas and on top of the outcrop rubble surface. Cleared



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Sample of Site 50-10-37-21637, Agricultural Complex; Plan View

FIGURE 24

areas are present adjacent to Site 21636 wall, which was probably due to the construction of the wall. Cowry shell and coral fragments were observed throughout the site area.

Site 21637 Summary

Site 21637 is in fair to good condition. The site is interpreted as a complex of dryland agricultural features that characterizes cultivation methods in the Kona Field System among loose, rocky terrain adjacent to larger soil areas (e.g., soil *kipuka* to the south). Plants and trees were likely cultivated within the rocky depressions as well as exposed soil pockets of the site.

Site 50-10-37-21638

Site 21638 consists of two parallel walls situated in the *ahupua'a* of Ma'ihi at approximately 310 ft amsl (see Figure 4). The walls were identified in the eastern half of the proposed road corridor. The vegetation at the site was covered in a dense guinea grass, and the underlying site and ground surface was difficult to discern. The overall landscape appeared to have been mechanically cleared (e.g., chain-dragged).

The site walls are spaced at 2.6 m apart and extend in a roughly southwest-northeast direction. The east end of the site appears to converge at pahoehoe outcrop, while the western end was undefinable. The walls are constructed of stacked and piled pahoehoe cobbles and boulders with heights ranging between 0.5 m to 1.0 m.

Site 21638 Summary

Site 21638 is in remnant condition with only a portion of the walls preserved in the eastern half of the proposed corridor. The site is tentatively interpreted as an historic trail or cattle run.

Site 50-10-37-21639

Site 21639 is a complex of features situated in the *ahupua'a* of Kuamo'o at an approximate elevation of 325 ft amsl (see Figure 4). The site area is characterized by an expansive soil area containing intermittent pahoehoe knolls and ridges. The landscape slopes gently to moderately to the west. The site covers the entire width of the corridor between Site 21238 wall and Site 21640 *heiau* located outside of the proposed road corridor (see Appendix A).

The site consists mostly of features that modify the pahoehoe outcrops. The features are typically defined by terraces on the outcrops; the terraces retain small soil pockets, or essentially create level surfaces on the outcrops. Mounds were also observed in the soil expanses dominating the site area.

Site 21639 Summary

Site 21639 is in fair condition. It is interpreted as a complex of dryland agriculture features that characterizes cultivations in the Kona Field System among soil expanses and scattered outcrops.

Site 50-10-37-21642

Site 21642 is a complex of features situated in the *ahupua'a* of Kuamo'o at approximately 375 ft amsl (see Figure 5). The site modifies a large area dominated by an undulating surface of pahoehoe outcrop knolls and east-west descending ridges; soil pockets exist between the outcrops. The features cover the entire width of the proposed road corridor.

The complex features consist almost exclusively of modifications on the existing outcrops, often defined by terracing along the perimeter, and on the surface of the outcrop, or linear mounds placed against outcrops to form enclosed soil areas. Mounds are also present throughout the complex and tend to exist in the larger soil areas. Marine midden was observed amongst one of the site features, to the west of Site 50-10-37-21641 habitation complex located outside of the proposed road corridor (see Appendix A).

Site 21642 Summary

Site 21642 is interpreted as a complex of dryland agricultural features that typify methods of cultivation in the Kona Field System among undulating pahoehoe landscapes lacking expansive soil areas.

Site 50-10-37-21645

Site 21645 is a complex of numerous features located in the *ahupua'a* of Kuamo'o. The complex extends across the entire width of the proposed road corridor at approximately 410 ft amsl. The site modifies a prominent pahoehoe knoll with an undulating surface of uplifted outcrops and adjacent soil pockets.

The site features consist of modifications in the pahoehoe that include mounds, low walls, stone-lined sinks (collapsed lava blisters), and terracing along the edges of the uplifted outcrops.

Site 21645 Summary

Site 21645 is interpreted as an agricultural complex that typifies cultivations in the Kona Field System that were rocky with small and shallow soil deposits. Site 50-10-37-21646

Site 21646 is an agricultural complex located in the *ahupua'a* of Kawanui. The complex extends across the width of the proposed road corridor at approximately 410 ft amsl (see Figure 5). The terrain is characterized by a somewhat undulating surface of pahoehoe knolls and ridges with intermittent areas of level soil expanses. A more expansive soil expanse exists to the west of the site, beyond the proposed road corridor.

The site features consist of large mounds and substantial outcrop modifications. The mounds are typically isolated and located in the soil areas of the site. The modifications occur as terraces and mounds piled along the outer edges of raised outcrops and collapsed lava blisters, as well as possible pit excavations in the pahoehoe lava.

Site 21646 Summary

Site 21646 is interpreted as an agricultural complex that characterizes cultivations in the Kona Field System that occurred on landscapes with high outcrop knolls and sizable soil areas.

Site 50-10-37-21648

Site 21648 is a complex of pahoehoe excavations located in Keauhou Ahupua'a, just east of the existing Ali'i Drive. The site is on the center line of the proposed corridor at approximately 100 ft amsl (see Figure 5). It modifies a level plateau of pahoehoe outcrop at the base of a steep a'a lava flow descending from the east.

The site consists of at least 12 excavated depressions in the pahoehoe surface. The excavations appear to have been done to expose the interiors of subterranean blisters and tubes (Figure 25). The stone material excavated from the depressions is present within the depressions and on the adjacent outcrop surface. Three water-rounded, small boulders were observed inside the depressions.

Site 21648 Summary

Pahoehoe excavations have been identified as cultural features throughout the island of Hawai'i. Depending on the context of the features, these feature types are subject to a variety of functional

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Site 50-10-37-21648 Pahoehoe Excavation

FIGURE 25

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Site 50-10-37-21649 Wall; View South

FIGURE 26

interpretations, including (but not limited to): mining, agriculture, and shelters. Cultural Surveys Hawaii, Inc, has identified similar types of features immediately up slope of the proposed corridor and concluded that the excavations were agricultural (Borthwick et al. 1994). Therefore, an agricultural function is tentatively assigned to Site 21648, especially since other possible agricultural features were identified nearby at similar elevations of the proposed road corridor (i.e., Site 21233).

Site 50-10-37-21649

Site 21649 is a wall located on the boundary of the *ahupua'a* of Keauhou and Honalo. The site is situated on an a'a lava flow which slopes moderately to the west. The site crosses the width of the proposed road corridor, in an east-west direction, at approximately 315 ft amsl (see Figure 4).

The wall is constructed of an 8 to 10 course facing of small to medium a'a boulders with a cobble fill (Figure 26). It measures 0.65 m wide by a an average height of 1.35 m.

Site 21649 Summary

Site 21649 is in good condition with some collapse apparent on the facing. The site is interpreted as an historic boundary and cattle wall that, akin to other *ahupua'a* walls in the region (cf. Hammatt et al 1997), may have been constructed along the course of a pre-existing agricultural wall associated with the Kona Field System.

Site 50-10-37-21650

Site 21650 is a wall located in the *ahupua'a* of Kuamo'o. The site wall crosses the width of the proposed road corridor at approximately 340 ft amsl (see Figure 4). The site is situated on a moderate slope (descending to the west) of pahoehoe lava outcrops and adjacent soil areas. The site wall is mounded with piled cobbles and small boulders measuring an average width of 1.2 m and height of 0.6 m.

Site 21650 Summary

Site 21650 is tentatively interpreted as a boundary wall. Given its poor state of preservation, it was probably constructed during the pre-Contact era. Since the site is situated amongst a dense concentration of agricultural features (e.g., Site 21642), it may have functioned as an agricultural boundary.

Site 50-10-37-21652

Site 21652 is a complex of two features (Feature 1 and 2) (Figure 27) located in the *ahupua'a* of Kawanui, at an approximate elevation of 415 ft amsl (see Figure 5). The site is situated within an undulating pahoehoe lava flow characterized by collapsed lava blisters, pahoehoe knolls, and adjacent soil pockets.

Feature 1 is a lava blister with a collapsed sink at the center (Figure 28). A mound of piled boulders occurs on the west side of the sink. An overhang is situated in the east side of the sink. Loosely compacted silt deposits exist within the sink and adjacent overhang floor. The silt has been extensively disturbed by pigs probably occupying the overhang. The overhang has an interior space of 2.5 m N/S by 1.5 m E/W and an average ceiling height of 0.6 m. No cultural material was observed among the churned up silt deposit.

Feature 2 is an L-shaped wall located as close as 2.0 m northeast of the Feature 1 sink. The wall has a long axis of 5.5 m (N/S) and short axis of 2.5 m (E/W). It is faced along the west and south faces of the wall to a maximum height of 0.8 m. The east and north sides are almost flush to the adjacent ground surface with a 0.2 m height.

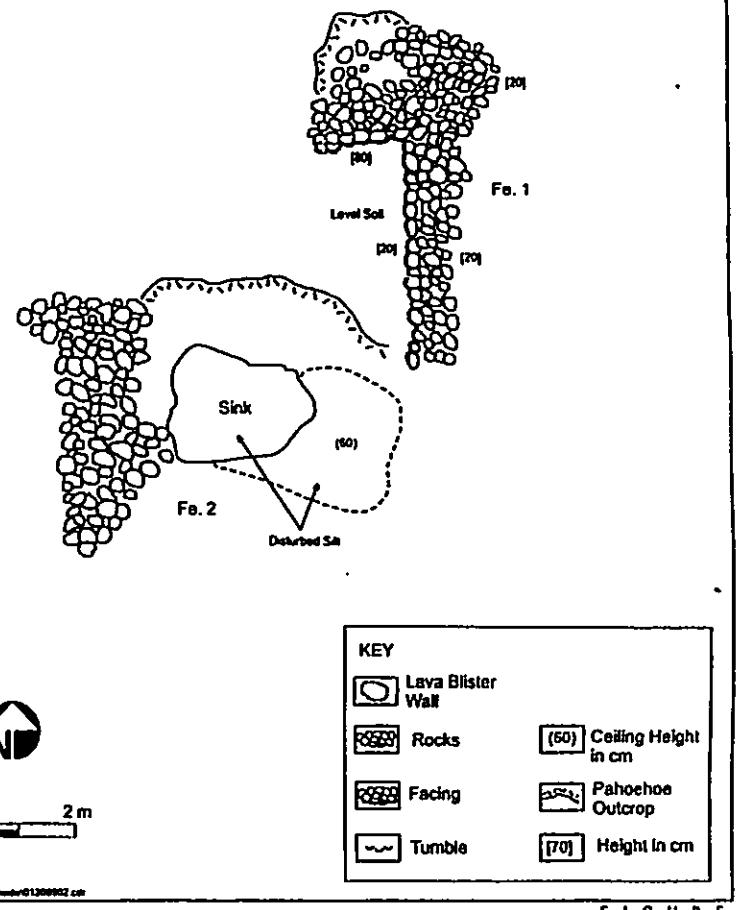
The mound located on the west side of Feature 1 may be the remnant of a wall extending around lava blister sink that once connected to Feature 2 wall. This is suggested by a concentration of boulders in proximity of Feature 2 and the east side of Feature 1 lava blister

Site 21652 Summary

Site 21652 is in fair condition. It is interpreted as a temporary habitation site that was probably occupied during the pre-Contact period. Due to its location near an agricultural complex (Site 21245), the site was probably utilized while tending to crops in the vicinity. Habitation is suggested by the natural shelter provided in the Feature 1 lava blister and the L-shaped shelter-like configuration of Feature 2. The small size of both features suggest temporary use.

Site 50-10-37-21662

Site 21662 is a small rectangular enclosure (Figure 29) located in Kawanui Ahupua'a. The site is situated at approximately 385 ft amsl (see Figure 5). The site is located on a pahoehoe knoll surrounded by soil pockets. Site 21248 is located 12 m/106° (TN) from Site 21662.



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Site 50-10-37-21652 Complex, Features 1 and 2; Plan View

FIGURE 27

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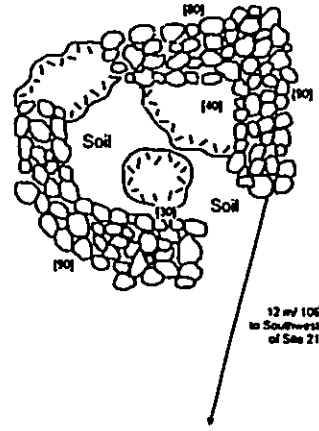
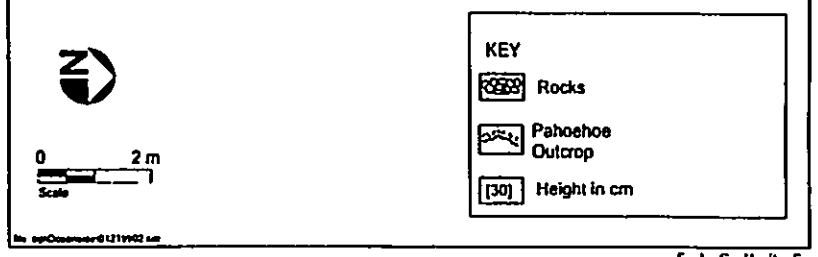
Site 50-10-37-21652 Feature 1 Lava Blister; View East

FIGURE 28





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Site 50-10-37-21662 Enclosure; Plan View

FIGURE 29

The enclosure is constructed along the outer perimeter of a pahoehoe knoll. The wall is constructed of piled small boulders and cobbles measuring 1.0 m wide by a height of 0.9 m. The enclosure interior has a level floor of soil and pahoehoe outcrop and measures 3 m by 3 m.

Site 21662 Summary

Site 21662 is in fair condition. Site 21662 is interpreted as a habitation site that based on its small size was probably occupied on a temporary basis.

ARTIFACT ANALYSIS

A total of 57 cultural artifacts were recovered from either the surface or during subsurface excavations. Fifty-five (98%) of the 56 artifacts are pre-Contact or traditional cultural materials and one (02%) is related to the historic period. Table 2 lists the artifacts by site, feature, and provenience.

Volcanic Glass

A total of 53 volcanic glass flakes were recovered during excavations at Site 21247. Fifty (50) of the flakes were recovered from one test unit (TU2). The volcanic glass flakes range in size from 5 mm to 20 mm and exhibit no signs of utilization along the edge.

Pendant

A human tooth was recovered from excavation in TU2 at Site 21247. The tooth has been perforated through the root, at the base of the enamel. The tooth is an upper right 2nd incisor and exhibits signs of wear, probably from an adult (30-40 yrs of age). The tooth measures approximately 20 mm in length and 6 mm in width (enamel). The hole is elongated or oblong in shape and measures approximately 1 mm in width and 3 mm in length.

Bead

One shell bead was recovered from excavation in TU2 at Site 21247. The shell is white in color and has been perforated through the center. The bead is circular in shape and measures approximately 5 mm in diameter and has a thickness of 2 mm. The hole measures approximately 1 mm in diameter.

Table 2: Artifact Inventory

Site Number 50-10-37-	Feature Number	Prov./ Layer	Material Shell	Material Bone	Type Vol. Glass	Basalt	Other
21247	1	I	✓		✓		
	1	II	✓		✓	✓	✓•
21247	5	I	✓		✓		✓^
	5	II	✓	✓	✓	✓	✓^
21236	8	I	✓		✓		✓^
	8	II	✓		✓	✓	✓••
16599	1	I	✓	✓			
	1	II	✓	✓			
	1	III	✓	✓			✓#

KEY:
- • human tooth pendant
- ^ unmodified coral and kukui nut
- •• unburned kukui nut
- # fish scale
- + adze

Ink Bottle

An intact ink bottle was recovered from the surface of Site 21241. The bottle is clear glass with an applied lip and is octagonal in shape. The bottle measures approximately 65 mm in height and has a base diameter of 65 mm. The neck of the bottle narrows to approximately 20 mm and the opening of the bottle measures 13 mm in diameter. This bottle dates from the late 1800s to early 1900s.

FLORAL AND FAUNAL ANALYSIS

The following section presents the midden recovered from excavations conducted this current survey. Due to the sparse number of midden materials collected during excavations, information on the absence/presence of midden from sites is presented in Table 3 below.

Table 3: Inventory of Floral and Faunal Remains

Site 50-10-37-	16599	21236	21247	Surface
Class: Gastropoda				
Conus sp.				✓
Nerita sp.	✓	✓	✓	
Cellana sp.			✓	
Drupa sp.			✓	
Cypraea sp.		✓	✓	
Other invertebrate				
Echinoderm		✓	✓	
Crustacean			✓	
Unidentified	✓	✓	✓	
Class: Chondrichthyes				
Fish/unidentified			✓	
Class: Mammalia				
Small mammal	✓		✓	
Other				
Kukui endocarps			✓	
Coral			✓	
Charcoal	✓	✓	✓	

DISCUSSION AND CONCLUSIONS

The inventory survey of the proposed Māmalahoa Bypass Road Corridor resulted in the identification of 47 sites in 13 of the total 17 *ahupua'a* crossed by the road corridor. The sites are located between 125 ft and 1060 ft amsl, with 60% of the sites situated between 300 and 400 ft amsl, in the *ahupua'a* in the southern half of the proposed road corridor (e.g., Honalo, Ma'ihi, Kuamo'o, and Kawanui).

Functional Affiliations and Chronology

Roughly half of the sites identified within the proposed road corridor (n=24) are interpreted as traditional Hawaiian sites attributable to the pre-Contact and early post-Contact periods; six of these 24 sites also contain post-Contact, non-traditional features (specifically boundary walls) and a few of the traditional site features have been modified for post-Contact, commercial agriculture. The remaining 23 sites are affiliated primarily with non-traditional land use during the post-Contact period.

The traditional Hawaiian sites are interpreted as features associated with intensive, dryland agriculture, habitation, and animal husbandry. The agricultural sites comprise 77% of the traditional site inventory. The majority of the agricultural sites identified in the proposed road corridor reflect various methods of intensive, dryland (or non-irrigated) cultivation undertaken between 300 ft to 900 ft amsl. This type of intensive agriculture in the Kona region is commonly considered to be associated with the Kona Field System.

The cultivation methods, as suggested by the architectural types of the agricultural features, are contingent on the underlying landscape. For example, field boundaries (*kuaiwi*) and mound concentrations, both of which served as planting matrices and as clearing piles, were established in the larger soil expanses (e.g., Sites 16599, 21234, 21235 and 21236); stone terraces were utilized as planting boundaries and soil retention among sloped surfaces of soil expanses (e.g., Site 21634); pahoehoe knolls and ridges were extensively modified for planting in adjacent soil pockets (e.g., Sites 21639, and 21642, 21645); and planting venues were established in rocky depressions of some of the lava flows (e.g., Sites 21645 and 21637). Agricultural endeavors were intensive between the 300 to 900 foot elevations, as is suggested by the relatively uniform density and vast distribution of the agricultural sites' features. This is consistent with the agricultural pattern observed in the Hōkūkano Project (Hammatt et al.1997:99) in which Kona Field System features, including *kuaiwi*, were present even below the 300 foot elevation.

The habitation sites, representing 8% of the site inventory, consisted of five temporary habitations (two of which are included in agricultural complexes) and one site (Site 11307) identified previously with a general habitation function. The habitation sites are represented by partially modified lava blisters and enclosures, with the enclosures having potential living areas measuring between 9 m^2 and 25 m^2. The habitation sites were likely utilized while tending to crops in the vicinity.

The two sites interpreted as animal pens (Sites 21248 and 21632) are likely components of permanent habitation sites located in the near vicinity (Sites 21247 and 21651, see Appendix A). The animal pens are enclosures with high walls (0.8 to 1.3 m) that lack entryways.

The non-traditional sites or features in the proposed road corridor include 24 boundary walls, the Kona Sugar Co. railroad trestle (Site 7214/10302), and a possible clearing mound (Site 13174). The 24 boundary walls are associated with 19th and 20th century cattle ranching and they delineate boundaries of privately owned land parcels and cattle paddocks. Thirteen (13) of the site walls probably follow traditional *ahupua'a* boundaries. In accordance with site interpretations in the Hammatt et al. Report (1997), the *ahupua'a* site walls are classified as both traditional and non-traditional in origin, as it is believed that the post-Contact walls were built over pre-existing, agricultural boundary walls.

The Kona Sugar Co. railroad trestle (Site 7214/10302) is part of an 11-mile railway line constructed in the early 1900's between Wai'aha, North Kona to Keōpuka, South Kona (Wong Smith and Maly 1999:B-1:55-56). The railway was utilized to haul cane from the adjacent fields.

At least two of the traditional agricultural sites in the proposed road corridor (Sites 16599, 21234 and 21235) have been modified for post-Contact commercial agriculture, such as sugarcane or homestead crops (e.g., coffee, pineapple). It is hypothesized in Hammatt et al (1997:110) that "stones were added to the *kuaiwi* to create a higher and wider wall girth and cross-slope walls were removed to create larger, rectangular fields". These types of modifications appear to exist at Sites 16599, 21234, and 21235, which are situated within potential cane lands *mauka* or east of the Kona Sugar Co. railroad trestle (Wong Smith 1999:B-1:56).

Overall, the archaeological sites identified in the proposed road corridor suggest that the middle and upper elevations of the Kona slope crossed by the proposed road corridor were under intensive cultivation during the pre-Contact and early Post-Contact periods. Based on radiocarbon analysis of habitation sites in the upland region (*ca.* 600 ft amsl), Hammatt et al. (1997:291-292) speculate that intensive, dryland agriculture (e.g., Kona Field System) was developed as early as AD 1250-1480 and through the AD 1400-1600s'. Being similar in form and presumed function, the traditional Hawaiian sites present in the project corridor are likely attributable to these same pre-Contact periods, but were probably abandoned by the time the project lands were placed under private ownership for ranching and market-based agriculture by the mid 19th century Māhele period.

SITE SIGNIFICANCE

All 47 sites in the proposed road corridor have been evaluated for site significance using the National and State Registers of Historic Places criteria. In accordance with the National Register criteria, a property is eligible for listing on the NRHP if:

> *The quality of significance in American history, architecture, archaeology, engineering, and culture is present is districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association and*
>
> *a. that are associated with events that have made a significant contribution to the broad patterns of our history; or*
>
> *b. that are associated with the lives of persons significant in our past; or*
>
> *c. that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or*
>
> *d. that have yielded, or may be likely to yield, information important in prehistory or history (36 CFR 60.4).*

The State Register criteria are nearly identical but add criterion e which applies to sites with cultural significance to native Hawaiians or other ethnic groups, particularly religious and burial sites.

All sites located within the proposed road corridor are evaluated as significant under criterion d. It is believed that all 47 sites have yielded or have potential to yield information indicative of the traditional settlement pattern of the 17 *ahupua'a* crossed by the road corridor, and characteristics and chronology associated with methods of intensive agriculture distinctive to the leeward slope of Hawai'i Island (e.g., Kona Field System).

The Kona Sugar Co. railroad trestle (Site 7214/10302) has been previously evaluated by Hammatt et al. 1997 as significant under criteria a, c, and d. Criterion a was assigned to the site because it reflects a "major historic trend in Hawai'i" with the introduction of commercial sugar cane cultivation (Hammatt et al. 1997:306). The site was evaluated as significant under criterion c because it was considered "to be an excellent example of early 20th-century construction, as well as a unique site type within the project area" (Hammatt 1997:307).

RECOMMENDATIONS

Nine of the project sites in the proposed road corridor have been previously recommended to undergo a combination of data recovery and preservation (Hammatt et al. 1997:8-9). These sites consist of eight boundary walls (Sites 16787, 16788, 16789, 16791, 16792, 16796, 16799, and 16800) and the Kona Sugar Co. railroad trestle (Site 7214/10302), all of which extend across the width of the proposed road corridor.

Due to the linear nature of the eight boundary walls (Sites 16787, 16788, 16789, 16791, 16792, 16796, 16799, and 16800) and Kona Sugar Co. railroad trestle (Site 7214/10302), it is recommended that the roughly 120-foot sections of the sites potentially impacted by construction of the proposed road corridor be subjected to Data Recovery. Prior to construction of the proposed roadway, efforts should be made to minimize further impact to these sites by stabilizing the site features and erecting fencing along the remaining portions adjacent to the roadway.

An additional site (Site 13174 mound) is currently under preservation in the development plans of a land parcel encompassing the south end of the proposed road corridor. Because the site function has yet to be determined, it is recommended that Site 13174 be subjected to a field inspection and possibly subsurface testing during the Data Recovery phase of the this study. This work will be done in an attempt to determine the site's function, and further evaluate site significance and appropriate mitigation measures (P. McCoy, pers. comm.).

Data recovery is recommended for all 47 archaeological sites identified in the proposed road corridor, including the 11 sites previously slated for preservation. Data recovery shall include detailed mapping of the larger agricultural complexes, further documentation of the construction techniques of the boundary walls, and excavations at the habitation sites and a sample of agricultural sites. Data recovery shall proceed in accordance with a Data Recovery Plan submitted to the DLNR State Historic Preservation Division for review and approval.

Prior to preparation of the Data Recovery Plan, it is recommended that the centerline of the proposed road corridor be staked by professional surveyors and each site potentially threatened by impact of the proposed road construction be located in relation to the stakes. This task will be especially important for sites identified previously in the southern and central portions of the proposed road corridor (Rosendahl and Jensen 1989; Barrera 1990; and Hammatt et al. 1997) which were not re-located during the present study. If any of the project sites are determined to be

located outside the impact area of the proposed road corridor, no mitigation work should be warranted for these sites.

Based on the results of the present study's inventory survey and previous archaeological surveys, additional sites are known to exist beyond the current boundaries of the proposed road corridor. Therefore, it is recommended that some level of site protection is attempted for these sites prior and during construction of the proposed road corridor. One method of site protection would be to install fencing along the perimeter of the road corridor to ensure that no ground disturbing activities occur beyond the limits of the proposed road corridor. If any ground disturbing activities are planned outside of the proposed road corridor, additional inventory survey work will be warranted.

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APPENDIX A:

DESCRIPTIONS AND TESTING RESULTS OF SITES IDENTIFIED OUTSIDE OF THE PROPOSED MAMALAHOA HIGHWAY BYPASS ROAD

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TABLE

Table 1: Summary of Sites Recorded Outside of Proposed Mamalahoa Bypass Road Corridor

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21243	Maihi 1-2		Complex	Agriculture	Prehistoric
21244	Kuamo'o		Complex	Agriculture	Prehistoric
21246	Kuamo'o		Rectangular enclosure	Animal pen	Prehistoric/historic
21247	Kuamo'o		Terrace-enclosure complex	Permanent habitation	Prehistoric
		1	Enclosure		
		2	Terrace		
		3	Terrace		
		4	Terrace		
		5	Terrace		
21249	Kawaaui		Terrace-enclosure complex	Permanent habitation/agriculture/Animal pen	Prehistoric
		6	Lava blister		
		1	U-Shaped enclosure	Permanent habitation	
		2	Terrace	Permanent habitation	

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21651 (cont.)		2	Circular enclosure	Permanent habitation	
		3	Wall	Agriculture	
		4	Wall	Agriculture	
21653	Kuamo'o		Terrace	Possible burial/ceremonial	Prehistoric
21660	Kuamo'o		Terrace complex	Possible burial/ceremonial	Prehistoric
21661	Kuamo'o		Enclosure	Animal pen?	Prehistoric
21663	Kuamo'o		Wall	Cattle wall	Historic

State Site No. (50-10-37-)	Ahupua'a	Feature No.	Formal Type	Probable Function	Possible Age
21249 (cont.)		3	Enclosure	Animal pen	
		4	Enclosure	Permanent habitation	
		5	Terrace	Agriculture?	
21640	Kuamo'o		Rectangular enclosure	*Heiau* (notched)	Prehistoric
21641	Kuamo'o		Terrace-enclosure complex	Permanent habitation/agriculture	Prehistoric
21641		1	Terrace	Agriculture	
		2	Terrace-enclosures	Permanent habitation	
		3	Terrace-enclosure	Permanent habitation	
		4	Terrace-enclosure	Permanent habitation	
21643	Kuamo'o		Terrace-enclosure complex	Permanent habitation	Prehistoric
21644	Kuamo'o		Wall remnant	Boundary	Prehistoric?
21647	Kawanui		Modified outcrop complex	Agriculture	Prehistoric
21651	Kawanui		Terrace-enclosure-wall complex	Permanent habitation/agriculture	Prehistoric
		1	Terrace	Permanent habitation	

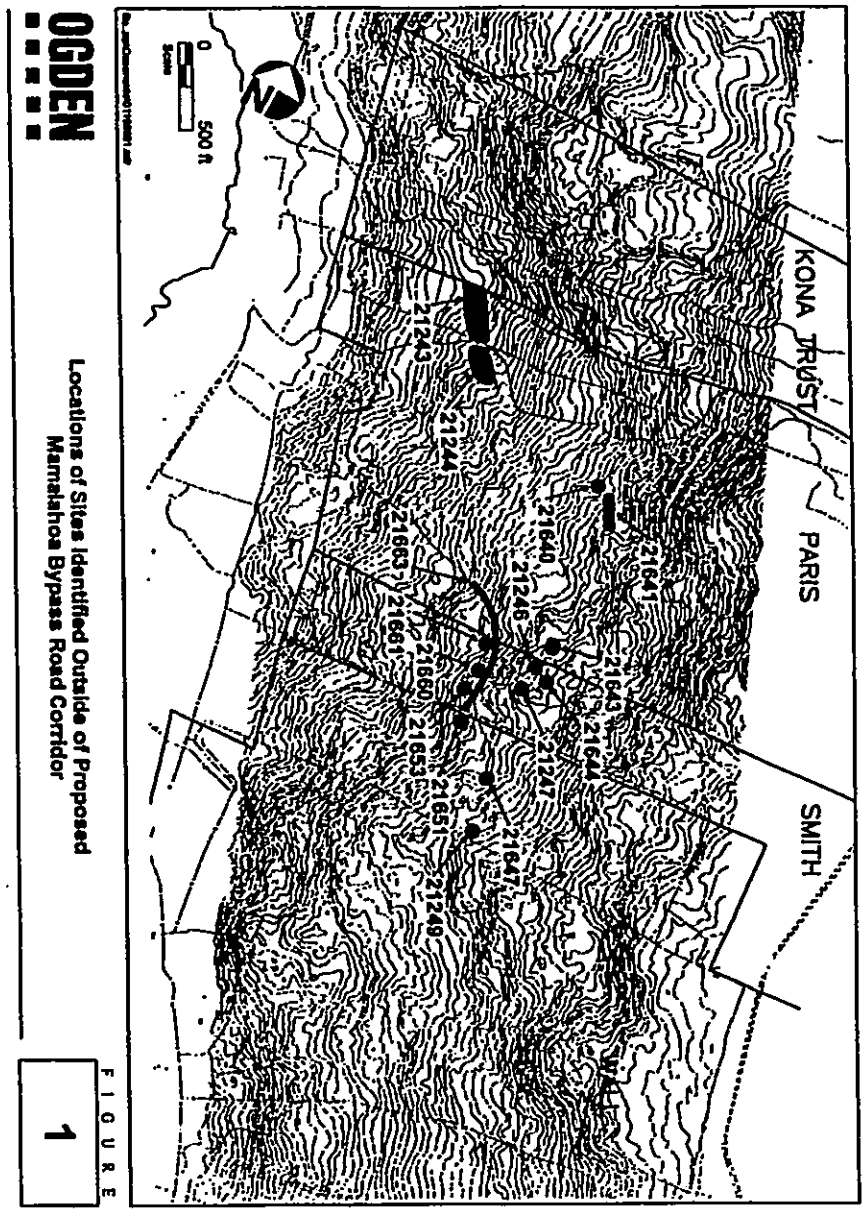


FIGURE 1

SITE 50-10-37-21243

This site is an agricultural complex located within the *ahupua'a* of Maihi 1-2 at approximately 220 ft amsl (see Figure 1). The overall site area has an undulating and rocky landscape. The site consists of numerous features including: modified rock outcrops, rock mounds, crude terracing, planting areas, and rock alignments.

Site 21243 Summary

Site 21243 is interpreted as an agricultural complex reflective of intensive, dryland cultivation in rocky landscapes of the Kona Field System.

SITE 50-10-37-21244

This site is a agricultural complex located within the *ahupua'a* of Kuamo'o at approximately 230 ft amsl (see Figure 1). The site contains the same types of features as observed at Site 21243.

This site includes modified rock outcrops, rock mounds, crude terracing, soil planting areas, and rock alignments. A sample map, Figure 2, illustrates the types of features encountered and the density in which they occurred.

Site 21243 Summary

Site 21243 is interpreted as an agricultural complex that reflects intensive, dryland cultivation in rocky landscapes of the Kona Field System.

SITE 50-10-37-21246

Site 21246 is a rectangular enclosure located within the *ahupua'a* of Kuamo'o. The site is situated on the west slope of a pahoehoe knoll dominating the area. It is currently located to the east of the proposed road corridor at approximately 420 ft amsl (see Figure 1).

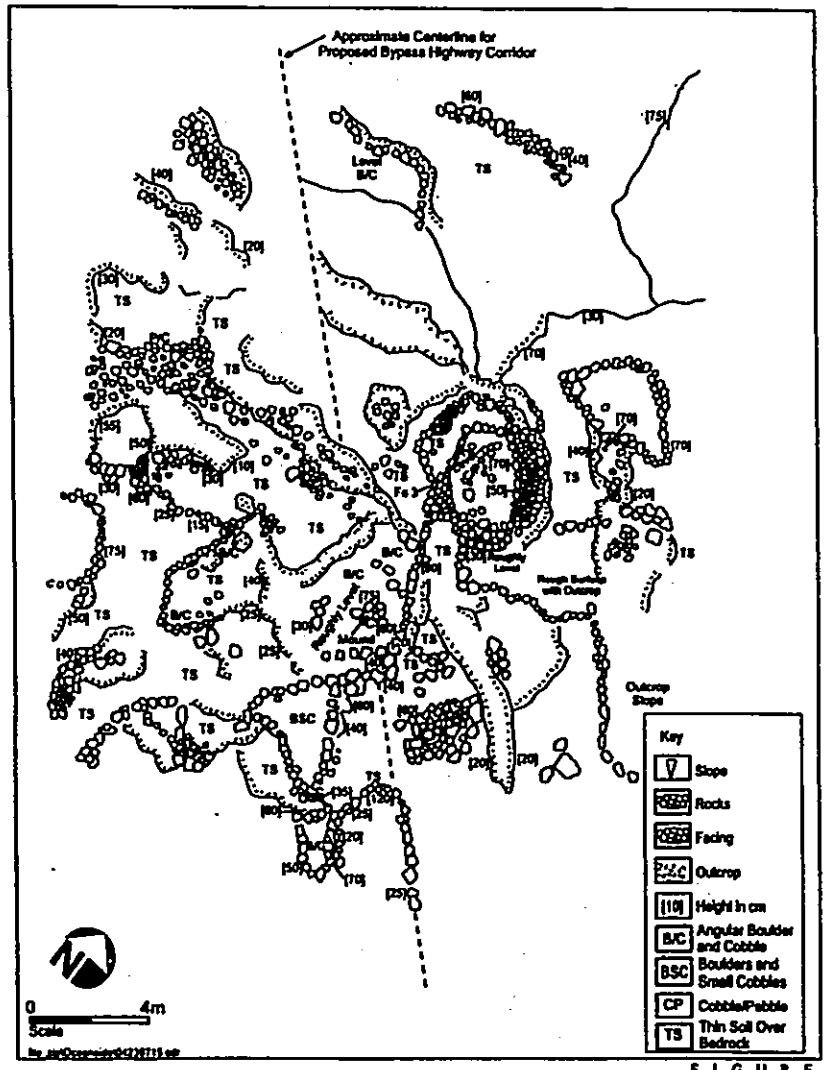
The enclosure measures 17.0 m by 15.0 m (Figure 3). The enclosure wall is bifaced with angular basalt cobbles and small boulders and measures approximately 1.0 m thick by an average height of 0.9 m. The enclosure floor is moderately sloped to the west and contains a raised pahoehoe outcrop in its eastern half. An unfinished or partially re-worked adze was collected from the ground surface roughly 25 m and 254° (TN) from the southwest corner of the enclosure.

Site 21246 Summary

Site 21246 is located in the vicinity of a cluster of permanent habitation sites, possible burials and agricultural features. Given the high-walled construction of the site, and its sloped interior and lack of entrance (the latter two elements precluding habitation use), it was probably used as an animal pen.

SITE 50-10-37-21247

Site 21247 is a complex of six features (Features 1 through 6) (Figure 4) located within the *ahupua'a* of Kuamo'o at approximately 420 ft amsl. The site is currently situated to the east of the proposed road



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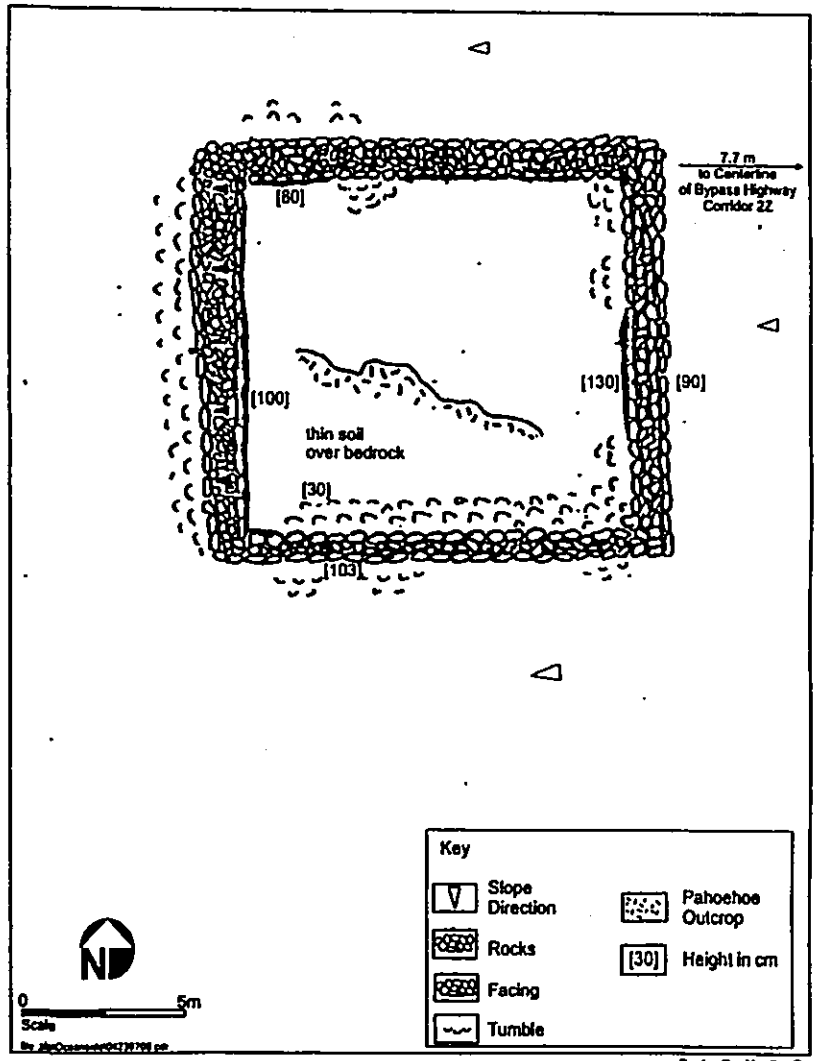
Sample of Agricultural Features within Site 50-10-37-21244

FIGURE 2



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Site 50-10-37-21246; Plan View

FIGURE 3

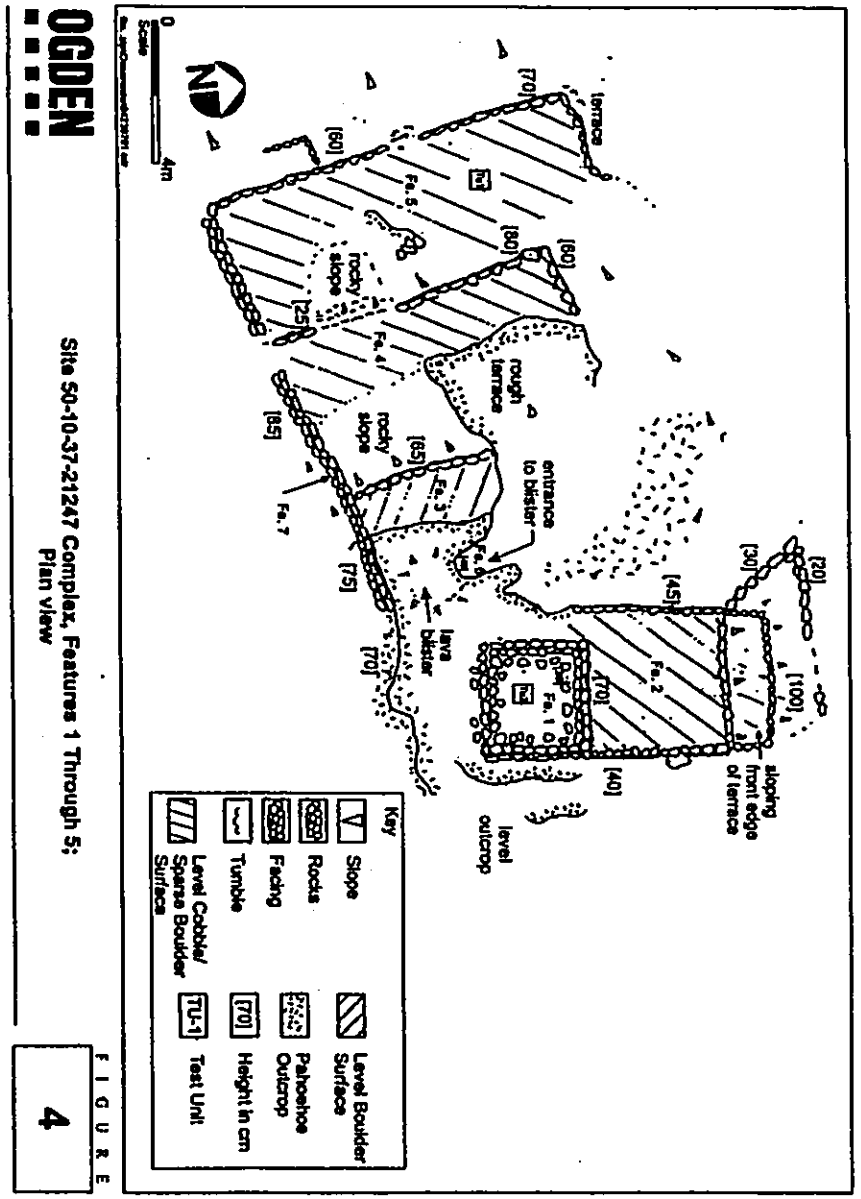


FIGURE 4

corridor on the west-facing edge of a prominent pahoehoe knoll (see Figure 1). The site location allows for a panoramic view of the coast.

Feature 1 enclosure measures approximately 3.5 m in length by 3.0 m in width. The walls are constructed of stacked angular basalt cobbles and small boulders and has an average height of 0.5 m and a width of 0.6 m. The exterior portion of the north wall is faced; the west and east walls were probably faced at one time but have since collapsed; the south wall is built against a natural rock outcrop. The interior of the enclosure wall has several upright boulders constructed in the face. The enclosure interior is a level soil area with scattered cobbles.

A coral abrader was observed at the base of the exterior portion of the north wall. Subsurface testing was conducted at Feature 1 of Site 21247 to assist in the determination of site function and temporal affiliation. The testing results are provided below.

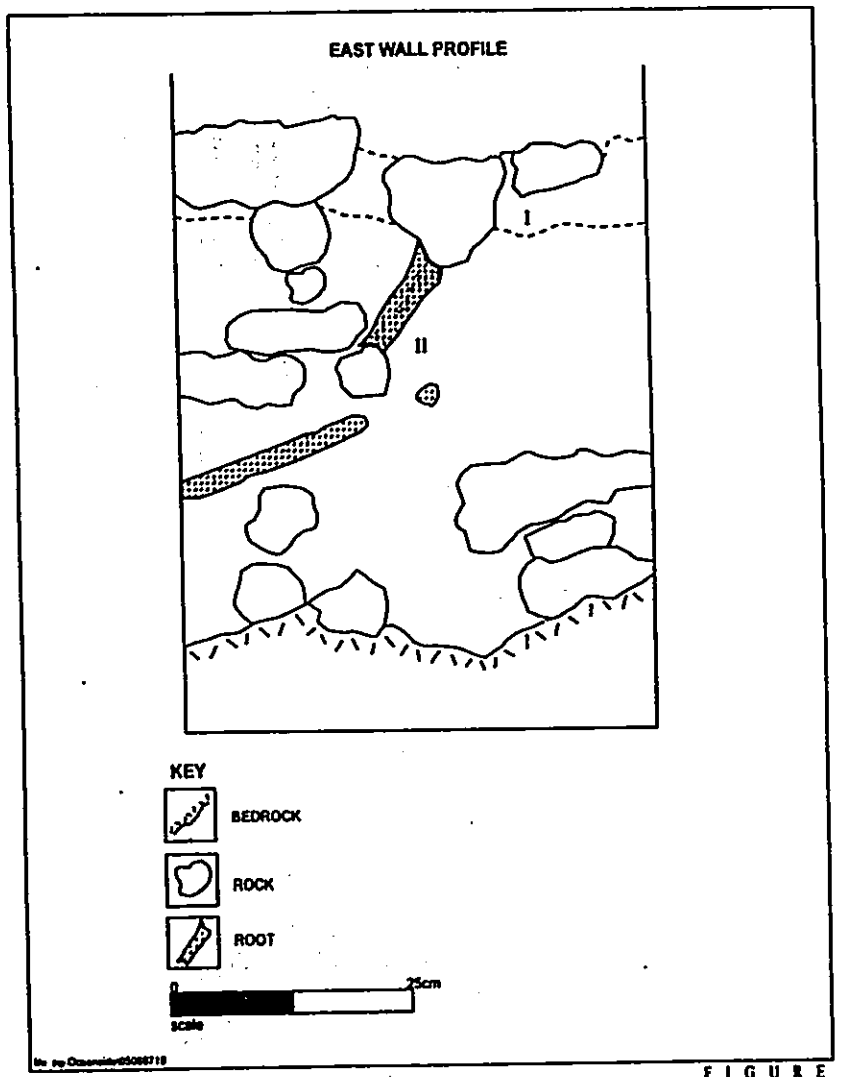
Site 21247, Feature 1 Testing Results

A 0.5 m by 0.5 m test unit (TU-2) was excavated in the soil area at the center of Feature 1 enclosure. Test Unit 2 was excavated to maximum depth of 60 cm below surface. Two stratigraphic layers (Layers I and II) were identified in TU2 (Figure 5). Layer I, a very dark brown silt loam, contained dispersed, sparse charcoal and was noticeably free of cobbles and pebbles. The underlying dark reddish brown, cobbly silt loam deposits of Layer II were non-cultural. Soil descriptions and cultural content of Layers I and II are provided below:

> Layer I 5-9 cm thick; very dark brown (10YR 2/2, moist) very cobbly silt loam with a high organic content; contains approximately 50-60%, by volume, angular to subangular pahoehoe basalt cobbles and pebbles; loose when dry, slightly sticky when wet, non-plastic; many, fine interstitial roots; abrupt, smooth boundary; cultural layer containing one volcanic glass flake and charcoal.
>
> Layer II 40 -55 cm thick; black (10YR 2/1, moist) very cobbly silt loam with a high organic content; contains approximately 50-60%, by volume, angular to subangular pahoehoe basalt cobbles and pebbles; loose when dry, slightly sticky when wet, non-plastic; few, medium, tubular roots; lower boundary undetermined; cultural layer containing marine shell, sea urchin, sparse fish bone, two waterworn basalt pebbles, volcanic glass flakes, a drilled shell, a human tooth pendant, and possible coral abrader fragments.

Feature 2 is a terrace is situated north of Feature 1 enclosure. The terrace measures approximately 5.0 m in length by 4.0 m in width and its surface is an angular basalt cobble fill. The north, east, and west sides of the terrace use small basalt boulders as a shallow facing to retain the surface fill. The facing is approximately 0.5 m in height. The south side of the terrace abuts the north wall of Feature 1 enclosure. Along the north side of the terrace there is a gradual slope which extends to an edge of the pahoehoe knoll.

There is a rock alignment that extends in a northwest direction off the northwest portion of the terrace (Feature 2). The alignment is constructed of angular basalt cobbles and small bounders and measures 2.5 m in length before turning towards the east for an additional 5.0 m. The alignment has an average height of 0.3 m and width of 0.3 m.



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Site 21247, Feature 1, Test Unit 2 Profile

FIGURE 5

Feature 3 is another terrace, located approximately 4.5 m southwest of the southwest corner of the Feature 1 enclosure. The terrace face is constructed of stacked angular basalt cobbles and measures approximately 4.0 m in length and has an average height of 0.6 m. The southern end of the terrace joins with a portion of the wall (Feature 7) that extends in a *mauka/makai* direction. The area behind (*mauka*) of the terrace face consists of soil. Several fragments of marine shell were observed on the surface. Feature 4 is a terrace located approximately 4.0 m *makai* (west) of Feature 3. The terrace face is constructed of stacked angular basalt cobbles and small boulders and measures approximately 8.0 m in length, 2.0 m in width, and has an average height of 0.6 m. A 2.3 m portion of the terrace face has collapsed, probably due to erosion. The area behind the terrace face consists of soil, exposed bedrock, and a rocky slope.

Feature 5 is the largest terrace of the complex and measuring approximately 10.0 m in length and 3.5 m in width. The terrace face is constructed of stacked angular basalt cobbles and has an average height of 0.7 m. The southern end of the terrace joins with the *makai* end of the wall (Feature 7). The area behind the terrace face consists of a level soil surface with areas of exposed outcrop.

A small L-shape alignment extends off the terrace of Feature 5, near the southern end. The L-shape measures approximately 1.5 m in length by 0.9 m in width and is constructed of angular basalt cobbles.

Subsurface testing was conducted at Feature 5 to assist in the determination of site function and temporal affiliation. Results of this testing are presented below.

Site 21247, Feature 5 Testing Results

A 0.5 m by 0.5 m test unit (TU-1) was excavated in the soil surface in the northern half of Feature 5 terrace (see Figure 4) TU-1 was excavated to an approximate depth of 40 cm below surface. Two stratigraphic layers (Layers I and II) were identified in TU-1. Layer I, a very dark brown silt loam, contained dispersed, sparse charcoal and was noticeably free of cobbles and pebbles. The underlying dark reddish brown, cobbly silt loam deposits of Layer II were non-cultural. Soil descriptions and cultural content of Layers I and II are provided below.

> **Layer I** 17-20 cm thick; Angular to subangular pahoehoe cobbles and pebbles in a black to very dark brown (10YR 2/1.5, moist) silt loam matrix; high organic content; silt loam matrix is loose when dry, slightly sticky when wet, non-plastic; abrupt, smooth boundary; cultural layer containing unburned kukui nut, marine shell, unmodified coral, and a volcanic glass flake.
>
> **Layer II** 5-18 cm thick; black (10YR 2/1, moist) cobbly silt loam with a high organic content; contains approximately 25 to 35%, by volume, angular to subangular pahoehoe cobbles and pebbles; loose when dry, slightly sticky when wet, non-plastic; directly overlies pahoehoe bedrock; cultural layer containing marine shell, a basalt flake, volcanic glass flakes, unmodified coral, burned kukui and wood charcoal.

Feature 6 is a small lava blister located 2.0 m west of the southern corner of the enclosure. The blister opening measures approximately 0.9 m in length and has a height of 0.4 m. Inside the blister is soil with *'opine* and cowrie shell and *kukui* nut on the surface.

Several fragments of marine shell and small coral fragments were observed *makai* of the entrance to Feature 6 lava blister.

Feature 7 is a wall, located on the south side of the site, that extends in *mauka/makai* direction. The wall is constructed of stacked angular basalt cobbles and small boulders and measures approximately 12.0 m in length, 0.5 m in width, and has an average height of 0.8 m. The *mauka* end of the wall starts along a natural rock outcrop and extends along the southern ends of the terraces (Features 3-5), until terminating at the south end of Feature 5.

Site 21247 Summary

Site 21247 is interpreted as a permanent habitation site that, based on the presence of traditional cultural material, was probably occupied during the pre-Contact era. The existence of multiple features (including at least two main habitation structures [Features 1 and 2]) in combination with its proximity to other habitation sites (Sites 21643 and 21651) and possible burials or ceremonial sites (Sites 21653 and 21660) suggests the habitation site was occupied on a permanent or recurrent basis.

SITE 50-10-37-21249

Site 21249 is a complex of five features (Features 1 through 5) (Figure 6) located within the *ahupua'a* of Kawanui, at approximately 435 ft amsl. The site is currently situated to the east of the proposed road corridor (see Figure 1) at the outer perimeter of an a'a flow. A soil expanse extends to the west of the site. Small mounds are located in the soil area west of the site.

Feature 1 is a U-shaped enclosure that is open to the west. The enclosure measures 10.0 m by 6.5 m. The north and east walls are bifaced with small boulders and a cobble fill. The south wall terraces a'a outcrop. The walls are approximately 1.5 m thick and have an average height of 0.6 m. The interior floor of the enclosure is level soil with scattered rock.

Feature 2 is a terrace located adjacent to the northwest corner of Feature 1. The terrace is roughly rectangular-shaped and is constructed of a small boulder facing (0.6 m high) on the west side which retains a level cobble surface. The north, west, and south sides are constructed flush to a'a outcrop underlying the site. The terrace measures 7.0 m by 3.0 m.

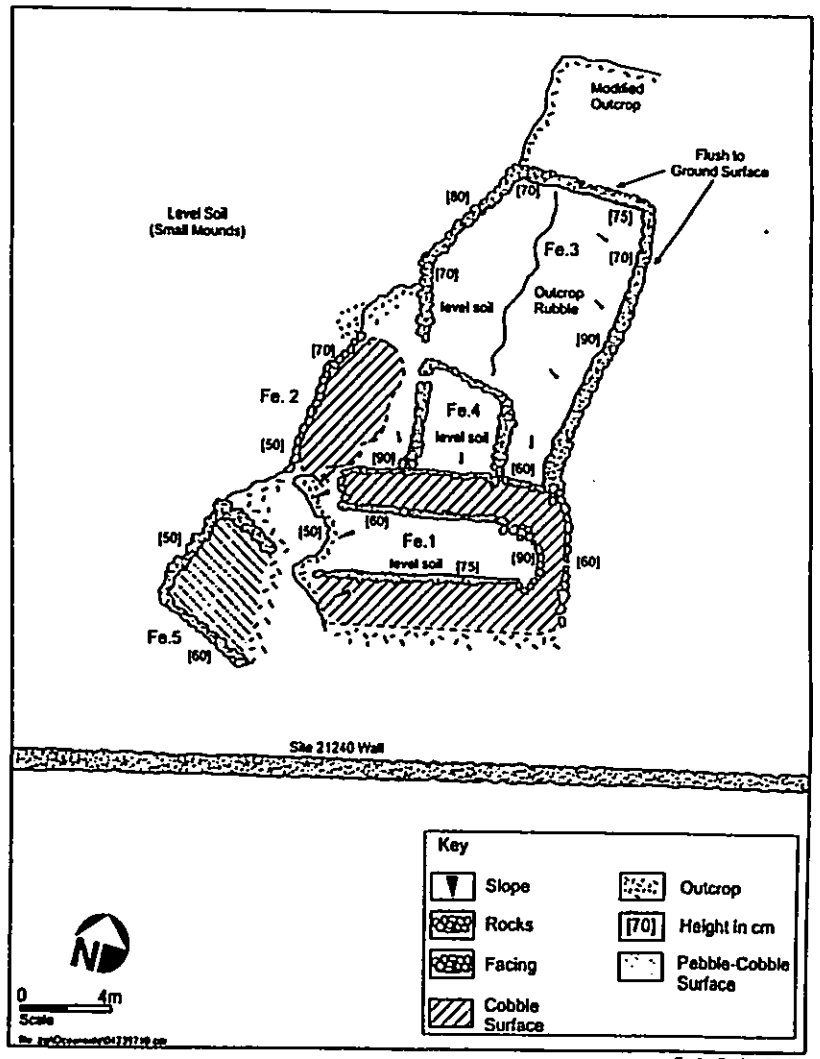
Feature 3 is a roughly rectangular enclosure located to the north of Feature 1. The enclosure measures approximately 13.0 m in length, 9.0 m in width, and has an average wall height of 0.7 m. The walls are constructed of stacked angular basalt cobbles and small boulders with evidence of facing on the interior portions of the east and north walls. The exterior portion of the east wall terraces the a'a outcrop underlying the site. The interior of the enclosure contains a sloped a'a surface in the east half and level soil in the west.

Feature 4 is a rectangular enclosure built against Feature 1's north wall, in the southwest corner of Feature 3. The enclosure wall is constructed of cobbles and small boulders. Most of the wall is in collapsed condition. A gap in the northwest corner may have been an entryway. The enclosure floor is level soil.

Feature 5 is a roughly rectangular terrace built against the west edge of the a'a outcrop underlying the site. The terrace is constructed of a perimeter of small boulders and a pebble and cobble surface; the east side is flush to the a'a outcrop. It measures approximately 5.0 m by 5.0 m, with a maximum height of 0.6 m

Site 21249 Summary

Site 21249 is in fair to good condition. Based on the substantial wall construction of Feature 1 and presence of a possible entryway in Feature 4, the site is interpreted primarily as a permanent habitation.



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Site 50-10-37-21249, Features 1 Through 5; Plan View

FIGURE 6

Since Feature 3 enclosure is raised on the interior (and not on the exterior) the feature may have functioned as an animal pen. The absence of post-Contact remains on the surface of the site suggests that it was occupied during the pre-Contact period.

SITE 50-10-37-21640

Site 21640 is a complex of features (Feature 1 through 6) (Figure 7) located along in Kuamo'o Ahupua'a at approximately 355 ft amsl. The site is situated to the east of the proposed road corridor (see Figure 1). It lies in a soil area with a gentle to moderate slope descending to the west. Feature 1 is an enclosure wall; Features 2 through 5 are internal features in Feature 1; and Feature 6 is a cluster of mounds located immediately west of Feature 1 enclosure.

Feature 1 enclosure is rectangular-shaped measuring an exterior of 15.4 m by 12.4 m. Its northeast corner is notched. The enclosure has a substantial wall construction that is stepped on the west side (Figure 8). The wall is neatly stacked with facings ranging from 6 to 9 courses of small boulders. Portions of the wall are constructed on top of pahoehoe outcrop. The wall measures a maximum thickness of 1.5 m; internal height of 2.0 m and external height of 1.5 m. A constructed entryway is located at the center of the west wall of the enclosure. It is defined by a low spot in the wall in which an alignment of bolder slabs (stepping stones) passes over in an east-west direction. The interior floor of the enclosure is sloped with stone rubble probably from wall and internal feature collapse. Coral fragments were observed within the enclosure.

Feature 2 is a terrace constructed across the interior floor of Feature 1, extending from the south to the north walls of the enclosure. The terrace has a raised edge on the west side and merges with the interior, rocky floor on the east side. It's raised edge is 0.5 m high, 8.0 m long (N/S) and defined by an alignment of cobbles and small boulders. The surface of the terrace measures roughly 2.0 m wide (E/W) and is paved with cobbles. A depression (Feature 5) is constructed in the northwest corner of the terrace, near its intersection with the north wall of Feature 1.

Feature 3 is a terrace extending north-south between the notched corner and west wall of Feature 1. It has a raised edge (south side) of cobbles and small boulders measuring 4.0 m (N/S) by a height of 0.3 m. The terrace surface extends between the raised edge and north wall of Feature 1. It has an undefined surface of cobbles and boulders.

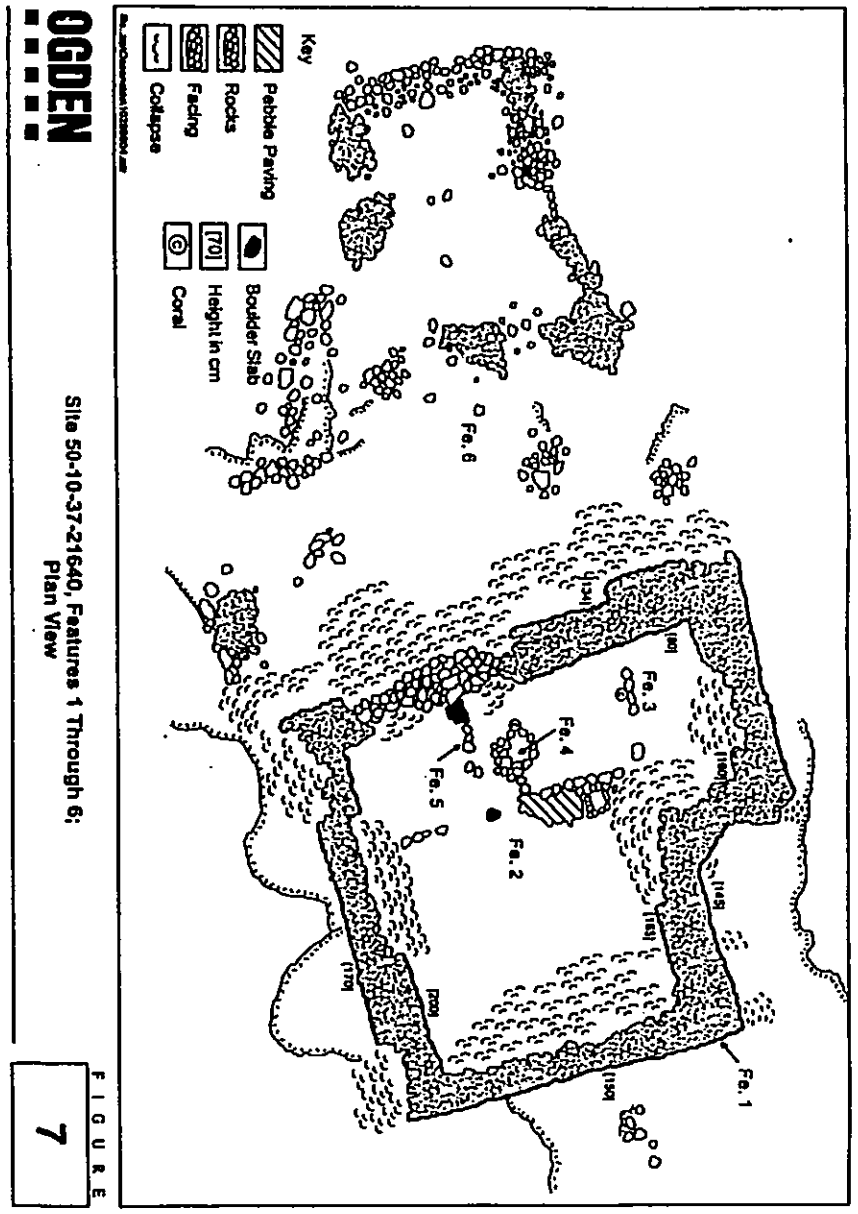
Feature 4 is a depression constructed approximately 2.0 m east of the Feature 1's entryway. It measures 1.0 m in diameter and has a depth of 0.5 m.

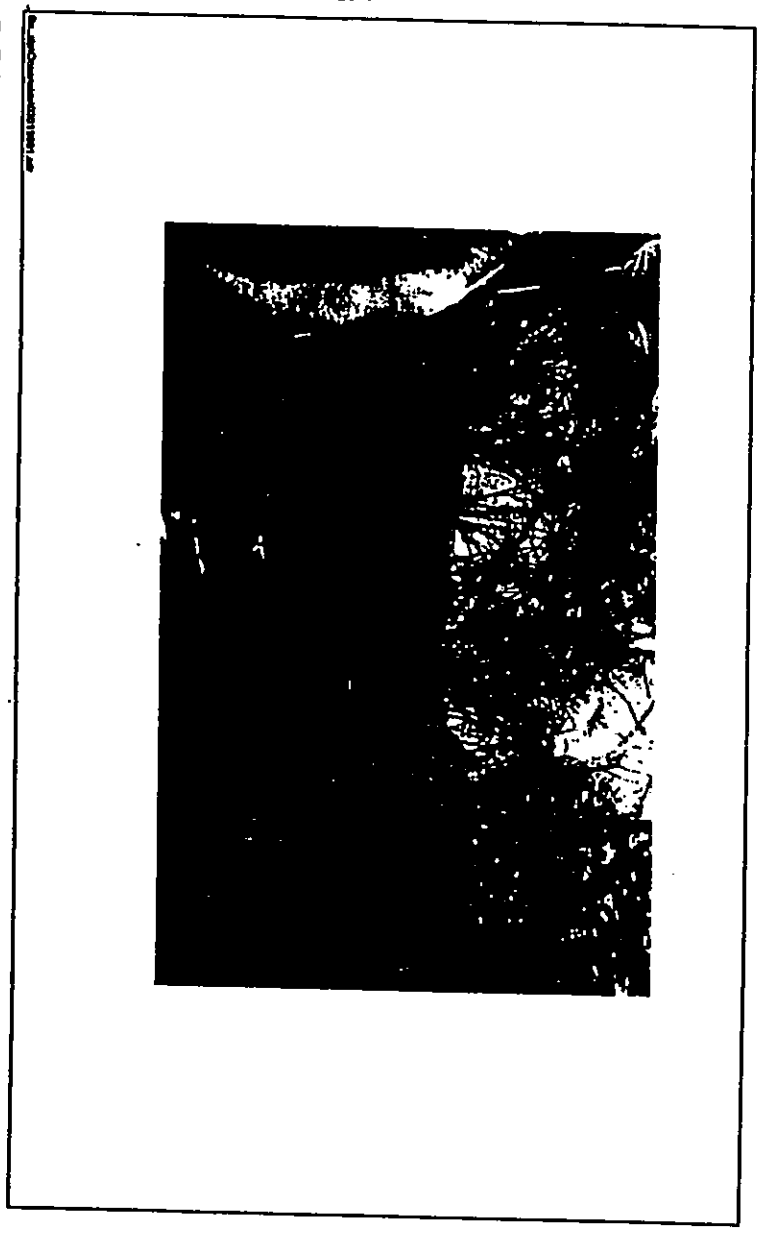
Feature 5 is the depression situated in Feature 2 (see above). The depression is 0.7 m in diameter and has a depth of 0.5 m

Feature 6 consists of at least five mounds located within a dilapidated wall to the west of Feature 1 enclosure. The mounds are in poor condition due to collapse and measure between roughly 1.5 m to 2.0 m in diameter, with average heights of 0.4 m. Natural outcrop exposures and a remnant wall to the west enclose the mounds in a roughly 8.0 m (E/W) by 15.0 m (N/S) soil area.

Site 21640 Summary

Site 21640 is in fair condition. It is interpreted as a *heiau* which, based on its notched construction, is similar to other architectural types identified on Hawai'i Island (e.g., in Kapua, South Kona [Robins et al.





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Site 50-10-37-21640, Feature 1 Enclosure; View East

FIGURE 8

1994]and Kau, North Kona (Ogden data recovery study – no report available) that are common to the island of Maui (e.g., Kolb 1991). Other characteristics that suggest the site is a *heiau* include: internal terraces possibly representing alters; surface depressions for offerings or idols; substantive wall construction; and presence of coral.

SITE 50-10-37-21641

Site 21641 is a complex of features (Features 1 through 4) (Figure 9) located in Kuamo'o Ahupua'a. The site is currently to the east of the proposed road corridor at approximately 375 ft amsl (see Figure 1). The site overlaps a lower, soil area on the north, with the majority of the complex modifying pahoehoe knolls and ridges in the south.

Feature 1 is a terrace and attached wall located in the soil area at the north end of the site. The feature extends across the soil swale in a north-south direction for 44.0 m. The north half of the feature is terraced with a raised face on its west side retaining two soil areas extending east. The soil areas are bisected into two areas by a perpendicular alignment and mounded wall (respectively) extending east of the west face. The west face of the terrace is stacked 3-courses high with a maximum height of 0.6 m. Overall the terrace portion of Feature 1 measures 28.0 m by 4.0 m.

The southern wall portion of Feature 1 is defined by a linear pile of large cobbles and boulders, roughly 0.7 m wide by a maximum height of 0.9 m. Intermittent facing is present, but most of the wall is collapsed. A faced depression exists on the south end of the wall. It measures about 1.0 m in diameter by a depth of 0.5 m.

Feature 2 consists of six contiguous enclosures and a terrace (Features 2A through 2F) situated to the south of Feature 1.

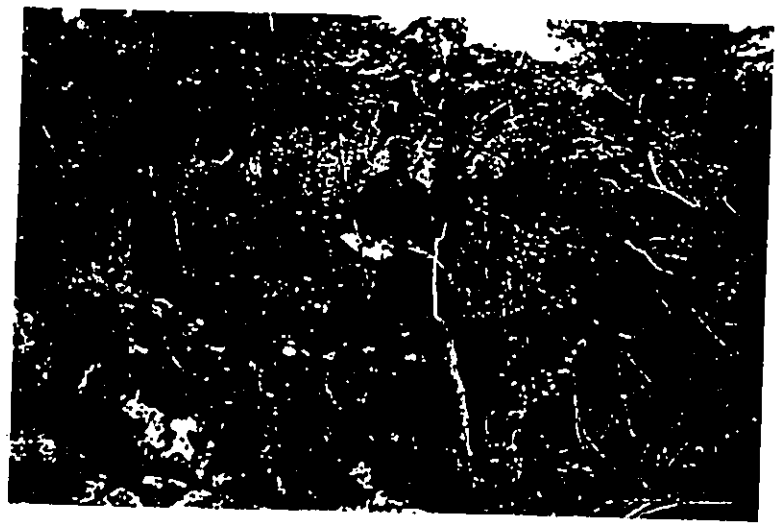
Feature 2A is a box C-shaped enclosure open to the west. It measures an interior of 3.0 m by 3.5 m and has a soil floor. The wall is 1.0 m wide by 0.8 m high. It is constructed of stacked small boulders. Feature 2A is contiguous to Feature 2B enclosure by a 3.0 m by 3.0 m. platform. The platform is rectangular shaped and built of a boulder perimeter and cobble surface fill.

Feature 2B is a box C-shaped enclosure open to the north. The enclosure interior measures 4.0 m by 4.0 m. The floor is soil covered and contains marine midden (isognomun and echinoderm). The wall is bifaced and measures 1.0 wide by a maximum height of 0.8 m. The south wall of Feature 2B's south wall is the north wall of Feature 2F, and its west wall is the east wall of Feature 2C.

Feature 2C is a rectangular enclosure located to the west of Feature 2B. The interior floor is undulating with pahoehoe outcrop and measures 4.0 m by 3.0 m. The wall is 1.0 wide by a maximum height of 0.5 m.

Feature 2D is a terrace extending west of Feature 2F enclosure. It is flush to Feature 2F's west wall and it forms the south side of Feature 2C. The terrace surface slopes to the west and is constructed of piled cobbles and boulders, rising a maximum of 0.4 m high. The terrace measures 4.0 m by 4.0 m.

Feature 2E is a rectangular enclosure (Figure 10) sharing the south wall of Feature 2F. The enclosure is constructed of a bifaced boulder wall with a cobble fill. It measures 0.7 m wide by a maximum height of 1.2 m along the east wall's interior face. The enclosure interior is soil-covered and measures 3.0 m by 4.0 m.



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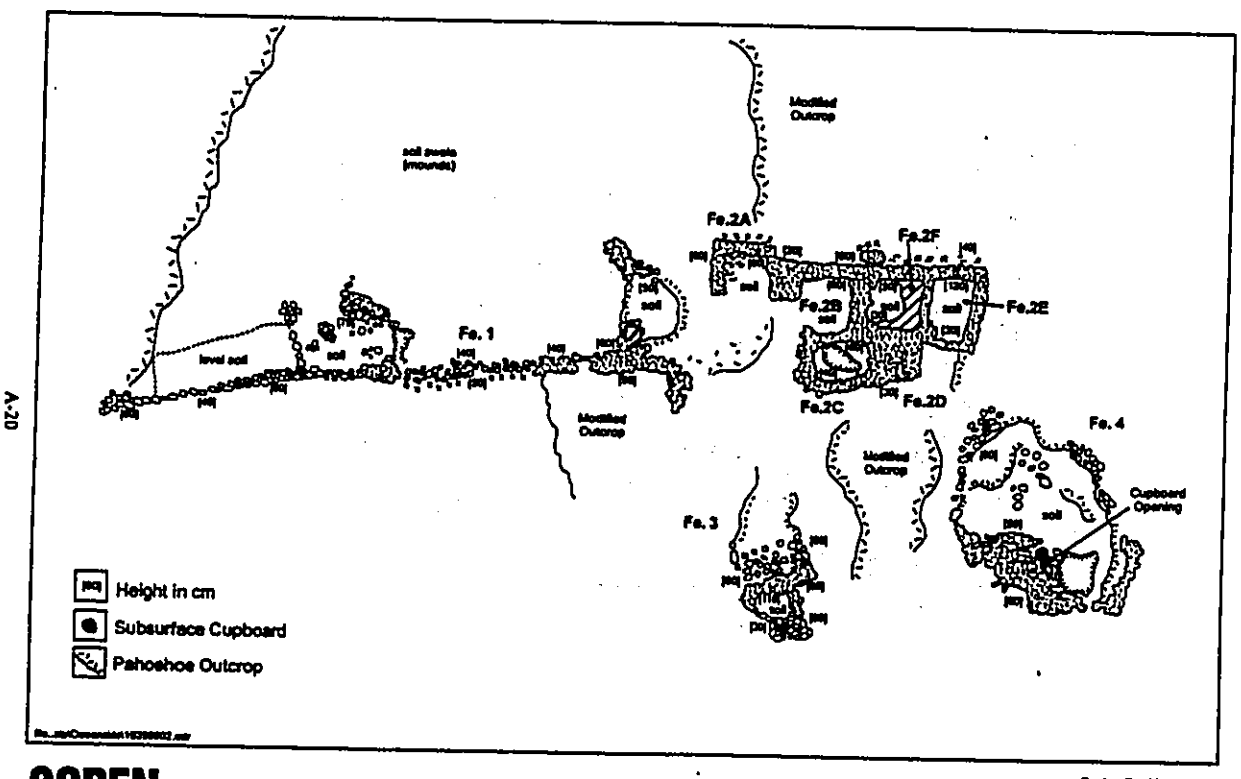
Site 50-10-37-21641, Feature 2E Enclosure; View South

FIGURE 10



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Site 50-10-37-21641 Complex, Features 1 Through 4; Plan View

FIGURE 9

Feature 2F is a rectangular enclosure located at the center of the feature complex on a raised area of pahoehoe outcrop. The enclosure wall is constructed of an portions of alignments and bifaced wall segments. The interior is partially paved on the south side, with soil and pahoehoe outcrop existing elsewhere. The enclosure interior measures 5.0 m by 4.0 m.

Feature 3 is located 11.0 m to the west of Feature 2. It is a terrace and enclosure modifying a pahoehoe knoll. The terrace, measuring 6.0 m by 4.0 m, is constructed of a paving of cobbles and boulders on top of the pahoehoe knoll. The terrace perimeter is defined by a facing of small boulders along the south and portion of the west side of the outcrop knoll. The enclosure abuts the west side of the terrace. It is constructed of a wall of piled small boulders, measuring 0.5 m wide by a maximum of 0.8 m.

Feature 4 is located 10 m south of Feature 3. It is a terrace and attached enclosure. The terrace is constructed on the surface of a pahoehoe outcrop knoll. It is defined by a roughly paved surface of small boulders and cobbles, and piled boulder perimeter measuring 6.0 m by 5.0 m. The vertical opening to an underlying lava blister is at the center of the terrace. The opening is faced on the north side and measures 0.4 m by 0.5 m. The blister interior extends 0.6 m to the east. This was probably utilized as a cupboard and a boulder slab next to the opening may have been a capstone for the cupboard.

The enclosure of Feature 4 extends in a roughly circular configuration to the east and south of the terrace. The enclosure wall is constructed of piled cobbles and small boulders, measuring a maximum of 1.0 m wide by 0.8 m high. The interior floor of the enclosure is undulating pahoehoe with small soil pockets and measures roughly 10 m in diameter.

Site 21641 Summary

Site 21641 is in fair to poor condition. It is interpreted as a permanent habitation complex with multiple habitation structures (Feature 2), garden areas (Feature 1), and possible work and storage areas (Features 3 and 4). Occupation of the site during the pre-Contact era was probably associated with the intensive, dryland agriculture once dominating the vicinity (Site 21642).

SITE 50-10-37-21643

Site 21643 is a complex of three Features (Features 1 through 3) (Figure 11) in Kuamo'o Ahupua'a, currently to the east of the proposed road corridor (see Figure 1). The site is situated on a prominent pahoehoe knoll at approximately 405 ft amsl. Features 1 and 2 are terraces constructed in the northwest and southwest corners of a roughly rectangular enclosure (Feature 3).

Feature 1 terrace is roughly rectangular and is built on the outer perimeter of a pahoehoe outcrop. The terrace measures 6.0 m by 3.0 m. Its is faced on the east and northwest sides with small boulders and has a cobble surface. Outcrop is exposed at the center of the feature. Feature 4 lava blister entrance is located in the outcrop at the center.

Feature 2 terrace measures 5.0 m by 3.5 m. Its perimeter is faced on the north and south sides to a maximum height of 0.9 m. The surface is level cobbles. It abuts pahoehoe outcrop on the north and east sides.

Feature 3 is a roughly rectangular enclosure constructed along the inside perimeter of a soil pocket formed in the pahoehoe surface. The enclosure wall is mostly piled with small boulders, measuring a maximum width of 1.3 m on the west and height of 0.8 m. The enclosure incorporates the natural pahoehoe face in the east and north side. The enclosure interior measures 14 m by 7 m and has a covered floor.

Feature 4 is a lava blister with a vertical entrance located at the center of Feature 1. The entrance is roughly 0.7 m in diameter and 1.0 m deep to the blister floor. The blister interior that is accessible is about 1.0 m in diameter. A coral abrader fragment was observed at the base of the opening.

Site 21643 Summary

Site 21643 is in fair condition. It is interpreted as a permanent or recurrent habitation site attributable to the pre-Contact era. The main habitation structure is potentially Feature 3, with Features 1 and 4 possibly being open-air structures (i.e., lanai). Due to the small interior and low ceiling height of Feature 4 blister, the feature may have been utilized for storage.

SITE 50-10-37-21644

Site 21644 is a wall section located in Kuamo'o Ahupua'a. It is currently to the east of the proposed road corridor at approximately 420 ft amsl (see Figure 1). The site is situated on a prominent pahoehoe knoll.

The wall is constructed of piled and collapsed boulders. Some portions of the wall are composed of alignments that probably represented intact perimeters of a bifaced wall. The wall measures 7.0 m long (N/S) by a maximum width of 1.2 m and height of 0.5 m.

Site 21644 Summary

Site 21644 appears to be in remnant condition. The wall probably delineated a boundary during the pre-Contact era.

SITE 50-10-37-21647

Site 21647 is a complex of excavated depressions in a'a lava, located in the *ahupua'a* of Kawanui. The site is situated at approximately 410 ft amsl (see Figure 1). The terrain is a moderately sloped channel of a'a lava.

The site features consist of more than 10 excavated depressions in a roughly 10-meter wide channel of a'a lava. The depressions measure between 1.0 and 3.0 m in diameter by 0.5 to 1.0 m deep. Some of the depressions are roughly faced along the interior wall.

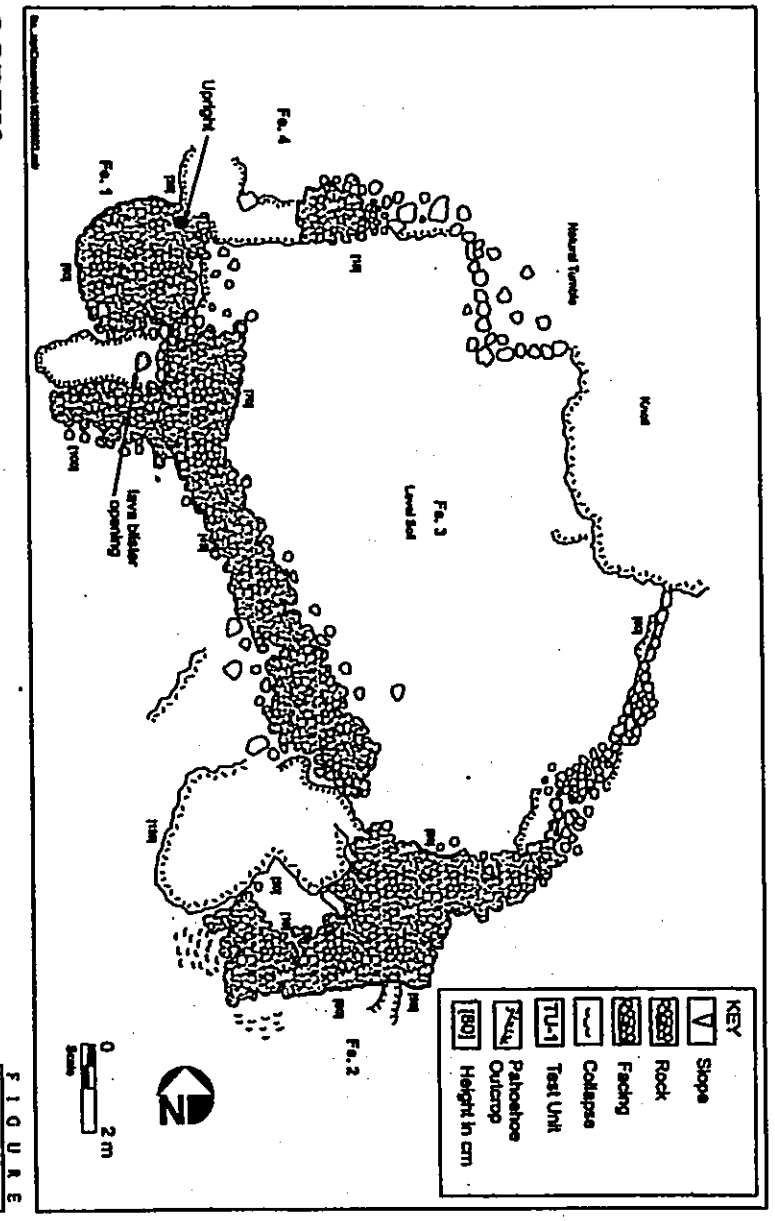
Site 21647 Summary

Site 21647 is in good condition. it is interpreted as an agricultural complex of the Kona Field System that typifies cultivations, particularly of tree crops, in depressions in a'a lava.

SITE 50-10-37-21651

Site 21651 is a complex of four features (Features 1 through 4) (Figure 12) located in the *ahupua'a* of Kawanui, at approximately 375 ft amsl (see Figure 1). It is currently to the west of the proposed road corridor. The site lies on pahoehoe outcrop that slopes moderately to the south and southwest. A concentration of mounds and was observed immediately to the south and southwest of the site.

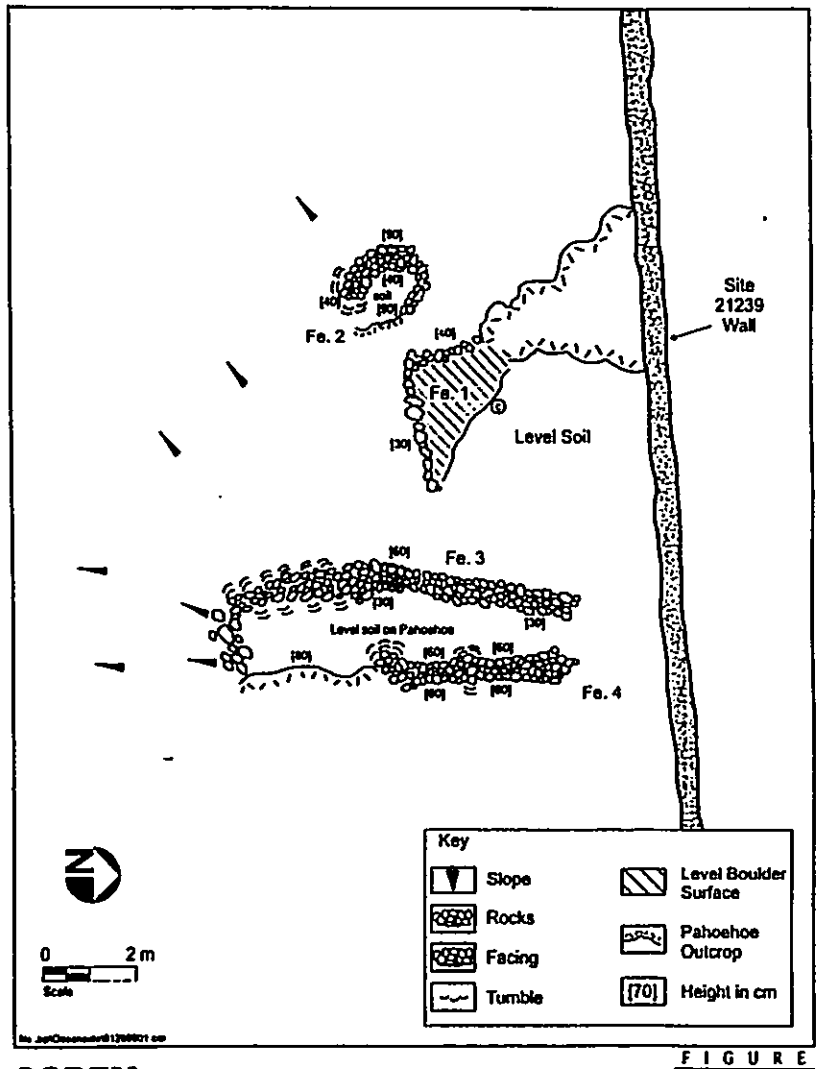
Feature 1 is a triangular-shaped terrace constructed on its north side flush to pahoehoe outcrop and a level soil area. The south and west sides of the terrace are defined by a single row of small boulders which



OGDEN

Site 50-10-37-21643 Complex, Features 1 Through 5; Plan View

FIGURE 11



OGDEN

Site 50-10-37-21651 Complex, Features 1 Through 4; Plan View

FIGURE 12

retains a level, boulder surface. The terrace measures 5.0 m (N/S) by a maximum width of 3.0 m (E/W) and maximum height of 0.4 m. A coral fragment was observed in the soil area to the north of the feature.

Feature 2 is a roughly C-shaped enclosure that is open to the south. The enclosure wall is partially bifaced (4-5 courses) with cobbles and small boulders, and contains a cobble fill. Much of the wall is collapsed causing the interior to be filled with rubble.

Feature 3 is a wall measuring 6.5 m (N/S) long by roughly 0.7 m wide. It has a maximum height of 0.6 m. The wall is constructed of stacked and piled boulders and a central cobble fill, with some facing present.

Feature 4 is a wall running parallel to Feature 3, roughly 1.0 m to the east. The wall is also constructed of cobbles and small boulders with a cobble fill. It extends along the outer edge of a pahoehoe outcrop for a total length of 4.0 m (N/S), and has a maximum width of 1.0 m and height of 0.6 m. Features 3 and 4 walls enclose an elongated, soil area measuring 1.0 m wide by 7.0 m long.

Site 21651 Summary

Site 21651 is in fair to good condition. The site is interpreted as a permanent habitation site, with Feature 1 and 2 probably representing the main habitation structures. This interpretation is tentatively based on the formal construction of these two features (e.g., paved surface of Feature 1 and bifaced/cobble-fill wall of Feature 2), size of potential living area of Feature 1 (25 m^2), and presence of multiple habitation structures.

SITE 50-10-37-21653

Site 21653 is a terrace (Figure 13) located in Kuamo'o Ahupua'a. The site is currently situated to the west of the proposed road corridor at approximately 355 ft amsl (see Figure 1). The site lies on the edge of a naturally terraced lava flow of a'a abutting pahoehoe lava. A natural pahoehoe terrace underlies the site.

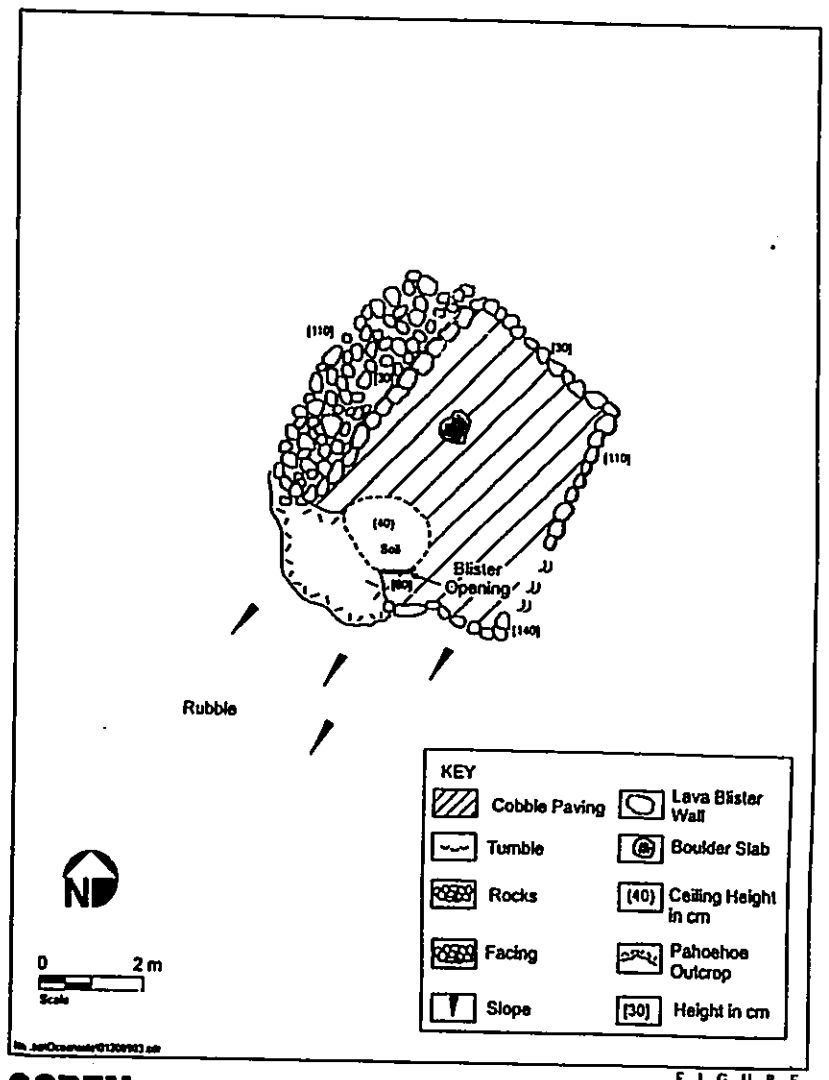
The terrace is rectangular in shape and constructed so its east side is flush to adjacent a'a outcrop and remaining perimeter aligns with the south, west and north edge of a pahoehoe knoll. It measures 6.0 m (N/S) by 6.0 m (E/W).

The terrace is constructed of a faced edge along the south and north sides and a rough boulder pile and outcrop exposures on the west side (Figure 14). The south face is substantial in height (1.2 m to 1.4 m) and constructed of 6 to 8 courses of small boulders. The north side of the terrace is defined by an alignment of small boulders (0.3 m high) and adjacent sloped surface of cobbles and small boulders to the north.

The terrace surface is paved with cobbles and contains a boulder slab at the center. A small lava blister is situated near the western face of the terrace. The slightly vertical opening to the lava blister is lined with boulders. The blister was inaccessible due to its low height (0.4 m). Its internal dimensions were roughly 1.5 m.

Site 21635 Summary

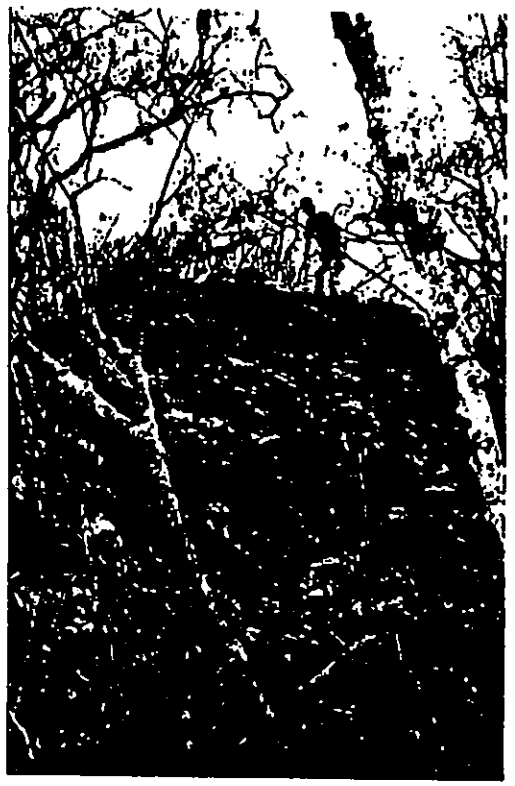
Site 21635 is in good condition. It is interpreted as a possible burial structure, based on the presence of the boulder slab at the center of the terrace (possible capstone), and the site's location over a lava blister.



OGDEN

Site 50-10-37-21653 Terrace; Plan View

FIGURE 13



OGDEN Site 50-10-37-21653 Terrace, West Face; View East

FIGURE 14

SITE 50-10-37-21660

Site 21660 is a terrace (Figure 15) located in the *ahupua'a* of Kuamo'o. The site is currently to the west of the proposed road corridor at approximately 355 ft amsl (see Figure 1). It lies on a naturally terraced slope of pahoehoe lava that descends moderately to the west.

The terrace has a 3-tiered construction that descends in steps to the west. Overall the terrace measures 9.0 m (E/W) by 4.0 m (N/S). The upper and middle tiers are constructed of a small boulder and cobble perimeter, with a 2 to 3 course facing (1.0 m high) on the west side of the middle terrace. This western face has an upright boulder incorporated into the southwestern corner of the middle terrace. The upper tier is paved with cobbles and has a 1.0 m^2 depression, 0.3 m deep. The interface between the upper and middle terraces is defined by a single course alignment of large cobbles raised 0.3 m high. The middle tier is also paved with cobbles. An alignment of small boulder slabs (possible stepping-stone trail) extends south of the middle terrace, along the surface of a natural terrace crossing the slope.

The lower tier of the terrace is defined by a surface pavement abutting the west face of the middle tier. A depression is present in the pavement at its juncture with the middle tier. The depression is 1.0 m N/S by 0.5 m E/W, by 0.3 m deep. The west side of the lower terrace is a defined by a facing (1-2 courses) of small boulders, roughly 0.5 m high.

Site 21660 Summary

Site 21660 is in fair condition. Based on the tiered terrace construction, presence of an upright boulder incorporated into the construction, and its spatial association with another possible burial (Site 21653) the site is tentatively interpreted as a burial.

SITE 50-10-37-21661

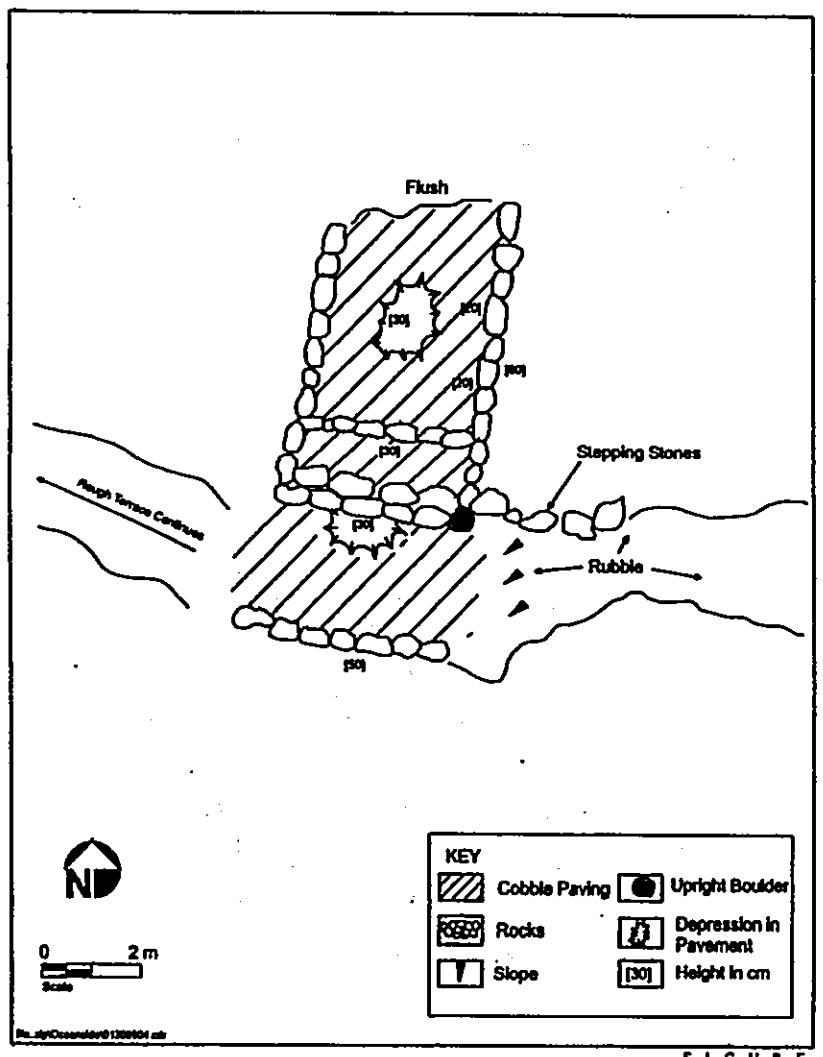
Site 21661 is an enclosure (Figure 16) located n Kuamo'o Ahupua'a at approximately 350 ft amsl. The site is currently situated west of the proposed road corridor (see Figure 1). The site lies on a pahoehoe outcrop at the western edge of an a'a flow.

The enclosure is defined by a C-shaped wall abutting a raised pahoehoe edge on its east side. The wall is constructed of faced, stacked small boulders with a cobble fill. The enclosure wall measures 1.3 m wide by a maximum height of 0.9 m. The enclosure interior is soil-covered and measures 3.5 m by 6.0 m.

A gap in the wall is present in the northwest corner of the enclosure. This gap is either due to wall disturbance or it was once an entryway. A small lava blister is incorporated into the construction of the wall on the interior, west side. The lava blister measures 1.0 m in diameter by 0.3 high and may have functioned as a cupboard.

Site 21661 Summary

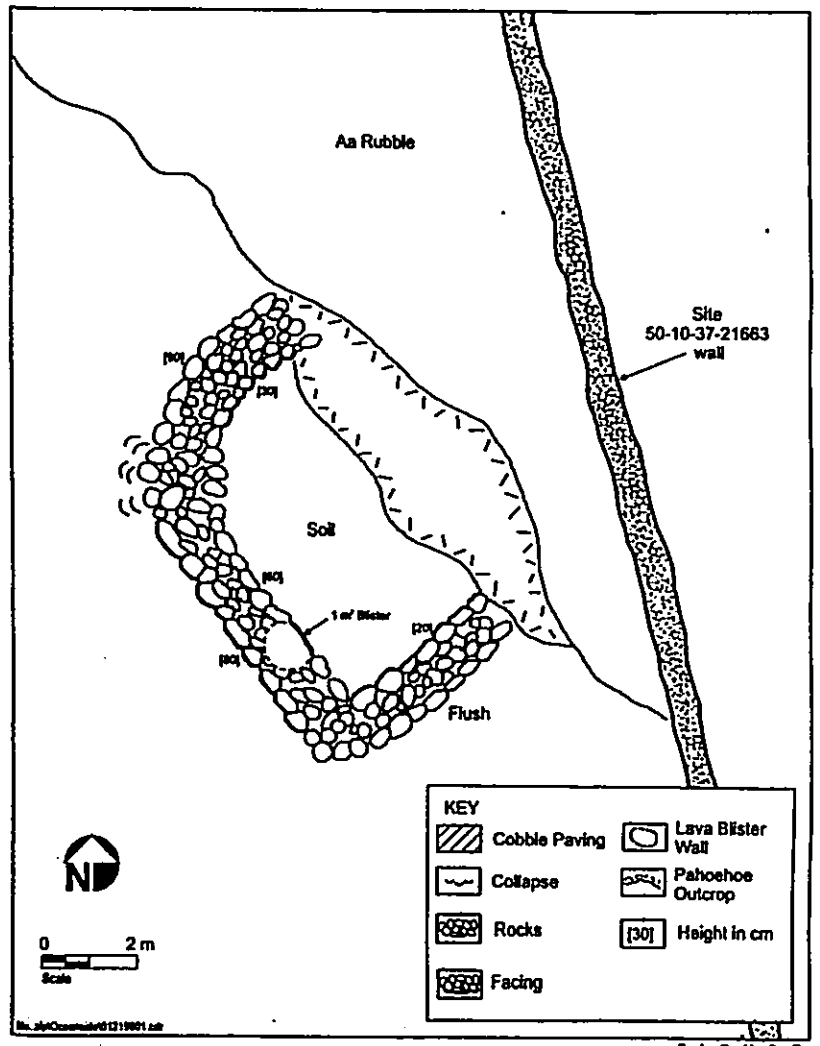
Site 21661 is in good condition. It is tentatively interpreted as a habitation feature due to the presence of a possible cupboard incorporated into the wall construction.



OGDEN

Site 50-10-37-21660 Terraces; Plan View

FIGURE 15



OGDEN

Site 50-10-37-21661; Plan View

FIGURE 16

APPENDIX B-I:

A REPORT ON ARCHIVAL-HISTORICAL DOCUMENTARY RESEARCH, ORAL HISTORY INTERVIEWS AND ASSESSMENT OF CULTURAL IMPACTS

PREPARED IN CONJUNCTION WITH THE ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MĀMALAHOA HIGHWAY BYPASS

Kumu Pono Associates
Kepā Maly, Cultural Resources Specialist
Helen Wong Smith, Archivist

Historical & Archival Documentary Research · Oral History Studies · Partnerships in Cultural Resources Management · Developing Preservation Plans and Interpretive Programs

HWS1250-g (022699)

A REPORT ON ARCHIVAL-HISTORICAL DOCUMENTARY RESEARCH, ORAL HISTORY INTERVIEWS AND ASSESSMENT OF CULTURAL IMPACTS

HE WAHI MOʻOLELO NO KONA, NĀ AHUPUAʻA O – KEAUHOU 2ND, HONALO, MĀʻIHI 1-2, KUAMOʻO 1-3, KAWANUI 1-2, LEHUʻULA 1-2, HONUAʻINO 1-4, HŌKŪKANO 1-2, KANĀUEUE 1-2, HALEKIʻI, KEʻEKEʻE 1-2, ʻILIKAHI, KANAKAU 1-2, KALUKALU, ONOULI 1-2, KEŌPUKA 1-2, & KAʻAWALOA

DISTRICTS OF NORTH AND SOUTH KONA, ISLAND OF HAWAIʻI

Prepared by: Helen Wong Smith, Archivist
and Kepā Maly, Cultural Resources Specialist
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DETAILED ABSTRACT

Background

In December 1996, James Leonard, of PBR Hawaii, on behalf of Robert Stuit (Oceanside 1250 Partners), requested that Helen Wong Smith (MLIS/Archivist), Historical Research Consultant, conduct historical research and the initial phase of a cultural assessment study. The study was conducted in conjunction with an archaeological inventory survey and the preparation of an Environmental Impact Statement (EIS) for the proposed development of the Māmalahoa Highway Bypass. Following consultation with staff of the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD, Wong Smith conducted the primary historical research and initiated a limited oral history/consultation program*. While conducting the oral history program, Wong Smith contacted Kepā Maly (*Kumu Pono Associates***), who was also conducting work in Kona, and who subsequently worked with Wong Smith in the organization of historical data and conducting several of the oral history interviews.

The research and interviews for this study were performed in a manner consistent with Federal and state laws and guidelines for such studies. Aside from consultation with DLNR-SHPD, the authors also referenced the National Historic Preservation Act (NHPA) of 1966, as amended in 1992; the Advisory Council on Historic Preservation's "*Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review*" (ACHP 1985); National Register Bulletin 38, "*Guidelines for Evaluating and Documenting Traditional Cultural Properties*" (Parker and King 1990); the Hawai'i State Historic Preservation Statue (Chapter 6E), which affords protection to historic sites, including traditional cultural properties of ongoing cultural significance; the criteria, standards, and guidelines currently utilized by the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) for the evaluation and documentation of cultural sites (cf. Title 13, Sub-Title 13:274-4,5,6; 275:6 – draft of December 1996); guidelines for cultural impact assessment studies, adopted by the Office of Environmental Quality Control (November 1997); and Environmental Impact Statement Rules of the State of Hawaii (Title 11 Chapter 200).

Wong Smith and Maly submitted a draft of the multi-faceted study with recommendations to Oceanside 1250 and its EIS Consultants in November 1997 (that work is superceded by this report).

Archaeological Resources

This study was conducted in conjunction with the undertaking of an archaeological inventory survey (OGDEN – Robins et al. Feb. 1999). In that survey, a total of 47 sites were identified in the bypass corridor, and an additional 15 sites were identified adjacent to the corridor. The sites are located between the elevations of 125 to 1060 feet above mean sea level, with the highest concentration of sites situated between the 300 to 400 foot elevation above mean sea level. Most of the identified sites occur in the *ahupua'a* (native land divisions) of Honalo, Mā'ihi, Kuamo'o, and Kawanui, in the southern half of the proposed bypass easement (Robins et al. 1999:85-86).

Twenty-four of the forty-seven sites are interpreted as being traditional Hawaiian (i.e., sites used in the pre-Contact and early post-Contact periods of Hawaiian history). These sites include short-term and long-term habitation features; boundary walls; agricultural fields and terraces; animal pens; and stone mounds and planting field markers. The remaining twenty-three sites are interpreted as having been used in the historic period (i.e. nineteenth century to present time), and are interpreted as being associated with historic period ranching and agricultural activities. The site types include boundary and pasture walls, a possible clearing mound, and the Kona Development Company railroad alignment (Robins et al. 1999: 86-87).

Additionally, the inventory survey identified a total of fifteen sites outside of, but adjacent to the proposed bypass alignment (Robins et al. 1999:Appendix A). Twelve of the sites are interpreted as being prehistoric; one site is interpreted as being a modified prehistoric site with historic period use, one site was of an undetermined age, and the remaining site is interpreted as a historic cattle wall. Twelve out of the fifteen sites are of similar habitation-agricultural functions as described in the preceding paragraph. Three of the sites are believed to have ceremonial function—one site is believed to be a *heiau* (Site 21640), and two of the sites may include possible burial components (Sties 21653 and 21660). All three sites are situated in the *ahupua'a* of Kuamo'o (Robins et al. 1999:Appendix A).

Findings and Recommendations

Reported as a Part of the Ethnographic Research

The archival-historical documentary research and oral historical interviews conducted as a part of this study presents readers a substantial overview of the history of the study area *ahupua'a*. The documentation (both archival and oral historical) includes descriptions of traditional and early historic residency and land use practices, cultural sites and resources, and traditional cultural practices associated with the lands over which the proposed Māmalahoa Highway Bypass crosses.

As would be expected—in relationship to early Hawaiian residency and land use patterns—because the bypass corridor is only 120 feet wide, a very limited amount of historical information was uncovered for the immediate study area. For the larger *ahupua'a* through which the corridor crosses, a significant amount of ethnographic information is recorded. This information includes descriptions of the broad relationships of people, practices, and land use in and around the study area—including rich historical accounts about sites and features on the coastal flats and in the upland forest—documenting resources extending from the deep sea fisheries to the forests and mountain slopes.

As noted above, for this phase of work (likened to an inventory level survey), a limited oral history and consultation program was conducted as a part of this study. In all, the study includes oral history interview documentation from six interviewees in nine interviews and follow-up discussions. Additionally, consultation records—collected by the authors—from

* Through conversations with staff of DLNR-SHPD, it was suggested that three or four interviews would be adequate for the initial phase of work which this study presents, the understanding being that further interviews and consultation would occur during the archaeological data recovery phase of work and in conjunction with the development of the project area preservation plan (pers. comm. R. Cordy, Ph.D. and M. Smith, Dec. 5, 1996; and H. McEldowney, Ph.D. July 15, 1997).

** Maly and Wong Smith now work together under *Kumu Pono Associates*.

three individuals with specific knowledge about the history and use of the study area lands are included, and an overview community discussions conducted by Oceanside 1250 are cited as well. The interviews and selected consultation records demonstrate a continuity and time depth in various aspects of knowledge and customs of the land as handed down by elders with whom the interviewees grew up.

While conducting the interview and consultation program, participants were asked their feelings about the proposed development of the bypass, and asked if they had recommendations that they would like considered in the review process. The interviewees all shared their concerns about the potential impacts of the bypass on various native Hawaiian and historic sites. In particular, the battle fields and burial grounds of Lekeleke (in the *ahupua'a* of Keauhou) and Kuamo'o (in the *ahupua'a* of Kuamo'o) were of great concern. Some interviewees recommended that the corridor be moved a distance *mauka* (inland) of those sites and others along the alignment. Since collection of those recommendations, further archaeological work, and developer-landowner consultation has occurred which has resulted in the bypass being moved further inland. The present alignment now passes through an area with a minimum of sites, and those sites are primarily associated with agricultural practices and historic ranching operations (cf. Robins et al. 1999; and pers comm. R. Stuit, Feb. 9, 1999).

Other areas of concern and recommendations raised by interviewees and/or consultation participants included, but were not limited to:

(1) The "Kona Field System" (Site 6601). A nationally recognized feature of cultural importance; the field system represents many generations of land utilization practices—covering several environmental zones—during the periods of growth and expansion in native Hawaiian history. Large areas of the field system within the project area have been impacted by historic ranching and land clearing activities.

The present alignment has been modified in the northern section of the bypass to minimize impacts on significant features in or associated with the system.

(2) The Kona Development Company (KDC) railroad alignment (Site 7214). The KDC railway is an important facet of development and growth in the early twentieth century of Kona, associated with the development of Kona's plantations and transportation systems.

Where the corridor passes through the railroad alignment, architectural features of the alignment will be stabilized and protected.

(3) *Ala pi'i uka* (native and historic trails extending between the shore and uplands). While no evidence of any of the native and historic trails was clearly found in the 120 foot wide bypass corridor (cf. Robins et al. 1999), archival documentation and oral history interviews provide descriptions of such trails.

Because the land over which the bypass alignment crosses is privately owned, access on the *mauka-makai* (upland to shore) trails has been limited throughout this century and many of the trails destroyed. Most of the remaining *mauka-makai* accesses have been modified into ranch roads for four-wheel drive vehicles.

It is suggested that further research (both archival and oral historical) be conducted during the next phase of data recovery and preservation plan development, to further define the nature and significance of trails that may pass through the alignment.

Mr. Robert Stuit, Director of Planning for Oceanside 1250 has stated that the both sides of the entire length of the bypass alignment easement will be fenced. At appropriate locations, cross ways for ongoing ranching operations and land owner access needs will be installed (pers comm. Feb. 9, 1999); and

(4) Develop a plan for interim- and long-term protection of significant cultural resources such as caves, residences, components of field systems, and ceremonial sites once access through the study area lands is improved; and institute a program that will ensure care of preservation sites near the bypass alignment during construction.

As noted in the preceding paragraph, Oceanside 1250 will place a permanent fence along both sides of the entire length of the 120 foot wide bypass easement. Fencing will be set in place prior to initiation of construction, and construction crews will be notified of the meaning of the fencing and of the cultural significance of sites outside of the fencing (R. Stuit, pers comm. Feb. 9, 1999).

Several interviewees also suggested that there be some level of programs designed in conjunction with the highway's development that will inform the public of the importance of the cultural and historical resources—perhaps as interpretive signs—and that there be a monitoring protocol established to help minimize inappropriate use of, or impact to significant resources *makai* of the bypass.

Documentation recorded as a part of the limited oral history and consultation program provided no site specific documentation of traditional sites and practices in the 120 foot wide bypass easement. Primary documentation related specifically to the bypass easement focused on nineteenth and twentieth century ranching operations and agricultural activities. Based on the findings of this study—with reference to applicable laws and guidelines—it appears that the proposed Māmalahoa Highway Bypass, by itself, will have not have a significant effect on the cultural-historical resources which have thus far been identified. It is noted in this study that individuals who participated in the oral history/consultation program shared a number of concerns and offered several recommendations for minimizing both short-term and long-term effects on the cultural landscape.

Additional informant interviews and consultation with appropriate native Hawaiian- and community-organizations in subsequent phases of work on the Oceanside 1250 projects will provide landowners and developers with important recommendations for the development of a plan for long-term protection and interpretation of significant sites. Pursuant to standard practice in the State of Hawai'i, such work would be undertaken as a part of the data recovery and preservation planning stages.

ACKNOWLEDGMENTS

This study is the product of many hundreds of hours of work, and as described in the historical narratives, the lands of Keauhou to Ka'awaloa are culturally and historically rich. While much has been presented in this study, there is much to tell and more that can be learned about the history of the lands and people of Kona. In preparing the study, one goal was to include in one manuscript, a wide range of the documentation recorded in the historical literature, extending from c. 1778 to 1960, and to demonstrate how facets of that knowledge remain important to residents—particularly native Hawaiians—of Kona today. While more can be reported, the authors have made a sincere effort to provide readers with a culturally responsible overview of the history of these lands, and to provide readers with references for further review.

This study has been significantly enriched by the contributions of several individuals; they include members of families with generations of residency in Kona (some on the lands of the study area), and others who have specific interest in historic resources of the region. The authors are greatly indebted to—

> Ian Birnie, Jean Greenwell, C. Kapua Heuer, Takao Ide, Lily N.M. Ha'anio-Kong, Wm. Billy Paris, D. Kahelemauna Roy, J. Curtis Tyler III, and the late Helen Kina'u Weeks

—for their willingness to share their time, knowledge, and *aloha* for the land and resources of Kona in this study.

Additionally, to the archivists and staff of the Kona Historical Society, Bernice Pauahi Bishop Museum, Hawaii State Archives, and Children's' Mission House Museum; the staff of the State Survey Division, and State Land Management Division; Jennifer Robins and Steve Clark (OGDEN); and to the many individuals unnamed here, but who helped make this study possible, we say — *Mahalo nui and Aloha no!*

Pili aloha o Kona, ho'oipo i ka mālie.
Love remains close to Kona, who woos the clam.
(Kona is a land beloved for its calm and pleasant weather.)
(Pukui 1985:290, # 2645)

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Background

At the request of James Leonard (Managing Director PBR Hawaii, Hilo Office), on behalf of Robert Stuit, Director of Planning for Oceanside 1250, Helen Wong Smith and Kepā Maly (*Kumu Pono Associates*) conducted a multifaceted study, including archival-historical documentary research; a limited program of oral history interviews and consultation; and prepared an assessment of cultural impacts in conjunction with preparation of an Environmental Impact Statement (EIS) for the proposed development of the Māmalahoa Highway Bypass. The proposed bypass corridor (the project area easement) is 120 feet wide, and extends about 5.5 miles from the land of Keauhou 2nd in the district of North Kona, to the land of Ka'awaloa in the district of South Kona, on the island of Hawai'i (*Figure 1*). The bypass easement traverses seventeen native *ahupua'a* (traditional Hawaiian land divisions) which in historic times were further subdivided and now total thirty-one historic *ahupua'a*[1]. The bypass corridor ranges in elevation from approximately 50 to 1,350 feet above mean sea level. As a result of its length and elevational range, the corridor crosses through several environmental zones and locales of importance to native lore and cultural practices. While the project area itself is a narrow band of land, it passes through many native land divisions (*ahupua'a*) which are an integral part of the overall study area reported herein.

The work reported herein was initiated by Wong Smith in December 1996, and a draft was completed by Wong Smith and Maly and in November 1997. Wong Smith began her research following consulting with staff of the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD). Following Wong Smith's conducting of the primary archival-historical research, she initiated a limited oral history/consultation program[2]. While conducting the oral history program, Wong Smith contacted Kepā Maly (*Kumu Pono Associates*), who subsequently worked with Wong Smith in the organization of historical data and conducting of several oral history interviews. A draft report of the multi-faceted study was submitted to Oceanside 1250 partners and EIS consultants in November 1997. This report incorporates additional historical documentation, findings of the archaeological inventory survey, and discussions of planning actions which Oceanside 1250 has agreed to implement as a part of development of the bypass. Thus, this study supercedes previous work by the present authors.

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[1] An *ahupua'a* was the primary subsistence land division of ancient Hawai'i. *Ahupua'a* generally extend from the fishery fronting a land division to the mountain slopes, and include most all of the natural resources necessary for sustaining the Hawaiian community. Though not always contiguous, various smaller land parcels within an *ahupua'a* were connected in the traditional management system. In this system individuals living along the coast shared management responsibilities with families of the uplands (and vice-versa). The *ahupua'a* management system may be likened to what is today called an "integrated resources management" approach. By the mid nineteenth century many of the native *ahupua'a* were further subdivided into smaller units of land, with the smaller divisions being identified by the original land name and numbers (e.g., Mā'ihi 1 & Mā'ihi 2), or the words *nui* (large) or *iki* (small). Today, these subdivided land units are each counted as a separate *ahupua'a*.

[2] Through conversations with staff of DLNR-SHPD, it was suggested that three or four interviews would be adequate for the initial phase of work which this study presents. The understanding being that further interviews and consultation would occur during the archaeological data recovery phase of work and in conjunction with the development of the project area preservation plan (pers. comm. R. Cordy, Ph.D. and M. Smith, Dec. 5, 1996; and H. McEldowney, Ph.D. July 15, 1997)

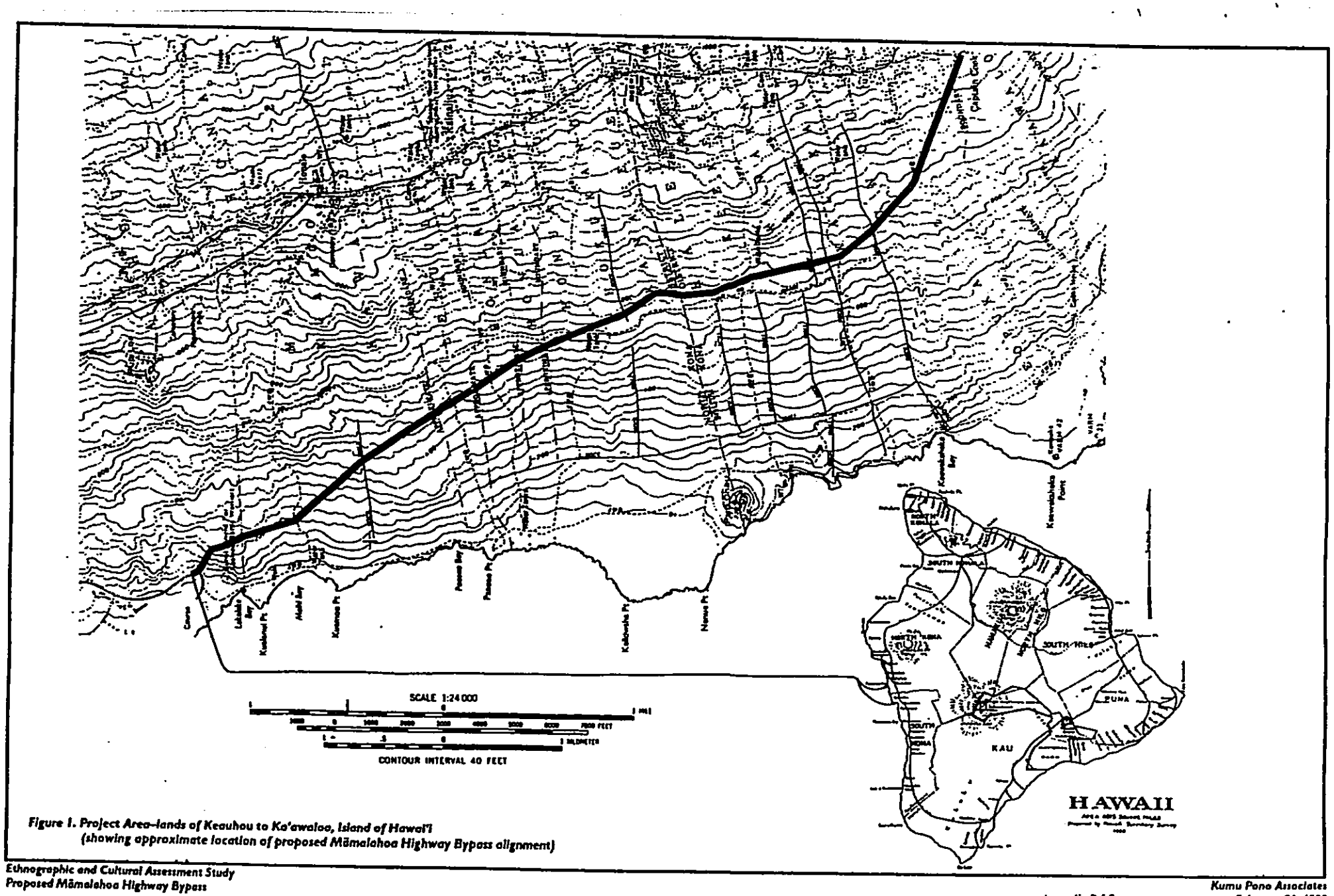

Figure 1. Project Area–lands of Keauhou to Ka'awaloa, Island of Hawai'i (showing approximate location of proposed Māmalahoa Highway Bypass alignment)

Scope of Work

The scope of work for this phase of project planning included several components. The primary objectives of the archival-historical research and the oral history/consultation program (the ethnographic work) focused on:

(1) conducting historical documentary research involving both published and unpublished sources including legendary accounts of native and early foreign writers; early historical journals and narratives; historic land records such as Land Commission Awards, Royal Patent Grants, and Boundary Commission records; historic-period accounts leading up to modern times; and previous archaeological documentation;

(2) identification of and consultation with interviewees;

(3) conducting interviews in order to record their concerns about traditional Native Hawaiian cultural sites and other historical sites, and to elicit their concerns or recommendations about sites and the proposed project;

(4) preparation of the present study, incorporating information from the various sources identified above; and

(5) developing an assessment—based on existing laws and guidelines—of the potential effects of the project on cultural-historical resources and recommend general forms mitigation to minimize any adverse effects.

Study Guidelines

The research and interviews were performed in a manner consistent with Federal and state laws and guidelines for such studies. Among the referenced laws and guidelines were the National Historic Preservation Act (NHPA) of 1966, as amended in 1992; the Advisory Council on Historic Preservation's "*Guidelines for Consideration of Traditional Cultural Values in Historic Preservation Review*" (ACHP 1985); National Register Bulletin 38, "*Guidelines for Evaluating and Documenting Traditional Cultural Properties*" (Parker and King 1990); the Hawai'i State Historic Preservation Statue (Chapter 6E), which affords protection to historic sites, including traditional cultural properties of ongoing cultural significance; the criteria, standards, and guidelines currently utilized by the Department of Land and Natural Resources-State Historic Preservation Division (DLNR-SHPD) for the evaluation and documentation of cultural sites (cf. Title 13, Sub-Title 13:274-4,5,6; 275:6 – draft of December 1996); guidelines for cultural impact assessment studies, adopted by the Office of Environmental Quality Control (November 1997); Environmental Impact Statement Rules of the State of Hawaii (Title 11 Chapter 200); and specifically addresses recommendations of DLNR-SHPD staff, for the current phase of work in presenting an overview of *ahupua'a* settlement patterns of lands associated with the project area (pers comm., R. Cordy and M. Smith, Dec. 5, 1996; and H. McEldowney July 15, 1997).

Archival and Historical Resources

Over the years a number of archaeological and historical studies have been conducted for various lands within the present study area. Of particular importance are historic archaeological studies conducted in 1906-1907 (Stokes and Dye 1991), and 1929-1930 (J. Reinecke ms., 1930). As a part of the background research conducted by OGDEN in preparation for the archaeological inventory survey, Robins et al. (1999) prepared an overview of more recent archaeological studies in lands through which the bypass easement passes.

In preparing the archival-historical documentary report for this study, the authors reviewed land use records, including Hawaiian Land Commission Award (LCA) records from the *Māhele* (Land Division) of 1848, and Boundary Commission Testimonies and Survey records of the Kingdom and Territory of Hawai'i (ca. 1860-1935); D. Malo (1951); I'i (1959); S. Kamakau (1961, 1964, 1976, and 1991); Wm. Ellis (1963); A. Fornander (1917-1919 and 1973); Thrum (1908); Stokes and Dye (1991); L.A. Henke (1929); J. W. Coulter (1931); M. Beckwith (1970); J. Reinecke (ms. 1930); T. S. Newman (1970, 1972, 1974); Handy and Handy with Pukui (1972); M. Kelly (1983); and R. Schilt (1984).

The archival-historical resources were located in the collections of the Hawai'i State Archives, Land Management Division, Survey Division, and Bureau of Conveyances; the Bishop Museum Archives; Childrens' Mission House Museum and Hawaiian Historical Society; the Kona Historical Society; University of Hawai'i-Hilo Mo'okini Library; and in the collections of the authors. The primary research was conducted in the period between December 1996 to October 1997, with subsequent research conducted through February 1999.

Oral History Interviews and Consultation Records

Oral history interviews and consultation records cited in this study was conducted between March 1996 to August 1997. Pursuant to recommendations from staff of LDNR-SHPD, this phase of work included a limited number of interviews and consultation contacts. The present study includes — oral history interview documentation from six interviewees in nine interviews and follow-up discussions; and consultation records from three individuals with specific knowledge about the history and use of the study area lands. Over the years, representatives of Oceanside 1250 Partners have also conducted a series of community meetings and participated in consultation discussions with community members. Excerpts of those records, provided to the authors by Robert Stuit (Oceanside 1250), are cited in this study as well.

Overall, the interviews and selected consultation records demonstrate time depth and continuity in the retention of various aspects of knowledge and customs of the land as handed down by elders with whom the interviewees grew up. Selected sites (land features and historic resources) described by the interviewees and consultation program participants were marked at approximate locations on maps used during the interviews.

Historical Overview: Kona – Nā Ahupua'a mai Keauhou a i Ka'awaloa

As a result of the above referenced research, a detailed record of traditional and historic period land use and residency activities has been collected for the study area. Situated on the leeward slopes of Hualālai volcano, on the island of Hawai'i, in the district of Kona, the project crosses several native land divisions or *ahupua'a*. North to south, the lands are named — Keauhou, Honalo, Mā'ihi, , Kuamo'o, Kawanui, Lehu'ula, Honua'ino, Hōkūkano,

Kanāueue (in North Kona); and Halekiʻi Keʻekeʻe, ʻIlikahi, Kanakau, Kalukalu, Onouli, Keōpuka, and Kaʻawaloa (in South Kona).

Passing through seventeen traditional and thirty-one historic *ahupuaʻa*, the easement of the proposed Māmalahoa Highway Bypass crosses over lands that have been used by Native Hawaiians since long before Western contact (pre 1778). A wide range of Hawaiian cultural sites, most notably, an extensive dryland agricultural field system complex, and ancient trails and *ahupuaʻa* boundary walls, habitation complexes, the historic Kona Development Company (KDC) Railway, and sites with probable ceremonial functions have been identified within and nearby the easement.

Beyond the primary project area (the highway easement), on both the *makai* (shoreward) and *mauka* (inland) sides of the project area, are ancient villages and residence features; burial sites; *heiau* (ceremonial sites); *wahi pana*, or storied places; the battle and burial grounds of Lekeleke and Kuamoʻo; caves; and other features. While not within the project area, these sites must be considered in the overall study and assessment of potential impacts related to development of the highway bypass (cf. Title 11, Chapter 200).

The ancient Hawaiians traveled through the project area along trail systems that provided them with access to the dryland agricultural fields, which in and around the project area were cultivated with crops such as *ʻuala* (sweet potatoes), *hue* (gourds), *kō* (sugar cane), and *ʻulu* (breadfruit) (cf. Newman 1970, Kelly 1983, and Schilt 1984). On a larger regional scale, the *ala hele* and *ala piʻi uka* (*ahupuaʻa* trails both lateral and *mauka-makai*) provided travelers with access to the distant inland field systems and mountain resources, and with access to the populous coastal villages and rich ocean fisheries.

During the middle to latter part of the nineteenth century, native use of the lands around the bypass easement study area was greatly curtailed. This was primarily due to the diminishing Hawaiian population and the Westernization of land ownership in the islands, which allowed a few people, primarily foreigners to acquire large tracts of land. Thus, land which had been put to use for native subsistence agricultural practices, was walled and fenced off, and used as pasturage for introduced herbivores. As a result, the primary native use of land in and around the bypass easement appears to have been associated with traveling between upland residences and agricultural fields to a few coastal residences and ocean fisheries.

The pattern of land use which evolved in the latter part of the nineteenth century remained the primary land use through most of the twentieth century, with the numbers of individuals going to the seashore steadily diminishing. By the 1940s-1960s, several of the ranchers began bulldozing jeep trails to the shore for access to stock and limited beach residences. Some of the new trails were made near the locations of the earlier Hawaiian trails, others were on the trails, or crossed them in locations (cf. interview with Billy Paris). Grazing of cattle remains an activity of economic venture on much of the land in and around the project area.

KONA:
A CULTURAL HISTORICAL CONTEXT

An Overview of Traditional and Early Historical Accounts

The island of Hawaiʻi is the largest, youngest, and southern-most of the Hawaiian islands. In the pre-western contact system of Hawaiian land management, the island was divided into six political regions (*moku o loko*). The district of Kona comprises most of the leeward (southwestern) land area of Hawaiʻi Island, with its northern, Kohala boundary being the *ahupuaʻa* of Puʻu Anahulu, and the southern boundary, the *ahupuaʻa* of Kaulanamauna, neighboring the district of Kaʻū. Today, the ancient district of Kona is divided, for political convenience into North and South Kona with the dividing line near Puʻu Ohau, between the *ahupuaʻa* of Kanāueue and Halekiʻi.

In native traditions, Kona is closely associated with the god Lono, who is said to have introduced the main food plants to Hawaiʻi. The following narratives provide an over view of rituals for inducing rainfall and fertility in Kona during the *Makahiki* season. Noted historians and ethnographers, E.S. Craighill Handy, Elizabeth Green Handy and Mary Kawena Pukui (1972) wrote :

> The most interesting mythological and legendary materials relating to Kona have to do directly or indirectly with Lono...The story of the origin of the Makahiki rain and harvest festival, bring Lono from Kahiki, whither he returns. From Kona we have the written record of a myth of Kumuhonua, [Earth Foundation, 36 generations before Wākea and Papa, who was the first man fashioned by the gods] whose writer says that Lono was a fisherman and yet ends his story by stating that the events related occurred before men peopled the earth. Lono is credited with introducing the main foods plants, taro, breadfruit, yams, sugar cane and bananas to Hawaii and also *ʻawa*. Hogs were likewise identified with Lono, but there is no mention of his having brought them to Hawaii (Handy, Handy and Pukui 1972:522).

Kona Chiefs and Unification of an Island Kingdom

The earliest period of Hawaiian pre-contact history is traditionally referred to as *Laʻilaʻi*, the tranquil time (Kelly and Barrere IN Schilt 1984:22). By the 1400s, the two highest ranking of the several chiefs of Hawaiʻi Island were located in centers of power on the leeward and windward coasts. The story of ʻEhu-nui-kai-malino, a prominent chief of Kona, and subsequent chiefs who ruled from the Kona district is presented in Marion Kelly's historical report prepared for the Kuakini Highway realignment corridor:

> The Kona story begins here with the 15th-century Kona chief ʻEhu-kai-malino. Among the Hawaiʻi Island chiefs, ʻEhu ranked second only to Liloa, the immediate founder of the dynastic line of Hawaii Island. ʻEhu was a contemporary of Liloa, according to Hawaiian historian Kamakau (1961:2), who also calls him the son of Kuaiwa (ibid.:429), Liloa's great-great-grandfather (Malo: 1951:238). According to Kamakau, ʻEhu placed his eldest son in Liloa's court in Waipiʻo in acknowledgment of Liloa's supremacy of

rule, as did other chiefs of district chiefdoms. Upon the death of Liloa, dynastic power was usurped by his younger son, 'Umi-a-Liloa. The chiefs of Hilo, Puna, Ka'u, and Kona, however, withheld allegiance to 'Umi. The story of how 'Umi conquered each of these district chiefs in turn has been told in some detail by Kamakau (1961:16-19).

Upon his unification of the island, 'Umi chose to dwell in Kona "where the climate was warm," and where he engaged in farming and fishing (Kamakau 1961:19). 'Umi took as one of his several ranking wives Moku-a-Hua-lei-akea, a descendant of 'Ehu-kai-malino (ibid.). Through this marriage and the intermarrying of descendants of 'Umi and Moku, the line of 'Ehu may be followed down to Kalani'opu'u and Kamehameha, the famous ruling chiefs of the late 18th century. Kamakau's account of this period dwells mostly upon the wars and struggles among the descendants of 'Umi, as one and then another sought to achieve supreme power over the entire island.

In the course of his history, Kamakau mentions a number of sites associated with various important chiefs who lived in Kona. Many of these sites, especially the *heiau*, were located and/or described by early investigators, primarily John F. G. Stokes (Ms.), Thomas G. Thrum (1908:43-46; 1907:69-77), and John Reinecke (Ms.). Present-day archaeologist are finding numerous other sites in Kona, some of which appear to be hitherto unreported *heiau*. Hikiau, the *luakini* or state *heiau* of Kalaniopu'u at Kealakekua Bay, has become the most famous of the Kona *heiau* because of its association with the Western discovery of the Hawaiian Islands by Captain Cook (Kelly 1983:1).

Several historic authors have elaborated on the role of the god Lono in Kona's history, and the importance of the *heiau*, Hikiau mentioned above. It appears that Hikiau was dedicated to the god Lono, the god of rains, agriculture, abundant crops, and medicine, at the time of Cook's arrival (1778). In 1906-1907 John Stokes of the Bishop Museum conducted a detailed survey of *heiau* of the island of Hawai'i. His study, was formally published in 1991 (Stokes and Dye 1991), but his notes from 1906, offer readers the following colorful historic observations:

> The *heiau* of Hikiau is deserving of more attention than any other in the Hawaiian group as it is the first which any record has survived. Information from Koo an old native of Napoopoo (1906) said Hewahewa was *kahuna nui* of Hikiau and that his house was on the platform near the northeast corner of the pond. The platform could be traced. Also that Pahua was *kahuna* Kaapuni or circuit priest. The later was an uncle of Opukahaia who was Koo's great-grandfather. That the small platform on the south was a *heiau* called Opukahaia after the priest's name and was the place where the latter was being trained for the priesthood by another uncle Lepeamoa. That Hikiau originally extended a short distance to the sea....The *heiau* is now used for drying vegetables. In 1906 the pool was found lined with stone walls built up to the level of the ground (Stokes Ms. BPBM Archives Group 2 Box 5 #1).

It was within the walls of Hikiau that Kalani'ōpu'u welcomed Captain James Cook as the "returning *Akua Lono*" (god Lono) (Kamakau 1961:99-101, 180). On January 28, 1779, Captain Cook read the first recorded Christian service on Hawaiian soil. It was an Anglican burial service over the body of William Watman. The spot is marked with the William Watman cairn and tablet which fronts and abuts the front wall of the *heiau* of Hikiau (Taylor 1929:47) Several early voyagers provide documentation of Hikiau (e.g., Edward Bell's "Log of the *Chatham*;" John Turnbull's "A voyage round the world, 1803-1806;" Vancouver's "A Voyage of Discovery;" and J.C.. Beaglehole's "The Journals of Captain James Cook on his Voyages of Discovery."

In notes compiled by Jean Greenwell of the Kona Historical Society, we learn that it was Kamehameha I, who " restored Hikiau to a *luakini heiau*, one where human sacrifices were offered" (Greenwell ms.).

Another of the early historical accounts which mentions certain lands of the project study area, is found in the writings of John Papa I'i (1959). I'i, an eminent Hawaiian historian and member of the courts of Kamehameha II, III, IV, and V, gives the following tale of a canoe paddler with super-human strength who lived during the reign of Kamehameha I:

> Akalele, a man famous for his paddling strength, is said to have come from Kauai and to have lived with our first king. One night the king left Kawaihae and set forth with his double canoes. Daylight found his company outside of Kekaha, and they rested a little while at Kailua. Akalele was alone on a single canoe about 6 fathoms long and filled with baskets of sweet potatoes, fowls, dogs, and such gifts as people brought who came to see the king on the beach in Kona. When they arrived at Kahaluu, or Keauhou perhaps, the single canoe began to race with the double ones, to see which could first reach their goal, Awili in Kaawaloa. So they raced, the king with his canoe paddlers, Akalele alone. Although the single canoe was loaded with goods, the king desired this race....After they passed Keopuka and reached Kalaemano at Kaawaloa, they again turned shoreward. Near the harbor of Awili, where there is a narrow channel only large enough for a single canoe, the king called out, "O Akalele, turn your canoe into the narrow entrance! Glide in on a wave!" Akalele did as he was told and was first to arrive at Awili. The others took the longer way around and found him the carrying the things ashore. The king helped Akalele because he was a stranger (I'i 1959:131-2).

Battle of Kuamo'o

Possibly one of the most significant references to lands within the study area *ahupua'a* is found in an account that is of not only local, but also of national significance to the Hawaiian people. As early as the c. 1770s, a *kāula* (seer or prophet) Kapihe foretold rise of Kamehameha I to power, his unification of the islands under one rule, and the overthrow of the ancient religious and *kapu* system (cf. Kamakau 1961, Malo 1951). In this prophesy are referenced the lands of Kona, from Kuamo'o and Hōlualoa, and by context, the lands between these two *ahupua'a* are also included as a part of the prophesy. Lands in the current project area that are included in this prophecy are Kuamo'o, Mā'ihi, Honalo, and Keauhou. The following narrative demonstrates the importance of these lands in the period of history

being described. Kamakau recorded:

> Ka-pihe the seer prophesied in the presence of Kamehameha and said, "There shall be a long *malo* reaching from Kuamo'o to Holualoa. The islands shall come together, the tabus shall fall. The high shall be brought low, and the low shall rise to heaven." The prophesy was fulfilled when the battle was fought at Kuamo'o for the downfall of the ancient tabus. Holualoa was the long *malo* uniting the kingdom from Kahiki to Hawaii. The kingdom of the gods fell, and the believers rose to the heavens (Kamakau 1961:223).

Nathaniel Emerson (1951) provides additional details on this prophecy in David Malo's *Hawaiian Antiquities*:

> Kapihe was a noted *kaula* of the last century, living in Kona, Hawaii, at the time when Kamehameha was a general under Kalaniopuu. To Kapihe was ascribed the following oracular utterance (*wanana*) which is of the nature of a prophecy:
>
> | | |
> |---|---|
> | [1]*E iho ana o luna;* | That which is above shall be brought down; |
> | *E pii ana o lalo;* | That which is below shall be lifted up; |
> | *E hui ana na moku;* | The islands shall be united; |
> | *E ku ana ka pala.* | The walls shall stand upright |
>
> (Emerson IN Malo, 1951:115).

Kamehameha did indeed rise to power, and by 1795, he had gained control of all the islands except Kaua'i and Ni'ihau. By 1810, these last two islands were ceded to Kamehameha by their king, Kaumuali'i (Kamakau 1961:196).

Another version of this prophesy was published in the Hawaiian newspaper "*Ka Hae Hawaii*" on May 23, 1860 (translated by Maly). One of the readers, identified only as "S.," offered the following short history to the editor of the paper:

> *He Wānana (A Prophesy)*
>
> Perhaps you have heard about the prophesy made by Kapihe, before Kamehameha first. If perhaps you have not, here is the prophesy:
>
> Kamehameha returned to Hawaii with the Niaukani [fleet of canoes and ships in c. 1812], he dwelt at Holualoa in North Kona. Kapihe was a person who dwelt at Kuamoo, and he was at times considered to be somewhat crazy [a result of his gift of prophesy]. He traveled from Kuamoo to Holualoa with a long *malo* (loin cloth), prophesizing before the King. This is what he said:
>
> | | |
> |---|---|
> | *E hui ana na aina,* | *The lands shall be united;* |
> | *E iho mai ana ko ka lani,* | *That which is above shall come down,* |
> | *E pii aku ana ko lalo nei,* | *That which is below shall rise above,* |
> | *E iho mai ana ke Akua ilalo nei,* | *The God shall come down,* |
> | *E kamailio pu ana me kanaka,* | *Speaking with mankind,* |
> | *E pii mai ana o Wakea iluna,* | *Wakea shall rise up,* |
> | *E iho aku ana o Milo ilalo,* | *Milo shall descend,* |
> | *E noho pu ana ke akua mie kanaka.* | *The gods shall dwell like men.* |
>
> *(Ka Hae Hawaii Mei 23, 1860:32)*

[1] Today, this *mele* has been taken up again as a call by members of groups seeking to restore Hawaiian sovereignty.

An eyewitness account of these events, recorded by Gideon La'anui, was published in *The Hawaiian Annual* (Thrum 1930:92). La'anui's account, originally published in the Hawaiian newspaper "*Kumu Hawaii*" in 1838, places the event in the period following the *Ni'dukani*—the return of Kamehameha to Hawai'i in 1812, as do the accounts from *Ka Hae Hawaii* above.

After the death of Kamehameha I in 1819, his consort, Ka'ahumanu, shared royal responsibilities and power with King Liholiho, (Kamehameha II). In her role of *kuhina nui* (regent) she aided in the overthrow of the religious *kapu* system and allowed the American missionaries to land in the islands in 1820. Ka'ahumanu, famed for her "rod or iron," style of governing, offended many of the chiefs with her decrees. Within six months following the death of Kamehameha I, the ancient religious and *kapu* system of honoring the gods and restricting men and women from eating together was dismantled (Kamakau 1961:223, 226-227). The demise of the ancient system was consummated when Liholiho sat down to eat at the same table with his mother, Keōpūolani and Ka'ahumanu. At the end of this ceremony he announced that the *heiau* should be destroyed and all the old idols overthrown. Liholiho's cousin Kekuaokalani was named the keeper of war god Kūkā'ilimoku, the famed feathered image that is on display at the Bishop Museum. Angered at the breaking of the ancient *kapu*, Kekuaokalani raised a rebellion against Liholiho from Ka'awaloa. However, the army of Liholiho's supporters, led by Kalanimōkū, was reinforced with American swivel guns mounted on double canoes (Day 1984:75). Hawaiian historian Samuel Kamakau provides a detailed account of the events leading up to the battle. Seeking a peaceful resolution to the differences, Keōpūolani approached Kekuaokalani in diplomatic etiquette to avert bloodshed. Upon her return to Kailua Bay, she reported to Kalanimōkū:

> ..."I was to have been killed." "Where is Ke-kua-o-ka-lani?" asked Ka-lani-moku. "He is coming by land." "How did you receive you?" "Friendly means have failed; it is for you to act now," and Ke-opu-o-lani then ordered Ka-lani-moku to prepare for war on Ke-kua-o-ka-lani. Arms and ammunition were given out that evening to everyone who was trained in warfare, and feather capes and helmets distributed (Kamakau 1992:227).

On the morning of the battle Kalanimōkū sent an emissary with the word, "Let your chief come and confer with your chief Liholiho at Kailua, and if he will consent there need be no war." The messenger met Kekuaokalani at Kuamo'o and gave the message. While the two were talking outside the stone wall at Lekeleke (Site 1745), advance guards of Kalanimōkū fired a shot at Kekuaokalani. Retaliation commenced:

> Ke-kua-o-ka-lani's scouts fired and killed some of the men and wounded two

chiefs on the side of free eating, but not seriously....These were the first casualties, and had they been fatal the battle would have gone to the *tabu* eaters. Ka-lani-moku's men retreated, but others, seeing how few in number the shooters were, pressed forward, the two sides met, and at Kuamo'o the battle began in earnest.

Ke-kua-o-ka-lani showed conspicuous courage during the entire battle. He kept on advancing and even when shot in the leg he fought on bravely until afternoon, when he was surrounded and shot in the chest and died facing his enemies. His wife Manono fought at his side. When he was shot she cried out to Ka-lani-moku to spare her, for he and she had the same father. "How is the chief?" he called. "He is dead." "Then it would disgrace me in men's minds for you to live."...She fell at her husband's side under a volley of shots " (ibid.:228).

When traveling around the island in 1823 Rev. William Ellis visited the battle ground and the burial site of Kekuaokalani and Mānono (Reinecke's Sites 72 & 79, near the border of Kuamo'o and Mā'ihi):

> After traveling about two miles over this barren waste, we reached where, in the autumn of 1819, the decisive battle was fought between the forces of Rihoriho, the present king, and his cousin, Kekuaokalani, in which the latter was slain, his followers completely overthrown, and the cruel system of idolatry, which he took up arms to support, effectually destroyed.
>
> The natives pointed out to us the place where the king's troops, led on by Karaimoku, were first attacked by the idolatrous party. We saw several small heaps of stones, which our guide informed us were the graves of those who, during the conflict, had fallen there.
>
> We were then shewn [sic] the spot on which the king's troops formed a line from the sea-shore to towards the mountains, and drove the opposing party before them to a rising ground, where a stone fence, about breast high, enabled the enemy to defend themselves for some time, but from which they were at length driven by a party of Karaimoku's warriors (Ellis 1979:78).

Ellis also reveals the location of a refuge cave which is characteristic of the caves found within the vicinity:

> A little way south of the spot where the chief fell, was a small cave, into which, in the confusion that followed the death of Kekuaokalani, a woman attached to his party crept, and, drawing a piece of lava over its mouth, remained until night, beneath whose friendly cover she fled to the mountains, not knowing that the victors had returned without pursuing their foes (ibid.).
>
> A pile of stones, somewhat larger than the rest, marked the spot where the rival chief and his affectionate and heroic wife expired. A few yards nearer the sea, an oblong pile of stones, in the form of a tomb, about ten feet long and six wide, was raised over the grave in which they were both interred (ibid.:79).

Bishop Museum archaeologist, John F.G. Stokes (Stokes and Dye 1991), reported that the battle was fought between the *heiau* named Kekuaokalani and Lonohelemoa (Stokes and Dye 1991:89). He reported "Kekuaokalani was killed where he made his last stand, just north of the latter *heiau*" (ibid.). Kekuaokalani Heiau is situated in the land of Mā'ihi 2, and Lonohelemoa Heiau, is in the land of Kuamo'o 1 (ibid.:87,89).

Perpetuation of this significant native account and knowledge of associated sites is demonstrated in the oral history interview with Billy Paris, who also makes a clear distinction between the battle and burial ground of Kuamo'o (in the *ahupua'a* of that name), and the battle and burial ground of Lekeleke in Keauhou 2 (pers. comm. May 9, 1997 – see interview records later in this study). Additionally, a historic interview with Ka'aha'āina an elderly native resident of Keauhou with genealogical ties to families of Mā'ihi—cited in the section describing land history of Mā'ihi—adds further information to the narratives and describe several features in the Kuamo'o area.

Another reference to events in the time of Kamehameha I discusses the bay and village of Nāwāwā, south of Pu'u Ohau in the *ahupua'a* of Ke'eke'e. Jean Greenwell noted that, "There is a strong wind called *Ulu Mano*, that blows from the south in the night only." In his "Treasury of Hawaiian Words in One Hundred One Categories," Kent (1986) reports that at one time, Kamehameha and his party were shipwrecked by this wind of Nāwāwā, and that the whole village was burned to light them ashore (Kent 1986:443).

A review of the writings of historians Samuel Kamakau (1961) and John Papa I'i (1959), offer no documentation of this event. Indeed one local resident, descended from a family with generations of residency in South Kona, believes that the account is of recent origin (G. Leslie, pers comm.).

Family Recollections: Historical Accounts

Based on local oral historical accounts, there is also an affiliation between sharks and humans at Nāwāwā Bay. Two accounts by local informants tell us that a "half human, half shark baby" is buried in one of the LCAs (possibly LCA 9753-B by association with the Keli'ikipi family) – Anna (Keli'ikipi) Keana'āina, pers comm. 1997). A third account relates that while swimming, a pregnant woman had what she though was a miscarriage and was leaving the water when a *kupuna* on the shore told her to wait, shortly she was surrounded by sharks and one baby shark came up and suckled at her breast (Keli'ikipi and Leslie *'ohana*, per Gordon Leslie IN Hammatt 1995:33).

Another local historical account refers to a large flat boulder on a rocky shoreline promontory, south of Keikiwaha Point. The *pāhoehoe* slab has the name *Pōhaku Lele*, which in part, refers to its movement and the sound it makes when buffeted by strong surf. Some believe that the rock may have also been a *leina 'uhane* or "leaping place of spirits" of *ali'i* (Kanaka'ole *'ohana*, per G. Leslie).

Native Land Management and Agricultural Practices In Kona

As noted earlier in the study, the island of Hawai'i was subdivided into a series of smaller political land units. Of these units, the *ahupua'a*—generally a division of land that extended from the fishery fronting a land unit to the mountainous zone, that provided land residents with the resources necessary for their welfare—was one of the most significant. The *ahupua'a* were also divided in a number of smaller manageable parcels such as the *'ili, 'ili lele, kihāpai, māla, kō'ele, mo'o, paukū*, and *kuaiwi* — these are small land units such as detached parcels with resources in various environmental zones, gardens, dryland agricultural parcels, rock wall-lined fields, and agricultural parcels worked by commoners for the chiefs. Interestingly, while for different reasons, in both pre-contact and post contact periods of history, many of these land divisions were marked by stone walls (examples of which may be seen along the length of the bypass easement today).

A synopsis of land management practices in pre-contact Hawai'i is provided by Marion Kelly:

> For generations the farmers and their families lived under the protection of chiefs and acknowledged that relationship by providing the chiefs and their land agents with portions of the harvest and labor on community projects. A chief had the responsibility for the overall management and productivity of the land. A good chief was one who "cared" for the land and the people living on it (Kelly 1983:70).

Handy, Handy and Pukui (1972) reported that:

> Kona, like eastern Maui, with its decomposing lava mixed with humus and with intermittent rainfall which soaks away quickly in the porous soil and rock, is ideal for sweet-potato cultivation. Sweet potatoes were the staple in lowland localities where there was sandy soil, as at Kailua, Honaunau, Kealia, and Ho'okena (Handy & Handy 1972:526).

In addition to sweet potato, dryland taro was also a viable crop in the uplands of South and North Kona district, between 1,000 and 3,000 foot elevations, with taro crops still under cultivation through the 1930s (ibid.:106-107, 523). The old method of planting the taro in Kona was to plant the cuttings in the lower, warmer zone and then to transplant them to the higher forest zone where the soil and moisture were ample (ibid.:525).

An 1859 article in *The Polynesian* described the cultivation techniques used by Hawaiians:

> In cultivating the uplands, natives do not generally think of breaking up the whole surface of the soil; but only a spot here and there, where the seed, whether it be potatoes, bananas, cane or any other, is there deposited and [they] leave the intermediate space to be wrought afterwards (An Old Farmer 1849:50-51 IN Kelly & Barrere 1980:41).

In the following excerpt, Handy et al. (1972) described native Hawaiian agriculture in various elevational zones of South Kona. Citing several early historical accounts, the authors reported:

> In time of intensive native cultivation, South Kona was planted in zones determined by rainfall and moisture. Near the dry seacoast potatoes were grown in quantity, and coconuts where sand or soil among the lava near the shore favored their growth. Up to 1,000 feet grew small bananas which rarely fruited, and poor cane; from 1,000 to 3,000 feet, they prospered increasingly.
>
> From approximately 1,000 to 2,000 feet, breadfruit flourished (Handy & Handy 1972:524-5).

The "Kona Field System" Hawai'i Register of Historic Places Site 10-37-6601

One of the most significant geographical and cultural features of the district of Kona is a dryland agricultural field system, now commonly referred to as the "Kona Field System" (HRHP Site 10-37-6601). The proposed highway corridor crosses through this field system, which was one of the most intensively cultivated areas in the Hawaiian Islands. Early historic accounts of the area and archaeological remains are the grounds of conclusions by T. Stell Newman's (1970, 1972, and 1974) that the Kona Field System (*Figure 2*) was the most extensive and monumental work of ancient Hawai'i. A review of the *kuleana* claims made by native tenants of the north-south Kona districts document that this extensive dryland agricultural field system continued to function through the period of the Māhele in the middle 1800s, and is a part of the lands through which the proposed Māmalahoa Highway Bypass crosses.

In his research, Newman's (1970) formulated a synopsis of how the Kona Field System was set up between c. 1778-1823. Newman identified the following subzones of the field system which offer us a general framework of the system as described in terms of elevation, rainfall and crop types:

Sweet Potato/Wauke Zone — Elevation: Sea level to about 500 feet
- Annual Rainfall: Seasonal; 30 to 50 inches
- Crops: Sweet potatoes and *wauke* grown in very rocky areas.

Breadfruit/Sweet Potato/Wauke Zone — Elevation: 500 to 1,000 feet
- Annual Rainfall: 30 to 60 inches
- Crops: Breadfruit trees, with sweet potatoes and *wauke* planted between them.

Sweet Potato/Dry Land Taro Zone — Elevation: 1,000 to 2,000 feet
- Annual Rainfall: 60 to 80 inches
- Crops: no breadfruit trees; sweet potatoes in the lower part, dry land taro in the upper part; field boundaries planted with ti and sugar cane.

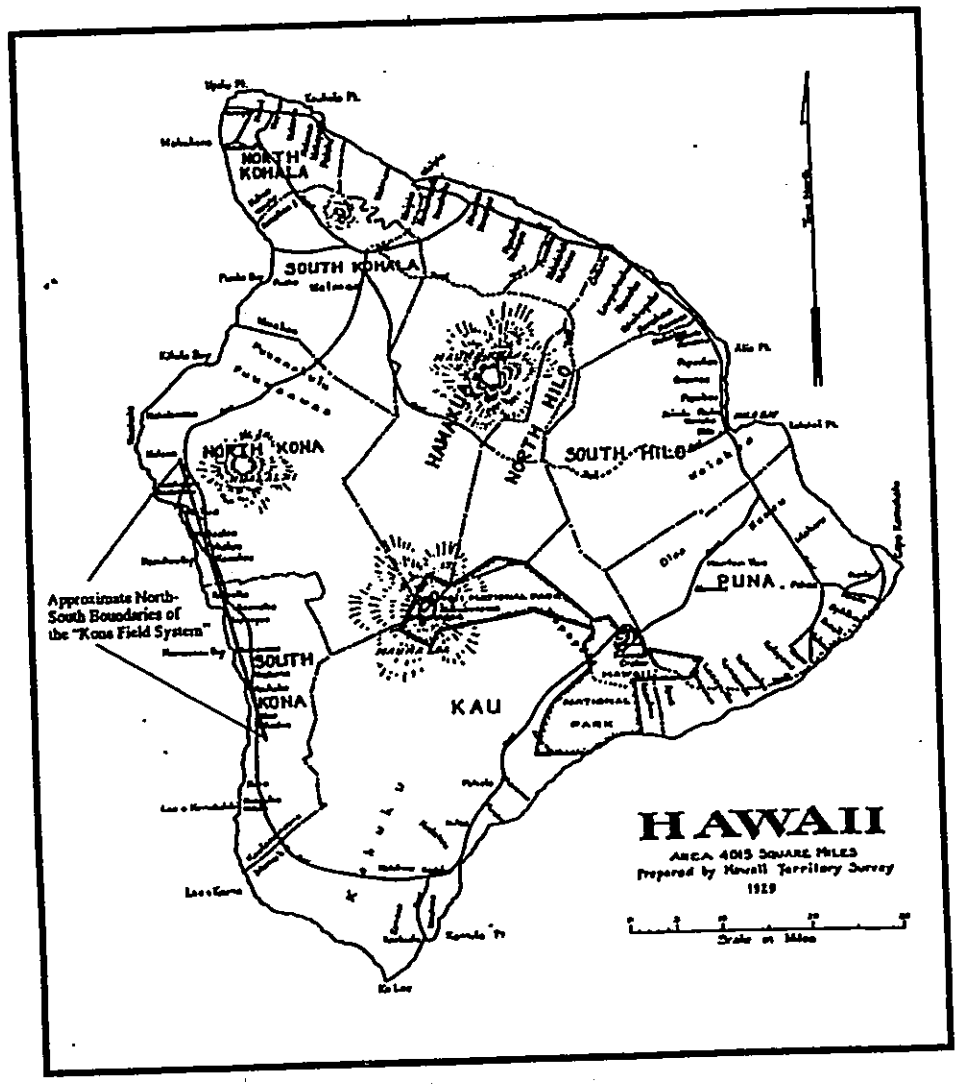

Figure 2. The "Kona Field System," Island of Hawai'i – showing approximate extent of field system, North and South Kona (after T.S. Newman 1978:Fig. 8)

Plantains and Banana Zone — Elevation: 2,000 to 3,000 feet
Annual Rainfall: 80 to 100 inches
Crops: bananas and plantains planted just below and within the forest.

As described in the elevational context above, it is seen that north to south, the proposed Māmalahoa Highway Bypass runs through the first two zones and in the south, crosses slightly into the third zone. One of the earliest historic records that provides us with a glimpse into the nature of this agricultural field system in the vicinity of the project area, comes from the journals of Captain James Cook and his crewmen (Cook IN Beaglehole 1967, Vol. 3 pp. 106-107).

The historic record documents that the plantations were divided from each other by thick, low walls of lava rock and that they found the breadfruit trees, plantains, taro root, sweet potato, ginger root, and sugar cane growing. William Ellis, surgeon with Captain Cook in 1778, described the country above Kealakekua:

> After ascending part of the hill, which was covered in every direction with plantations of sugar-cane, sweet-potatoes, tarrow [sic], plantains, and breadfruit trees (which were by far the largest they had seen) they arrived at a spot of land entirely uncultivated, and overrun with long grass and ferns...they arrived at a long tract of plantain-trees, which far exceed the cultivated ones in size; they produce fruit like them, but it never arrives at perfection...but they took a different route to their former one [possibly the inland trail identified in native lore as Kealaehu or Mamalahoa trail] proceeding nearly in a W.N.W. direction, through innumerable plantations of the paper mulberry-tree, breadfruit, and plantain trees, which formed an extensive garden (Ellis 1784, Vol. 2 pp. 91-96).

The same region is described in detail by Archibald Menzies, a surgeon and naturalist, who accompanied Captain George Vancouver in 1793. The entry provides insight to the level of cultivation:

> The forenoon was spent in arranging and equipping the party before we left the village [Ka'awaloa], and as our route lay directly back from it, over a dry barren rocky country, up a steep ascent...The tract which extended along shore, if we might judge from its appearance and our knowledge of that which we had already traveled over, we were ready to pronounce a dreary naked barren waste, if we except a few groves of cocoa palms here and there near the villages. But that which stretched higher up along the verge of the woods from the manner it was industriously laid out in little fields, exhibited a more pleasing and fertile appearance...On leaving this station, we soon lost sight of the vessels, and entered their breadfruit plantations, the trees of which were a good distance apart, so as to give room to their boughs to spread out vigorously on all sides, which was not the case in the crowded groves of Tahiti, where we found them always planted on the plains along the sea side.

> But here the size of the trees, the luxuriancy of their crop and foliage, sufficiently show that they thrive equally well on an elevated situation. The space between these trees did not lay idle. It was chiefly planted with sweet potatoes and rows of cloth plant. As we advance beyond the bread-fruit plantation, the country became more and more fertile, being in a high state of cultivation. For several miles round us there was not a spot that would admit of it but what was with great labor and industry cleared of the loose stones and planted with esculent roots or some useful vegetable or other. In clearing the ground, the stones are heaped up in ridges between the little fields and planted on each side, either with a row of sugar cane or sweet [ti] root of these islands where they afterwards continue to grow in a wild state, so that even these stony, uncultivated banks are by this means made useful to the proprietors, as well as ornamental to the fields they intersect.
>
> The produce of these plantations, beside the above mentioned, are the (wauke) cloth plant...taro and sweet potatoes...
>
> The land here is divided into plantations, called ili, which take their rise at the sea side and proceed up the country, preserving a certain breadth without any limitations, or as far as the owner chooses to cultivate them, and without the protection either of high walls or gates (Menzies 1920:74-77).

While traveling from Hualālai toward Ka'awaloa, Menzies' party descended out of the forest and he noted:

> ...we found the lower edge of it [the forest] as in other places, adorned with rich plantations of plantains and bananas....We came to a village among the upper plantations, where we took up our residence for the night about nine or ten miles northeast of Kealakekua Bay, and where we were surrounded by the most exuberant fields of the esculent vegetables of these islands, which for industry of cultivation and
>
> agricultural improvements could scarcely be exceeded in any country in the world, and we were happy to find their labor here rewarded by such productive crops of these vegetables (ibid.:167-168).

In addition to Menzies, an earlier visitor, John Ledyard (Cook's voyage), wrote in his journal about the trip into the uplands, back of Kealakekua Bay, and northward toward Kailua. Going in a northeasterly direction from Kealakekua Bay in 1779, Ledyard described the land as a plain of little enclosures separated from each other by low broad walls. He noticed that most of these fields were planted with sweet potatoes and suggested tha· they were the principle crop. He also noted many breadfruit forests, and patches of sugar cane along the plains of Kona, up to about three miles from Kailua town (Kelly 1983:71-72).

The observations of these early westerners have been matched to specific land areas and analyzed according to modern environmental data to determine the characteristics controlling the agriculture (Newman 1970, 71, 72; Kelly 1983; Schilt 1984). Newman suggested, and the testimonies given while filing for *kuleana* parcels following the Māhele, substantiate, that

this system continued northward from Kealakekua to include the area back of Kailua town, for an estimated overall size of approximately 3 miles wide by 18 miles long (Hawaii Register of Historic Places, Site 10-37-6601). Newman asserts:

> ...the whole Kona System, is well designed to take advantage of the western Hawaii Island environment. The orientation maximizes the available sunlight and exposure to periodic rain showers. The alignment would have made the crops susceptible to high velocity trade winds were it not for the protection of Mauna Loa. Onshore winds are generally light so physical damage or excessive plant evaporation would not have been a crucial factor in field alignment...(Newman 1970:56-59).

Pā Pōhaku (Stone Walls and Enclosures)

As noted above, *pā pōhaku* (stone walls) and *pā ·'āina* (land division walls) were an important aspect of Hawaiian land management practices. The walls found within the project *ahupua'a* are of both prehistoric and historic origin. Kelly offers readers an overview of the development and use of walls in the native and historic landscapes:

> The dominating archaeological features of Kona are its walls—the low earth and stone walls of the cultivated fields, the stone walls that enclose plots on land (the older ones usually enclosed former house lots, or served as animal pens), and the "walls of the land," *pa 'aina*. *Pa 'aina* are reported on all the islands and denote walls built by communal labor for the general benefit of the people. In early days *pa 'aina* were built upon the command of chiefs who had authority over particular lands. They were built by tenants as part of services due to their landlords. In historic times labor was performed on walls and roads as service not only to land-holders but also to the government. Such tenant labor on government lands ceased in 1852, and ceased on chief-owned (*konohiki* lands) as tenants received their *kuleana* awards and bought or otherwise acquired their parcels in fee simple.
>
> In addition, wall and road work were assigned as punishment for infractions of law. Thus, there was a continuum of work on the *pa 'aina*. Walls were built to protect the cultivated lands from the ravages of free-roaming dogs and pigs kept near the coastal habitations (*Ke Au Okoa*, Mar. 19, 1868; Testimony, Native 3:605). John Papa I'i recorded such a wall at Honua'ula in 1812, saying "A stone wall to protect the food plots stretched back of the village from one end to the other and beyond" (Ii 1959:111)... Over a hundred years later the Rev. Albert Baker reported the same for the Kuakini Wall (Kelly 1983:75):
>
> Just a little above [the stone church at Kahalu'u], and continuing all the way to Kailua, is the huge stone wall built in Kuakini's time to keep pigs from the cultivated lands above. A still larger wall may be seen *mauka* of Kainaliu, built for the cattle landed by Vancouver in 1793 [Baker 1915:83-84].

Kelly suggests that the "wall" referred to by Baker above Kāināliu should be read as "enclosure," which was reported in 1880 to have contained 486 acres, with walls four miles long (Bowser 1880:550-551; see also references to "Ka Pā Nui" and "Wai Hou" in the interview with Billy Paris). Kelly postulates that the wall cited by I'i prior the tenure of Kuakini as Governor, (1820-1844) was a precursor and later incorporated into what became known as the Kuakini Wall, "which may be followed from its starting point at Palani Road above Kailua Bay to beyond Kahalu'u Bay.

It should be noted that both historic land records and local community knowledge document the continuation of the "Kuakini Wall" (Site 6302 or 7279) beyond it's terminus in Keauhou 1st. Beginning near the Keauhou 2nd-Honalo boundary, the Kuakini Wall may be located once again, and is seen on the land as far as Kalukalu in South Kona (cf. H. Ackerman and B. Paris in this study).

Changing Residency Patterns:
Regional Population Statistics of the Nineteenth Century

Severe drought and extensive destructive fires in the Kailua area forced many residents to move to other areas of the island in August of 1824 to May of 1825. Reports of scarcities occur again in 1825 and 1827, possibly the result of demands for sandalwood collecting made upon the populace by the chiefs. Kona's population may have been reduced by nearly half between 1824 and 1835, from about 20,000 to about 11,000 (Kelly & Barrere IN Schilt 1984:24).

In 1824 the Rev. Asa Thurston reported a population of not less than 20,000 inhabitants along a 30-mile stretch of the Kona coast, including the 3,000 at Kailua itself (Thurston, Ms.). Most of the people lived close to the seacoast, with another belt of residence about two miles inland. The population distribution was plotted by the geographer Gerald Holland and is included as *Figure 3* (Kelly 1983:14).

By 1832 the inhabitants of Kona were recorded in a census by the resident missionaries as follows:

Kane	4,607
Wahine	4,670
Keikikane	1,559
Kaikamahine	1,596
Total	12,432 (Schmitt 1973:21)

Although the figure of 20,000 estimated by missionary Thurston in 1824 and the census figure of approximately 12,400 in 1832 may not seem comparable, given the catastrophic depopulation of the Hawaiian Islands in those years, the figures probably reflect something close to the actual populations. The missionary census taken in 1835 reported the following:

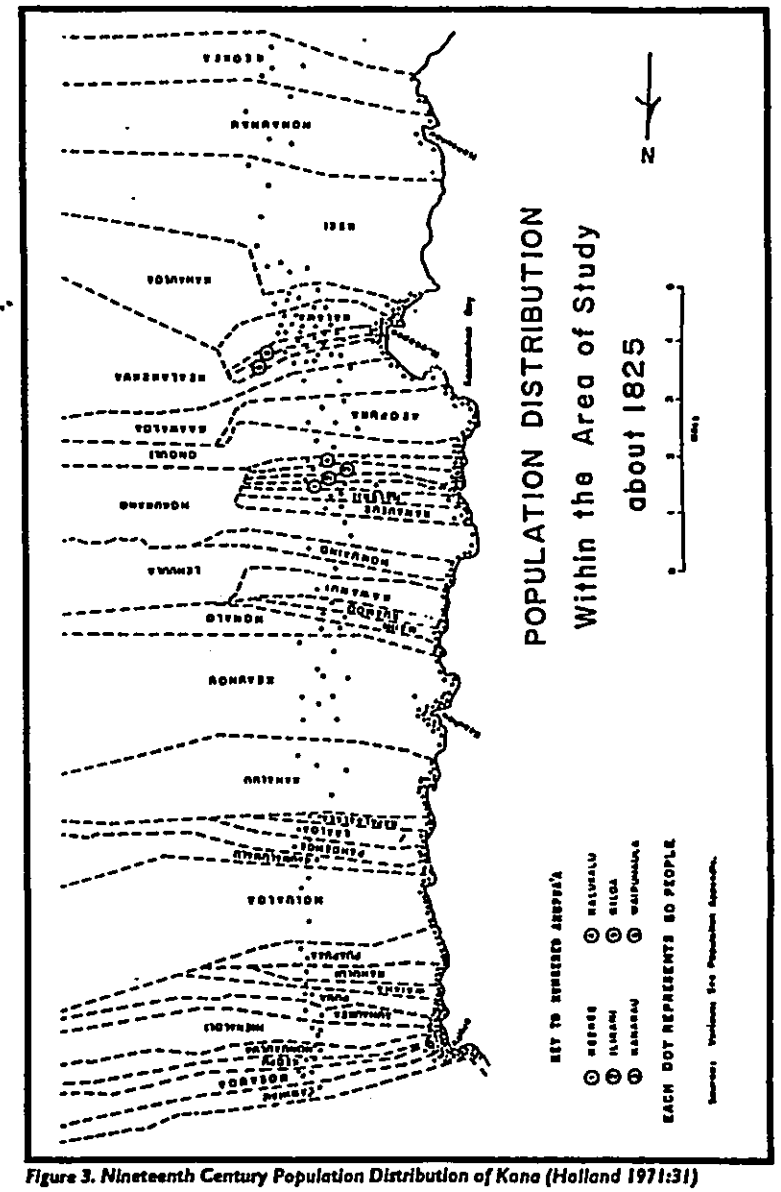

Figure 3. Nineteenth Century Population Distribution of Kona (Holland 1971:31)

South Kona		North Kona	
Kane	1,734	Kane	1,988
Wahine	1,812	Wahine	1,977
Keikikane	729	Keikikane	996
Kaikamahine	722	Kaikamahine	996
		Total	10954

(Schmitt 1973:29, 31) [p.14]

Based on Hollands' statistics of population distribution in ca. 1825 (as indicated on *Figure 3* above), there were approximately 4,800 individual living in the coastal region between Keauhou Bay to the Ka'awaloa Flats, and approximately 1,800 people living in the uplands of the same region. Historical references to Ka'awaloa, Nāwāwā, Hōkūkano-Kāināliu, Kawanui, and Keauhou record that these locations were among the major coastal villages of the region (see section below titled "*Land Records by Ahupua'a*").

Government records for roads (in the Hawai'i State Archives) do document the requests of community members for roads to improve access between harbors, residences and growing town centers. By 1836, a new government road or trail from Kailua to Ka'awaloa had been completed (Schilt 1984:24). As result of privatization of land ownership and the development of business interests in the middle 1800s, the need for more and improved government roads was being addressed. Following receipt of petitions from native and foreign residents of North and South Kona in 1860, the Minister of the Interior appointed a jury of residents to investigate the best route for a new road from the old Ka'awaloa road to the harbor at Keauhou. On September 29th 1860, the jury wrote:

> ...That in our opinion the proposed new road from the old Kaawaloa road to the beach at the harbor of Keauhou, will much conduce to the benefit of the community of this district, and facilitate travel and commerce. We recommend that it commence at the cave called Kanupa on the Kaawaloa road, thence running seaward over such convenient localities as may be designated by the Road Supervisor, until it joins the old Keauhou road at a place called Leohapuu, thence following the route of the old road, with such slight deviations as may be necessary to clear hills and rocks, to the harbor of Keauhou (Interior Department Files – Roads Hawaii; Sept. 29, 1860).

Additional documentation about early trails and road ways between Ka'awaloa and Keauhou, and the gradual shifting of routes from the coast to the uplands is found in Māhele testimonies, Interior Department Road files, land grant records, and historic survey records.

LAND TENURE:
THE MĀHELE (1848) AND SUBSEQUENT LAND GRANT SALES

During the reign of Kamehameha III, the *Māhele 'Āina* (Land Division) took place. The Māhele separated and defined the undivided land interests of the King and the high-ranking chiefs and *konohiki* [*konohiki* originally referred to the person in charge of a tract of land on behalf of the king or chief. It is in the later statues that the chiefs or landlords were referred to as "*konohiki*" (Chinen 1958:vii and Chinen 1961:13)]. In 1848, More than 240 of the highest ranking chiefs and *konohiki* in the kingdom joined Kamehameha III in this division. The first Māhele was signed on January 27, 1848 by Kamehameha III and Princess Victoria Kamāmalu by her guardians Mataio Kekuanā'oa and Ione I'i. The last Māhele was signed by the King and E. Enoka on March 7, 1848 (Chinen 1958:16).

The Māhele did not convey title to any land. The chiefs and *konohiki* were required to present their claims to the Land Commission and to receive awards for the lands quitclaimed to them by Kamehameha III. Until an award for these lands was issued, title remained with the government. Because of the lack of surveyors at the time of the Māhele, the lands were divided by name only, with the understanding that the ancient boundaries would hold until a survey of such lands could be made in the future. Thus the Land Commission awarded lands to chiefs and *konohiki* by their names only. These awarded lands became known as Konohiki Lands (Chinen 1961:13).

During this process all land was placed in one of three categories: King's Land (In 1865, during the reign of Kamehameha V, these were renamed "Crown" land in order to prevent Dowager Queen Emma from retaining lands held by her husband Kamehameha IV, thus making them the property of the occupant of the throne), Government Lands, and Konohiki Lands. These were all "subject to the rights of native tenants," (Laws of Hawaii, 1848:22). Native tenants were the commoners who lived and worked the land for their subsistence. Whenever *ali'i* procured an entire *ahupua'a*, they were bound to respect the rights of the existing tenants. These tenants, if they filed a claim to The Board of Commissioners to Quiet Land Titles, could continue to cultivate and reside on their parcels.

The Kuleana Act of 1850 permitted the Land Commissioners to issue awards to the farmers for house lots and gardens cultivated by them for their own subsistence only, providing the claimants had fulfilled all other legal requirements, such as making a written application before February 14, 1848, having two witnesses give sworn testimony regarding applicant's past occupation and use of the land for an extended period, and having no counter claims made by others (Kelly 1971:6). The parcels for house and garden purposes became known as *Kuleana* (responsibility). Until its dissolution on Mach 31, 1855, the Land Commission issued thousands of awards to native tenants for their *kuleana*; even so, less than 30,000 acres of land were awarded to the native tenants as Kuleana Lands.

The *ali'i* and Commissioners had to file a claim to Quiet Land Titles with the Board of Commissioners, usually referred to as the Land Commission. When such a claim was filed, a Land Commission Award (LCA) was assigned and upon payment of a fee, a Royal Patent was awarded. The testimonies of native Hawaiians and foreigners, regarding their claims for

kuleana in the *ahupua'a* of the project area, and for land grants, which are cited below, were reviewed at the Hawai'i State Archives, Bureau of Conveyances and Land Management Office. In addition to said testimonies, references to the subject parcels were investigated in the Hawaii State Archive's Land Index files which provide further insight to land use.

The general housing and agricultural pattern at this time includes coastal house lots with corresponding upland agricultural lots. Coastal lots were clustered in two primary areas, Nāwāwā Bay and at the Kāināliu or Hōkūkano Village area; additionally a few records document the occurrence of a some residences scattered along the coast in areas like Ka'awaloa, Kawanui, Kuamo'o and Mā'ihi. Agricultural lots were located in an elevational band from ca. 1,200 to 1,500 feet above mean sea level, *mauka* of the proposed bypass corridor. This pattern of a coastal house lots with corresponding upland agricultural lots is typical of residency and land use patterns in Kona. In the present study area *ahupua'a*, most of the land grants were made up of large parcels of hundreds. With the passing of time, many of the grant parcels were sold and consolidated into larger parcels. Such historic period consolidation represents a shift into market-oriented land use, and in the study area, this was primarily associated with a few large ranching operations.

Overview of Claims for Land, Land Use Patterns, and Historic Accounts of the Ahupua'a from Keauhou 2nd to Ka'awaloa

The following section of the study provides readers with a synopsis of the LCA and Grant records for the project area lands, and also includes selected historical accounts (e.g. church, education department, business, and early archaeological records) of sites, residences, and uses of the lands between Keauhou to Ka'awaloa. Generally, the information is summarized and presented in a format similar to that which was presented in the study that was conducted and accepted for 19 of the 31 historic *ahupua'a* within the present project area (cf. Wong Smith in Hammatt et al. 1997).

It is generally recorded that at the time of the Māhele, many families claimed residences close to the shore where they could have easy access to fisheries that fronted the various *ahupua'a*. They also claimed land for agricultural and residency use in the uplands, generally in the area around, and extending above the Māmalahoa Trail (near the present-day highway of the same name). As a result, and as demonstrated in various testimonies, *mauka-makai* trails providing access through the various environmental zones of the *ahupua'a* were integral to the lives of the native residents.

Even as the Māhele and early land grant programs were underway, changes in the Hawaiian population, and the restriction of access through large sections of land being turned over to ranching operations, were significantly impacting native residency and land use patterns. This is demonstrated in the narratives below, which indicated that only a few coastal areas maintained sizable communities by the mid-to-late 1800s. A historic Taxation Division map from c. 1928 presents viewers with a detailed overview of grants and various land holdings from the 1800s through the period of the map's production (*Figure 4* at the end). *Figure 4* has been annotated, and depicts the location of the proposed Māmalahoa Highway Bypass, archaeological sites identified within road easement, and selected sites discussed in oral history interviews, in relation to historic land tenure boundaries.

Land Records by Ahupua'a (North to South):

Keauhou 2

The land of Keauhou is bounded on the north, by Kahalu'u, and on the south, by Honalo. Traditional and early historic accounts describe Keauhou and Kahalu'u as a chiefly center in the district of Kona. The number of *heiau*, chiefly residences, and stories that are told of events at Keauhou, give the area great significance in the history of the island (cf. Tomonari-Tuggle 1985; "Keauhou Cultural Resource Management Plan"). By the time of the Kamehamehas (c. 1790), the land of Keauhou came to be closely associated with the ruling family. One of the most interesting and significant accounts identifies the village at Keauhou Bay as the birth place of the still-born infant Kauikeaouli, who was revived in the waters of fronting the village. This child later became Kamehameha III. Some accounts also record that the great Hōlua of Keauhou—which existing roadways now pass through—was built on the occasion of Kauikeaouli's birth.

The lands between Keauhou 2 to Kuamo'o are of particular significance to the history of the Hawaiian Kingdom. It was on these lands that the *Kaua 'ai noa* (Free-eating Battle) was fought in 1819. In a battle between forces loyal to the young King Liholiho (Kamehameha II), and those of his elder cousin, Kekuaokalani (keeper of the ancient gods), the latter was defeated and the ancient *kapu* system overturned. Today, the battle and burial grounds of Lekeleke, with their *pū'o'a* (burial mounds) near the border of Keauhou 2 and Honalo (by which the proposed highway will pass), and similar mounds at Mā'ihi-Kuamo'o, are a striking reminder of the ancient warriors and chiefs who fought passionately for their beliefs. It is recorded, that at Lekeleke, the supporters of Liholiho (Kamehameha II) fought and gained victory for their King (cf. Reinecke ms. 1930; and interview with Wm. Paris in this study).

Today, the overall importance of the land of Keauhou to members of the Kamehameha line is still evident. The land is largely held by the Kamehameha Schools-Bishop Estate Trust.

In the Māhele of 1848, 19 claims were made for *kuleana* in Keauhou 2, by native tenants of the land. The claims include documentation of house sites both in the uplands and on the shore (situated around Keauhou Bay). None of the land awarded, appears to be situated within the present project area.

Among the notable references in the claims are those for agricultural fields and cultivated crops which included *'olonā* (*Touchardia latifolia*) , *kalo* (taro), *'uala* (sweet potatoes), coffee, oranges, *kou* trees, and *loulu* (*Pritchardia* spp.) and coconut palms; animal pens, walled enclosures; and *ala pii uka* (or *mauka-makai* trails). Many of the claimants stated that their claim had come from their elders, at least back to the time of Kamehameha I. The list below, identifies families of Keauhou 2 who claimed LCA in the Māhele.

Awardee	LCA	Acreage
5561-E & 5785	Keahua-laaumoku	1.57 ac.
5561-F	Kewalo	4.70 ac.
5561-D	Kauihana	2.88 ac.

Awardee	LCA	Acreage
5561-H	Kahilo	not found in indices
5561-I	Ki	4.85 ac.
5561-F	Kalalakoa	4.70 ac.
7366	Kukahi	0.14 ac.
7484	Keao	1.50 ac.
7738	Aoao	3.00 ac.
10260	Moa	2.00 ac.
5786 and 7482	Kapela	2.11 ac.
7320	Kahililoa	1.75 ac.
7319	Naholowaa	4.90 ac.
5903 & 10734	Paiki	5.53 ac.
7365	Keohoaeae	6.28 ac.
9698	Kapela	2.30 ac.

Today, the *ahupua'a* of Keauhou is renowned for its Hawaiian sites and its place in the history of Hawai'i. On its north, Keauhou is bounded by the *ahupua'a* of Kahalu'u which is noted as being a significant Hawaiian place; portions of both Kahalu'u and Keauhou are contained within the Kahalu'u Historic District (HRHP Site 4150).

Honalo

In 1929-30, BPBM contracted John Reinecke to conduct research on archaeological sites in Kona. His manuscript (ms. 1930) records that he was told Honalo meant "to conceal" (ms. 1930:1). Pukui, Mookini, and Elbert (1974) do not offer a translation of the name, but reports that at Honalo, there is "a *heiau* here was called Kualani (chiefly back)" (Fornander Vol. 4:588 IN Pukui et al., 1974:48). John F. Stokes, investigated the *heiau* of Kualanui in Honalo. He placed it "south of the bay on the flat between the lower government road and the sea" (Stokes and Dye 1991:86). He found no local history for it. On its northern boundary, Honalo borders Keauhou 2, while on its southern boundary it is adjacent to two *ahupua'a*, Mā'ihi and Lehu'ula.

Reinecke (ms. 1930) noted that there were numerous graves in a *mauka* section of Mā'ihi and Honalo as well as "a *hālua* (Site 85; SIHP 1753) about 14'-15' wide and 2' above surface, roughly paved running down within 100' of the shore so that athletes could leap into the water after their slide, and extending 1,000' *mauka* (Reinecke, 1930 Part 5:10,11).

Nāluahine Ka'ōpua, an elderly Hawaiian historian and descendant of native families of Kona, recorded that by the 1950s, the inland boundary of Honalo was at a point on the *mauka* side of Teshima's store (IN Kelsey and Kekahuna Ms.). Kualanui Point on the ocean, is the northern shoreward boundary of Honalo. In the wooded mid-section of Honalo is a water hole named, Kapapakaukeana (Boundary Comm. Testimony). Lekeleke is on the boundary of Honalo and Keauhou. Komomoku is the name of a *pali* on *mauka* boundary of Honalo and Keauhou.

In Alexander's map of Keauhou 2, (c.1885) Honalo is described as government land covered with *kukui* nut trees. The entire *ahupua'a* was designated as government land with twelve *kuleana* ranging in size from 0.30 acre to 3 acres awarded to claimants. These LCA include:

Awardee	LCA	Acreage
Kawahaaiai	7965	3.00 ac.
Keliinohokaha	7958	1.59 ac.
Kunpuu	5249	1.25 ac.
Kukea	7963	2.10 ac.
Lumihai	9918	3.0 ac.
Pinao	7979	0.30 ac.
Poka	7978	1.20 ac.
Heleaole	3965	0.50 ac.
Kaanehe	7961	2.00 ac.
Kahalio	7960	3.40 ac.
Kaiahauli	7962	1.92 ac.
Kuanuuanu	7959	not awarded
Kahaialii	7964	3.40 ac.

Agricultural land use information is present for three of these awards (7962, 7965, 7963). For LCA 7962, an award of slightly under 2 acres, "19 taro and potato *kihapai*;" for LCA 7965, an award of only half an acre, "4 taro *kihapai*...3 taro *kihapai*...[1] taro *kihapai*;" and for LCA 7963 an award of slightly more than 2 acres, "35 taro and potato *kihapai*." Four of the awards (7960, 9188, 8575, and 7958) included coastal lots. Their presence in association with inland lots and residences indicates that there were *mauka-makai* trail accesses in Honalo. Such accesses would also include various features such as trails, resting places, trail shrines and other sites which are recorded as having occurred with native use of the land (cf. TMK 7-9-05).

A letter found in the State Archives' Public Instruction letter file, dated, 18 January 1862, notes that Honalo school had 32 pupils, and in 6 months, there was an increase to 47 pupils. There was also a Catholic school situated at Honalo, *makai* of the present-day Māmalahoa Highway.

Another reference to Honalo, found in the Hawai'i State Archives' Land Index is a letter (March 22, 1879) from Henry N. Greenwell (HNG) to the Minister of the Interior. In it Greenwell states that a remnant of Honalo was leased to Dr. Trusseau and transferred to H.N. Greenwell for $105 a year. *Figure 5*, Register Map No. 1281 (ca. 1891) also shows several Government Land Grants were awarded in Honalo. They are:

Grantee	Grant	Acreage
Poka	1594	40 ac.
J.N. Travis	1595	175 ac. (in the project area)
Kamochalau	1172	53 ac.
Johnson	2342	454.4 ac.
J.N. Travis	1173	70 ac.
Molale	726	50 ac.

Mā'ihi 1-2

In "Place Names of Hawai'i" readers are told that Mā'ihi was named for the wind goddess Mā'ihi-'ala-kapu-a-Lono (Fragrant sacred Mā'ihi, [child] of Lono) (Pukui et al. 1974:138). The Paris family, who are the owners of the *ahupua'a* pronounce the name as "Mai-hi." Reinecke recorded that Mā'ihi means "stripped, peeled" (1930:1).

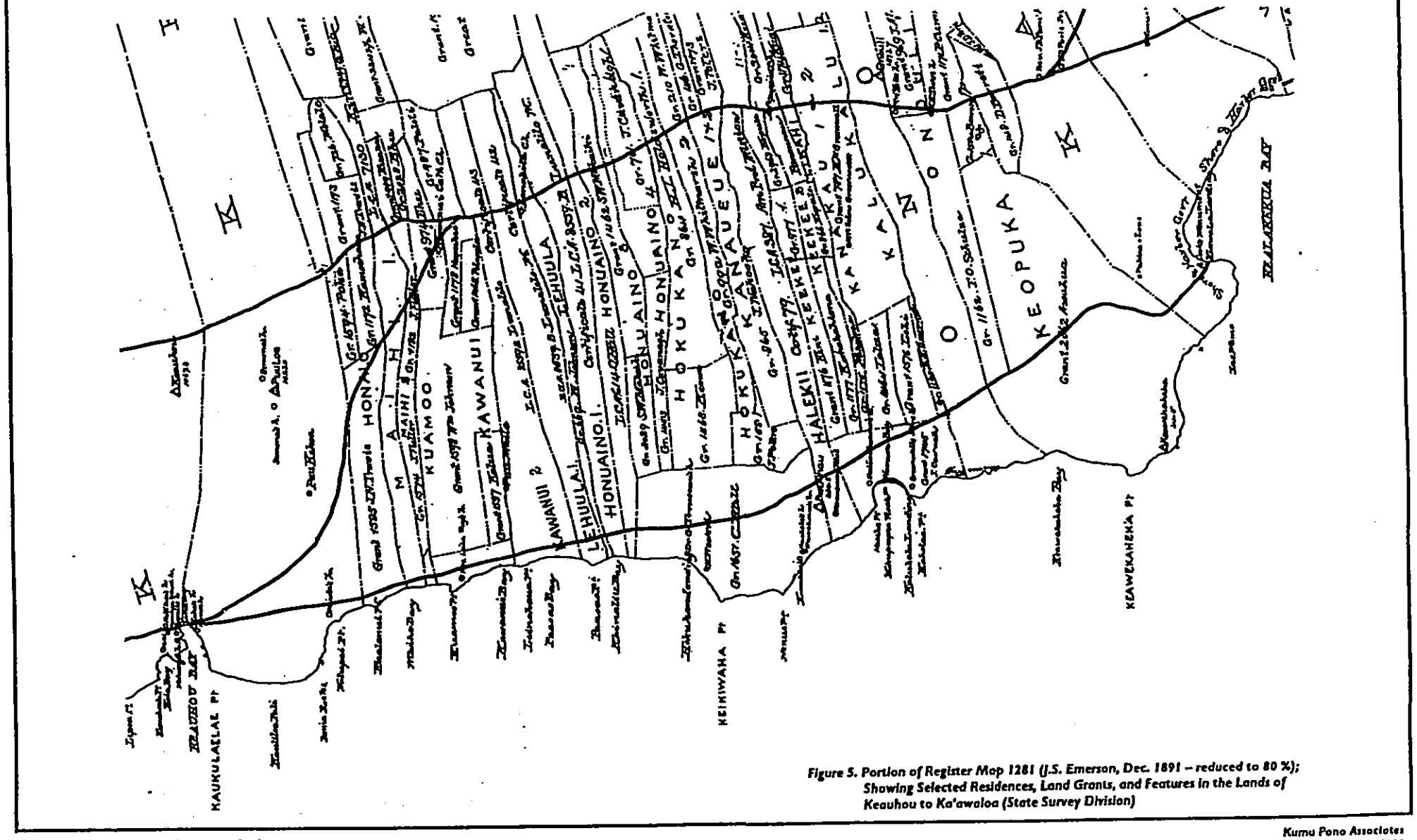

Figure 5. Portion of Register Map 1281 (J.S. Emerson, Dec. 1891 – reduced to 80 %); Showing Selected Residences, Land Grants, and Features in the Lands of Keauhou to Ka'awaloa (State Survey Division)

Mā'ihi borders Kuamo'o on the south, and Honalo on its northern boundary. Boundary Commission testimonies (in the collection of the authors) record that Ka'ilikini, a native female resident identified "Leinakaloa" as "the name of a canoe landing on the boundary of Mā'ihi 1 and 2. A *pali* between "Koa Opelu" (an *'opelu* fishing station marker) belongs to Mā'ihi 1. Boundary at shore between Mā'ihi 1 and Honalo is at Keawakui...Mahikua is on Honalo..." (Boundary Commission Testimonies).

Ehu also testified that Leinakaloa was the boundary at the shore between Mā'ihi 1 and 2. He added that "Ancient fishing rights extend out to sea, the *opelu* belong to Maihi and the *ahi* to Keauhou...Mahikua, a cave, is the boundary between Honalo and Maihi 1, a bathing place near Kailikini's house is not on the boundary but is on Maihi. The boundary is a little on the south side from Mahikua...Leinakaloa is a place on the shore where Umi chased a chief into the sea..." (Boundary Commission Testimony Aug. 8, 1873).

There are two *heiau* that have been recorded in historic archaeological surveys within the *ahupua'a* of Mā'ihi. One is recorded as being called Mā'ihi, in Mā'ihi 1. The other, is Kekuaokalani in Mā'ihi 2. For the *heiau* called Mā'ihi, Thomas Thrum recorded that it was "...120 x 145 ft. in size; its walls in fair condition, but all internal divisions gone (Thrum 1908:43-46). In his study of 1906-1907, J.F.G. Stokes recorded the following description of Mā'ihi *heiau*:

> Located 500 feet east of the main government road...The main axis of the *heiau* is approximately north-south. It is built as an enclosure with heavy sloping walls and with benches on the outside of the east, south, and west walls....No local history was obtained on Hawai'i, but in later correspondence, it was ascertained that the *heiau* was built by Kamehameha and that the god Kuka'ilimoku was worshipped there. The size and appearance of the place suggest a *heiau* of importance, but the situation seems unsuitable for human sacrifice, which the worship of Kuka'ilimoku, the god of war, would demand (Stokes 1906:24; Stokes and Dye 1991:86).

Of Kekuaokalani *heiau*, Stokes reports that it was situated west of and adjoining the government beach road, 300 to 500 feet from the sea (Stokes and Dye 1991:86) Although Stokes found no local history for Kekuaokalani (it was used for drying nets at the time of his survey in turn of the century) he notes:

> ...it was in this locality that the last battle in support of idolatry was fought and lost. The leader around whom priests' party rallied was Kekuaokalani, and the *heiau* may have been hastily built and dedicated to ensure victory to the side of religion. While the natives of the place knew nothing of the *heiau* except the name, they did know about this battle called "Kuamo'o." It was fought between this *heiau* and Lonohelemoa Heiau. Kekuaokalani was killed were he made his last stand, just north of the latter *heiau* (Stokes and Dye 1991:89).

One of Stokes' informants for the area from Honalo to Lehu'ula was Kealoha Kahalio (probably the son of Kahalio, recipient of LCA 7960), who was born in 1836 and lived in

Honalo. Stokes wrote that is a "probability that Kekuaokalani made this locality his stronghold because the old religion had a stronger hold than elsewhere" (Stokes field notes, BPBM Archives Group 2 Box 5 #1).

An interview conducted by M.K. Pukui in the 1930s, with an elderly Hawaiian woman, Ka'aha'āina-a-ka-Haku, who was born at Mā'ihi (c. 1830) offers further details on the battle of Kekuaokalani at Kuamo'o. The account is particularly interesting as it comes from an informant whose own family witnessed the events described, and it speaks of the importance of an inland area in Mā'ihi. One of the references made, is to a *pu'uhonua* (place of sanctuary) named Kuaiaku. The *pu'uhonua* is situated at an inland section of Mā'ihi; on a *pu'u* (hill) called Pu'u Kuaiaku, and from the *pu'u*, could be seen the shore of Kuamo'o. The following interview notes were viewed in the collection of Jean Greenwell at the Kona Historical Society. Ka'aha'āina-a-ka-Haku's mother's name was:

> ...Papa'ikani'au and her father's was Ka-moku-o-Namakeha, Her grandmother was Ku-aloha, a prophetess, and her grandfather, Ku-ka-lau-o-Kanaloa.
>
> Ku-aloha was living when Kekuaokalani and his wife Manono incited war [upon] Liboliho's *ai noa* (free eating) after the *ai kapu* (*tabu* eating) ended; [Kekuaokalani and Mānono] and the god Kukailimoku were at Kuamo'o, Kona, Hawaii.
>
> There at Ma'ihi is the *puuhonua* Kuaiaku. From its top can be seen the seasbore of Kuamo'o. Kualoha saw the people fleeing in every direction from the battle at the seashore; she went to the top of this Pu'u Kuaiaku and called out to the people coming, "E, don't go to the hills or the forests or you will die; come with me. This is your refuge, and you will escape through me." The people turned back at her (Kualoha's) call...When the people were assembled Kualoha said, "*Auhea oukou*, get ready food and fish; cook a lot of food–taro, sweet potatoes, yams, [and] *kalua* many pigs against hunger."
>
> From where Kualoha was, she could see the canoes from everywhere coming up to the seas of Kuamoo and Ma'ihi. In the evening the warriors came up to Ma'ihi and came to where Kualoha was seen...After the death of the chief Kekuaokalani, his body was mistreated. In the darkness of night certain of his own people came and took the body away, and hid it well... The burial place has never been found. He died at Na-hau-o-Ma'ihi (The *hau* trees of Ma'ihi)... (ms. Pukui)

In c. 1930, Reinecke recorded the following descriptions of the two recorded *heiau* and other sites within the *ahupua'a*:

> Site 79: Many graves noted in *mauka* section of Maihi.
>
> Site 72. "At the gate in the wall between Kuamo'o and Maihi 1, or very near it, according to Mr. Johnson of Kainaliu, the rebel Kekuaokalani and his wife were killed in the great battle, which terminated about Lonohelemoa Heiau.

On a *pahoehoe* knob 1/2 way between Waipuhi and Kuamoo - Maihi wall, a platform 16 x 12, this is a possible fishing *heiau*.

Site 76: In front of the windmill in Maihi 2 is a mark in the lava, about 125' long, sinuous and bearing a striking resemblance to the tail of an eel. According to Mr. Kahalioumi (of Keauhou), the legend connected with this mark is the obvious one that a man, pursued by his enemies, changed himself into a great eel and wriggled into the sea, leaving this trace behind. Hence the place is called *Waipuhi*...(1930 Part 5:10).

During the Māhele, Mā'ihi was originally awarded to chiefess Miriam Kekau'ōnohi, but then commuted to the King (Interior Dept. Index Land Matters Doc. 391). However, the *ahupua'a* was later awarded to chief Kinimaka (LCA 7130) (Native Testimony Vol. 10:161). Kinimaka's Land Claim 7130 is included in Royal Patent 5693 and is noted in the Māhele Book for Mā'ihi (Minister of Interior Office, 13 Oct. 1852 A.G. Thurston). Kinimaka later commuted Mā'ihi to the Government in exchange for fee simple title for some of his other holdings in Kona (Interior Dept. 1851 April 14).

It appears that no *kuleana* were awarded to native tenants in the lands of Mā'ihi. An early map of the vicinity (*Figure 5*–Reg. Map No.1281), does identify the following grants as being awarded in Mā'ihi:

Grantee	Grant	Acreage
J. Fuller	1574	50 ac. (crossed by the bypass easement)
J. Fuller	1182	40 ac.
Ehu	2028	44 ac.
Kuakea	989	25.5 ac
W. Johnson	2342 ½	125.75 ac.

Kuamo'o 1-3

Reinecke (ms. 1930) recorded that Kuamo'o means "a narrow path." Place Names of Hawai'i provides the literal translation, "backbone" (Pukui et al. 1974:119). Kuamo'o borders Mā'ihi on the north and Kawanui on the south. The *mauka* boundary between Kawanui and Kuamo'o is the stone wall between Teshima's restaurant and the Daifukuji Church (J. Greenwell personal notes).

As noted in several areas in preceding sections of this study, one of the most significant aspects of Kuamo'o's history comes from the period of Kekuaokalani's religious rebellion against the young King, Liholiho, in 1819. Fairly detailed documentation on the battle and subsequent burials at Kuamo'o is presented in this study (cf. section titled "Battle of Kuamo'o" and documentation for the land of Mā'ihi). One additional citation is recorded here, from the journal of Tahitian missionary, Toketa (n.d. [c. 1822-1838]). On a journey to Kuamo'o, Toketa reported:

> I went sightseeing (*maka'ika'i*) where I came upon Kaniho. He showed where Kekuaokalani had been killed. It was in a hollow near the path (Barrere and Sahlins 1979:32).

Lonohelemoa *heiau* is located in Kuamo'o 1. Stokes places it 200 to 300 feet east of the government beach road. Although he gave a detailed physical description of Lonohelemoa, he was unable to secure any history (Stokes and Dye 1991:89). Reinecke's information on Lonohelemoa is found in the citation provided under Mā'ihi: "Site 72. At the gate in the wall between Kuamo'o and Maihi 1... which terminated about Lonohelemoa Heiau."

During the Māhele the entire *ahupua'a* of Kuamo'o was awarded to Kealakai (LCA 703, Indices 1929:482). However, in testimony, Kealakai claims, "I enter my claim for Kuamoo, an *ahupuaa* in Kona, Hawaii, received from the King (Claim 8610 "Not awarded" IN Barrere 1994:303). A letter by Kealakai to the Minister of the Interior asks if his 'land in Kuamo'o, Kona has been sold (Interior Dept. Doc. 144). Additional records from the State Archives Land Files record:

> Kuamo'o 2
> Interior Dept. Doc. No. 374
> In list showing that the above land in Kona Hawaii belongs to Kamehameha.
>
> Interior Dept. Doc. No. 375
> In list showing that the above *ahupuaa* in Kona was set to Kamehameha III, in the division made between Leleiohoku and the King.
>
> Interior Dept. 1843
> List showing that the above land in Kona, Hawaii is one of the lands released. It being the custom during Kuakini's administration, possession of land went to the King for 1 year & the succeeding year possession went to Kuakini.
>
> Interior Dept. 1854 Nov. 23
> In letter from J. Fuller to the Minister of Interior (Young) forwarding a report which is attached, showing that 49 acres in Kawainui [i.e. Kawanui] 1 & in the above place as one piece, had been sold to Wm. Johnson & 454 ½ acres in Honalo. Maihi 2 & said Kuamoo in the other piece, sold to the same party is awaiting for the approval of the Privy Council (Grant 1598).
>
> Interior Dept. 1897 Dec. 29
> Superintendent of Public Works to Minister or Interior
> Enclosing deed for right of way, duly signed and acknowledged from Huia (w) in the above tract.

As a result of archaeological field work conducted as a part of the EIS for this project, one ancient residence complex (Site 21247), containing six features, was identified within the project area (Robins et al. 1999). Subsequently, the bypass easement was realigned to avoid impacting the complex (Robins et al. 1999 – Appendix A). None of the archival information reviewed as a part of this study could be directly associated with this site, though Billy Paris discusses his visiting the site with field archaeologists in his oral history interview.

Kawanui 1-2

Kawanui (also transcribe in error as "Kawainui" on certain historic land records), is recorded as meaning "Big leaping [diving] place" (Pukui et al., 1974:99). Its northern boundary is Kuamo'o and its southern, Lehu'ula, just north of Pā'ao'ao Point. Billy Paris gives the name "Awa-ka-lepa" as that of the canoe landing at Kawanui (cf. interview with Wm. Billy Paris in this study).

Historic studies identify one *heiau* in the coastal region of Kawanui I. It is Pū'o'a *heiau*, and is located "between the government road and the sea, the latter being 250 feet distant (Stokes and Dye 1991:89). Reinecke (ms. 1930) suggested that it was used as a fishing *heiau*.

During the Māhele, a third of Kawanui was awarded to William Charles Lunalilo (King Lunalilo was the son of Charles Kana'ina and Kekāuluohi) in LCA 8559-B for 380 acres. In the documents of Lunalilo Estate and Land Matters (State Archives, M.94) it is recorded that "...Kawanui Iki - 343 acres; Lehu'ula Nui - 306 acres; Honua'ino Nui - 275 acres...are fine valuable lands near the estates of Hall and Johnson in Kona and *have quite a number of natives...*" (emphasis added). As a result of the Māhele, a number of *kuleana* were awarded to native tenants. Among those parcels are:

Kawanui 1

Awardee	LCA	Acreage
Kahaleko	5561-L	0.50 ac.
Kahoseae	7332	1.41 ac.
Ninauiwi	10369	2.50 ac.
Pelapela	10723	1.28 ac.

Kawanui 2

Awardee	LCA	Acreage
Iliksualoha	7496	1.30 ac.
Kahaleola	7399	1.07 ac.
Kaiwi	7348	1.20 ac.
Kekahunanui	7347	0.40 ac.
Keohoaese	7332	1.41 ac.
Keohokalole	7349	0.26 ac.
Molale	10292	1.40 ac.
Pumoku	10733	0.49 ac.

House lots are referenced in eight of the above claims: LCA 5561-L, 10369, 10723, 7399, 7348, 7349, 10292 (two house lots are cited in this claim, one in Haleololi *ili* and Kapukalua *ili*), and 10733. TMK 7-9-06 identifies Molale's parcel number 2 (LCA 10292:2) and Kahaleola's parcel (LCA 7399:2) as being just *mauka* of the old coastal trail from Ka'awaloa to Keaubou. As in other *ahupua'a* associated with the overall study area, the association of *makai* lots with inland parcels indicates that there were *mauka-makai* trails in the vicinity. Such trails would logically be associated with various native sites that may still be present. Agricultural activities were referenced in only three of the claims. They include cultivation of: taro in LCA 10723; coffee in LCA 7399 (Molale); and potatoes in LCA 10733.

Of particular interest to the discussion of coastal residence in Kawanui is the record that accompanies Land Grant 1652 to Wm. Johnson, of November 30, 1854. The map (*Figure 6*) that accompanies the grant record identifies at least eight house sites *mauka* of the Ka'awaloa-Keauhou "Public Road," near the boundary of Kawanui 1 & 2, and also identifies the "Great Wall" (Pa Kuakini) as the *mauka* boundary of the parcel. Boundary references cited in text and on the map include:

> A part of Kawanui 1 and Kuamoo below the Great Wall...
> ...2. [on the south from the sea to]: A coconut tree;
> 3. boundary through Ho'olapa's house;
> 4. boundary along the ancient boundary of Kawanui 2
> 5. [*mauka* boundary]: along the Great Wall...
> 9 & 10. along the boundary of Maihi 2 to road... to sea...
> ...Containing 49 acres (Grant 1652 Nov. 30, 1854 - Bureau of Conveyances)

Wm. Johnson also received other land in upland Kawanui:

> Privy Council Vol. 8:191
> Resolution confirming the sale of 280 ½ acres of the above lands to W. Johnson.

Additional land records for these *ahupua'a* include the following:

> Kawainui 1
> Interior Dept. 1852 April 27
> Letter by H.M. Lyman
> ...Of these I enclose the following surveys-C.R. Sampson.
>
> Surveyed by Dr. Pelhm. This was made a long time ago, and includes the harbor. The harbor is not very great, and cannot be used when there is much wind, but it is a good place to keep canoes. Sampson wishes to make a pigpen of it, and tear down the canoe houses...
>
> Kawainui 2
> Interior Dept. 1866 April 26
> In report by J. H. Kalaibcana showing that the above *ahupuaa* belongs to Kanaina.
>
> Kawainui
> In letter from H.N. Greenwell....Thompson and Norton have been stripping that bark off the *koa* trees of the above *ahupuaa*.

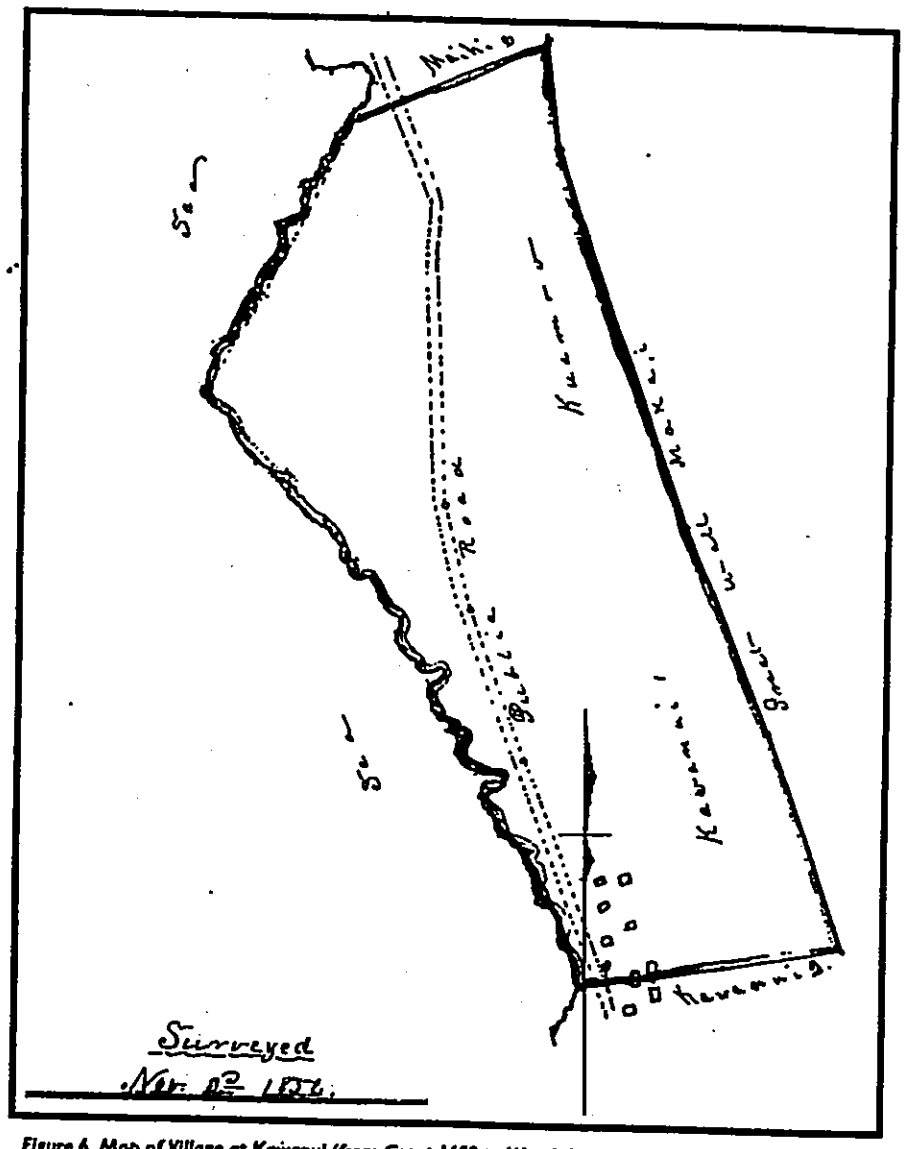

Figure 6. Map of Village at Kawanui (from Grant 1652 to Wm. Johnson; 1854)

Lehu'ula 1-2

In "Place Names of Hawai'i," Lehu'ula is translated as "red ashes (Pukui 1974). The northern boundary of Lehu'ula is Kawanui and Honua'ino is on the south. Boundary Commission Testimonies also record that Lehu'ula nui has ancient fishing rights that extend out to the sea. Register Map 1281 (*Figure 5*) identifies one of the features in Lehu'ula 2 as the "Great Walled Lot" which is located within Grant 193 to William Johnson (cf. TMK 7-9-02-15). This lot is called the "*Pa Nui*" and is bounded on the south by Waihou (cf. interview with Wm. Billy Paris in this study). Paris reported that Kamehameha I had the first cattle brought by Vancouver in 1793 held in this paddock. The lot is nearly 500 acres. As early as c. 1822, Toketa, a Tahitian missionary and companion of the *ali'i*, reported on Kāināliu as a source of beef — "...beef arrived for us from 'Amala, who had butchered it at Kainaliu..." (Journal of Toketa, c. 1822-1838).

Among the cultural resources recorded for the land of Lehu'ula is the Old Kona Trail from Moku'āweoweo which passes through Waihou (see Paris transcript in *Appendix 1*). Another site is the *heiau* 'Ukanipō or 'U'ukanipō in Lehu'ula 1. Stokes places this *heiau* about 300 feet east of the government beach road (Stokes and Dye 1991:93). Although he found no local history at the time of his survey, he cites Rev. Ellis who states that it was dedicated to 'Ukanipō, a shark, to which abundant offerings were made at various times by the people along the coast (Ellis 1825:73). In his study of sites in Kona, Reinecke (ms. 1930) described 'Ukanipō:

> On the hill 50' south of Uukanipo cave, remains of a platform, perhaps a fishing *heiau*. Back of this 2 or 3 nondescript heaps and a *puoa*... Site 71 - A beautiful cave in the shore, which Mr. Kahalioumi of Keauhou says was the haunt of the shark-god Uukanipo (1930 Part 5:6, 9).

Lehu'ula nui was awarded to William Charles Lunalilo during the Māhele (LCA 8559-B). However, three *kuleana* awards were also given out:

Awardee	LCA	Area
Kaholua	5562	0.10 ac.
Pepehu	7986	1.50 ac.
Aa	8006	0.17 ac.

Kaholua claims a house lot in Lehu'ula 1 while Pepehu described agricultural activities, including four taro and two coffee *kihāpai* (gardens) in addition to a house lot in Lehu'ula 2.

Selected citations from the Land Index of the State Archives present an overview of the changing ownership of land within the *ahupua'a*:

> Dole's Collection Doc. #17
> In list showing that the above land, in Kona Hema, Hawaii were leased to Kanaina for a term of 5 years at $100 - from the Lunalilo Estate, & c.

Interior Dept. Doc. No. 314
In list of lands, showing that Royal Patent 7454, was issued to Lunalilo, by name only on Land Claim No. 8559-B, on above land in Kona.

Interior Dept. 1854 Sept. 28
Chas. Kanaina to Minister of Interior: That the above place was sold by the Government to a foreigner, who is in possession of Kamehameha I plantation lot in Kainaliu, called Kahakuai. Has brought this matter up before the Privy Council & it was voted that said land was his.

Interior Dept. 1873
In report by the Commissioner of Boundaries (Hoapili) showing that $3 had been paid to the witnesses who testified at the hearing on the settlement of the boundaries of a piece of land in the above place belonging to Lunalilo.

Lehuula nui
Interior Dept. Doc. No. 374
In list showing that the above land in Kona belongs to Kamehameha.

Lehuula iki
Interior Dept. Doc. No. 375
In list showing that the above *ahupuaa* in Kona Hawaii was set to WM. P. Leleioboku in the division made between the King and Leleioboku.

Interior Dept. 1848 May 18
Communication by S.P. Kalama directing Namauu by order of the legislature that the above *ahupuaa* be awarded to the rightful owner.

Interior Dept. Bk.2:558 1850 March 7
In letter of the Minister of Interior (Goodale) to W. Johnson that his application for 250 acres of land in Lebuula iki will be granted, upon his agreeing to accept conditions...

Interior Dept. 1871 May 19
Greenwell to Minister of Interior. In letter from H.N. Greenwell....Thompson and Norton have been stripping the bark off the koa trees of the above *ahupuaa*.

Lehuula 1
Interior Dept. 1866 April 25
In report by J.H. Kalaiheana showing that the above *ahupuaa* belongs to Kanaina.

Lehuula 2
Interior Dept. 1866 April 25
In report by J.H. Kalaiheana showing that the above *ahupuaa* belongs to the Government has been sold.

Honua'ino 1-4
In Place Names of Hawai'i (1974), readers learn that one interpretation of the name "Honua-'ino" is "Bad Land." The name was reportedly given because Honua'ino was the only land in this region of Kona without a canoe landing (Pukui et al. 1974:51). However, local lore tells us that one of the important canoe landings of Honua'ino is the place known as Kā-i-nā-liu (cf. interview with Billy Paris in this study). Today, there is confusion about the name and location of Kāināliu. Up through the middle to late 1800s, the original village of Kāināliu was a place along the coast, fronting the canoe landing and resting spot (see *Figure 4*). As the Hawaiian population declined, and a western-style land ownership and market-based system replaced native subsistence practices, the small village was abandoned. The new village along the Māmalahoa Highway, in cooler upland Honua'ino, became known as Kāināliu.

Generally, except for the shoreline frontage which is *pāhoehoe* lava, Honua'ino has a good soil terrain, conducive to agricultural and ranching activities. By the time of the Māhele (1848), the *ahupua'a* of Honua'ino was divided into four separate units (1-4). Land awards of the Māhele record the following claims for land in Honua'ino:

Honua'ino

Awardee	LCA	Area
V. Kamamalu	7713	405 Ahp (Ap. 8)
Kaoena	8523-D	0.45 ac.
Kuula	5563	1.42 ac.
Lono	5992	3.30 ac.
Puolo	6150-C	1.10 ac.

Honua'ino iki

Awardee	LCA	Area
Hall, Charles	614	248.80 ac.

Honua'ino nui

Awardee	LCA	Area
Lunalilo, Wm.	8559-B	262 ac.

Honua'ino 1

Awardee	LCA	Area
Ahia	6042	0.81 ac.
Kaaoaokapu	5561-G	0.37 ac.
Keawe	7190	2.06 ac.

Honua'ino 1

Awardee	LCA	Area
Keohookahaku	8523-E	1.40 ac.
Keohokui	7347-B	1.25 ac.
Naohelo	5523	1 ac.

Honua'ino 2

Awardee	LCA	Area
Martin, J.	3659	4.70 ac.

Honua'ino 3

Awardee	LCA	Area
Kaawaehina	5561-C	1.70 ac.
Kekua	5561	1.24 ac.
Kukaueli	5561-BB	2.40 ac.
Maeoho	10138	0.75 ac.

Honua'ino 4

Awardee	LCA	Area
Aheakalani	5564	2 ac.
Kanakaole	7901	2 ac.
Nohopaa	6150	1.89 ac.

Honua'ino 'Ililoa

Awardee	LCA	Area
Aheakalani	5564	2 ac.

It appears that at least five of the LCA awarded, had lots on, or near the shore of Honua'ino (LCA 3659 to Martin, 5561-BB:2 to Kukaueli, 5561-C to Kaawaehina, 5992:1 to Lono, and 614 to Hall). Three of the awards were to individuals with Hawaiian surnames and two were to foreigners. The "*Alanui Aupuni*" or government road, is mentioned as the *mauka* boundary of several of the coastal parcels. Additionally, several of these *kuleana* claims, as well as the remainder of those identified as being awarded in Honua'ino, included upland lots and agricultural land use.

The upland agricultural lots were located at an elevation range from about 1400 to 1550 feet above sea level. It appears that the two LCA (6150C and 10138) that did not have references to house lots were for upland parcels only, with no corresponding coastal house lot identified in Honua'ino. Land use data for 6150-C indicates that on approximately 1.1 acres, there were "10 *kihapai*" of "taro and potatoes." This lot was located just *makai* of the present-day Māmalahoa Highway at about the 1,400 foot elevation. For LCA 10138, also at the same general elevation as LCA 6150-C, the claimant listed "5 taro and potato *kihapai*" being grown on a .75 acre parcel.

The concept of shore to inland *'ili* is reinforced by LCA records of Honua'ino 3, with additional information, suggesting that the *'ili* were further broken down into "*mo'o*" which were also long narrow strips of land that ran *mauka-makai*. In describing the land area for LCA 5561C (to Kaawaehina) the claimant states that there is a "section of Kukuipalaoa *'ili*, a *moo* and a house lot."

Data for LCA 5992 (to Lono) indicate two lots, with the house lot located at the coast (shown on TMK maps) and an upland parcel which is not shown on maps. The data for LCA 7901 (a lot claimed in Honua'ino 1) indicates that in Honua'ino 4, the claimant also has a single upland lot of some 2 acres. Also at Honua'ino 4, Lono (LCA 5992) was awarded a coastal house lot with a corresponding upland agricultural lot. The occurrence of both coastal and inland lots in individual claims indicates that there were *mauka-makai* trail accesses in Honua'ino. Such accesses would also include various features such as trails, resting places, trail shrines and other sites which are recorded as having occurred with native use of the land (cf. TMK: 7-9-06 and 7-9-12).

Hōkūkano 1-2

Pukui et al. (1974) records that the name Hōkū-kano commemorated the star (*hōkū*) "Pōkano" (1974:47) Hōkūkano 1 and 2 have broad shoreline frontage, and extend *mauka* beyond the forest zone and into the saddle region between Hualālai and Mauna Loa. The land is bounded by Honua'ino on the north and Kanāueue on the south. The broad shoreline frontage of Hōkūkano is the seaward extent of the *pāhoehoe* flow which forms a delta-like fan, with low cliffs of *pāhoehoe* shelves, allowing for relatively easy access to the ocean. Between the shoreline and the Kuakini Wall (at about the 200 foot elevation and 3,000 feet inland of the shore), the *pāhoehoe* flow is relatively level, though there are numerous *pu'u* and tumuli rising from the flats. This undulating backshore *pāhoehoe* area is referred to as the "Hokukano Flats" (Reinecke ms. 1930). *Mauka* and north of the *pāhoehoe* flow in Hōkūkano there is a fairly rich soil resource.

The *ahupua'a* of Hōkūkano 1 and 2 were retsined as government land, but also contained some 26 *kuleana* awarded as a part of the Māhele. The LCA records for the 26 claims include references to house lots in 16 claims and agricultural parcels for seven claimants. Both historic maps and TMK maps depict a cluster of 17 upland *'āpana* (parcels), with only two parcels at the coast. However, data associated with the LCA claims clearly indicate that the portion of coastal Hōkūkano—north of Keikiwaha Point, and south of Honua'ino *ahupua'a*—as the location of the coastal house lots claimed, and referred to as Hōkūkano Village. The following LCA were claimed in Hōkūkano:

Hōkūkano

Awardee	LCA	Area
Kaikushine	9425	0.40 ac.
Kama	9428-D	1.40 ac.
Mamalu	9421	0.14 ac.
Hōkūkano		
Paia	1059-B	1.50 ac.
Ualoko	9418	0.30 ac.

Hōkūkano 1

Awardee	LCA	Area
Hikiaoao	7740	0.50 ac.
Kapaaku	8157-F	2 ac.
Kapohaku	7731	2.65 ac.
Keawe	9419	1.35 ac.
Keawekaapali or Kauhikaapali	9428-F	2.40 ac.
Kukele	9423	0.65 ac.
Lono	7277-D	2.30 ac.
Lupea	7739	3.56 ac.
Naai	9414	1.50 ac.
Napela	10444	0.94 ac.
Poka	9420	0.20 ac.

Hōkūkano 2

Awardee	LCA	Area
Kahana	9413	3.10 ac.
Kauhimahi	9428-E	1.20 ac.
Keawe	8157-B	1.10 ac.
Keliikapaole	9428	1.20 ac.
Kuaha	9428-C	0.80 ac.
Kuahuia	9424	0.72 ac.
Kukahi	9427	1.60 ac.
Nahuewai	8157-O	4.80 ac.
Ukaka	9416	1.68 ac.

The clustered upland *kuleana* parcels of Hōkūkano are actually situated in two distinct groupings. There is a group of eight *kuleana* which form a long (*mauka-makai* or east-west) narrow (north-south) strip extending from approximately the 400 foot to 1,550 foot elevation. The second grouping of nine parcels is situated in a wider north-south band but at a narrower elevational range of the 1,400 to 1,550 foot elevation. The LCA records do not provide any descriptions of agricultural activities within the long narrow *mauka-makai* strip. However, for LCAs (e.g., LCAs 7739 and 9414) in the elevational band between 1,400 and 1,550 feet above sea level, taro, sweet potatoes and *lau hala* are mentioned as the primary crops.

LCA 7739 to Lupea, describes what is believed to be a typical record land use in Central Kona in the mid-1800s. Two sections or *'āpana* were awarded with LCA 7739, both in the *'ili* of Kaneanau. Total acreage for the award was 3.56 acres. A house lot awarded on the coast encompassed approximately 0.6 acres, and the upland lot was approximately 2.9 acres. The upland lot is situated at the 1,400 foot elevation, and agricultural activities included "4 *mala* [dryland gardens) of taro, 4 *mala* of sweet potatoes, 2 *lau hala* trees. 1 *kihapai* (dryland garden) (Kua is the cultivator) with 3 *mala* taro, 7 *mala* sweet potatoes" (N.T. Vol. 8:723 & N.R. Vol. 8:508).

The practice of having a coastal house lot—providing access to fisheries—with a corresponding upland agricultural lot is clearly portrayed for LCA 7739. Other agricultural lots also recorded diversified subsistence-oriented crops, with elevation (i.e. coolness and moisture) being important supporting factors. The record for Lupea's claim also indicates that the *'ili* included resources that extended from mountain to the shore, as both of the parcels in LCA 7739 were within the *'ili* of Kaneanau. Another interesting aspect of the LCA data for Hōkūkano is that the *'ili* of "Kainaliu" is mentioned, in three separate LCAs of Hōkūkano 1, as the location of both upland and coastal lots.

The occurrence of both coastal and inland lots in Hōkūkano means that there would also have *mauka-makai* trails by which the native residents traveled from one elevational zone to another. As such, a variety of sites may have occurred within the zone crossed by the present project area corridor. Among these sites would be trails, resting places, and trail-side shrines etc., all of which are recorded as occurring along trails around the island of Hawai'i.

Land Grants

Hōkūkano, like the other project area *ahupua'a* was sold in parcels by the Hawaiian Government as land grants. As with most grants, no specific land use documentation for the grant parcels has been found to date. The survey map which accompanied Grant 1651 depicts the entire *makai* portion of Hōkūkano (that is the section below the Kuakini Wall), as well as the *makai* portions of Honua'ino 3 and 4 and Kanāueue (*Figure 7*). The housing clusters shown include some 16 houses and a school in "Hokukano Village" north of Keikiwaha Pt. which is outside the project area. The school house in Hōkūkano Village is depicted as being in the LCA 7739, awarded to Lupea. The other housing cluster shown is much smaller and includes what appears to be four houses or walled lots just north of Pu'u Ohau.

Based on LCA data, it is presumed that this cluster depicts the Kanāueue coastal house lots at what is presently called "Coconut Beach." The map with Grant 1651 also depicts a "tomb" near the summit of Pu'u Ohau. "Kamalama's Tomb"[4] is identified on Register Map 1281, and is reportedly the burial site of King Kalākaua's grandmother (cf. *Figure 5* and the interview with Curtis Tyler). The maps also depict a "public road" or the shoreline "*Alanui aupuni*," and adjoining land grants.

By the c, 1880s, the land grants of Hōkūkano were consolidated by H.N. Greenwell, and used primarily for livestock pasturage. H.N. Greenwell and, prior to him, Henry Weeks and Dr. George Trousseau raised sheep in land holdings at higher elevations in Hōkūkano and Keauhou. The wool and various upland resources were transported via *mauka-makai* trails to landings at Kalukalu (by H.N. Greenwell) and Hōkūkano Village (by G. Trousseau and H. Weeks). To this day, the small landing at Hōkūkano Village is still called *Awa Hanale Wiki* or Henry Weeks Landing. The old *mauka-makai* trail, known as the "Trousseau Road" descends along the Lehu'ula 2-Honua'ino 1 boundary to the shore and then cuts south to the Trousseau-Weeks Residence and *Awa Hanale Wiki* (see *Figure 4*; and interview with Helen Kina'u Weeks and Curtis Tyler III in this study).

Kanāueue 1-2

Ka-nāueue may be literally translated as "The rotating" or "The shaking," and is said to have been named for a chief (Pukui et al. 1974:84). Kanāueue is the southernmost *ahupua'a* in the district of North Kona. The coastal boundaries of this *ahupua'a* are unclear, as most historic maps and records either depict no shoreline frontage (it being superseded by Hōkūkano) or a relatively narrow shoreline stretching immediately north of Pu'u Ohau (cf. TMK: 7-9-12 & 8-1-04). The area fronting this land, is generally covered by *pāhoehoe* lava flows.

Historic records post-dating the Māhele indicate that the shoreline frontage of Kanāueue consisted of low *pāhoehoe* lava with a back shore sand deposit. The sandy shoreline is historically known as "Coconut Beach" (*Figure 8, TMK: 8-1-04*).

[4] The tomb is depicted on the map of Grant 1651 and on Reg. Map 1281. Kingdom surveyor, J.S. Emerson's Register Book No. 255:135 (November 14, 1883), includes survey notes of Pu'u Ohau; he specifically states "Grave atop hill, Kalakaua's grandmother," who is referred to by two names – one is Kamae (AKA Kamaekalani) and the other is Kamalama; both names are cited in the Emerson texts (in the collection of *Kumu Pono Associates*).

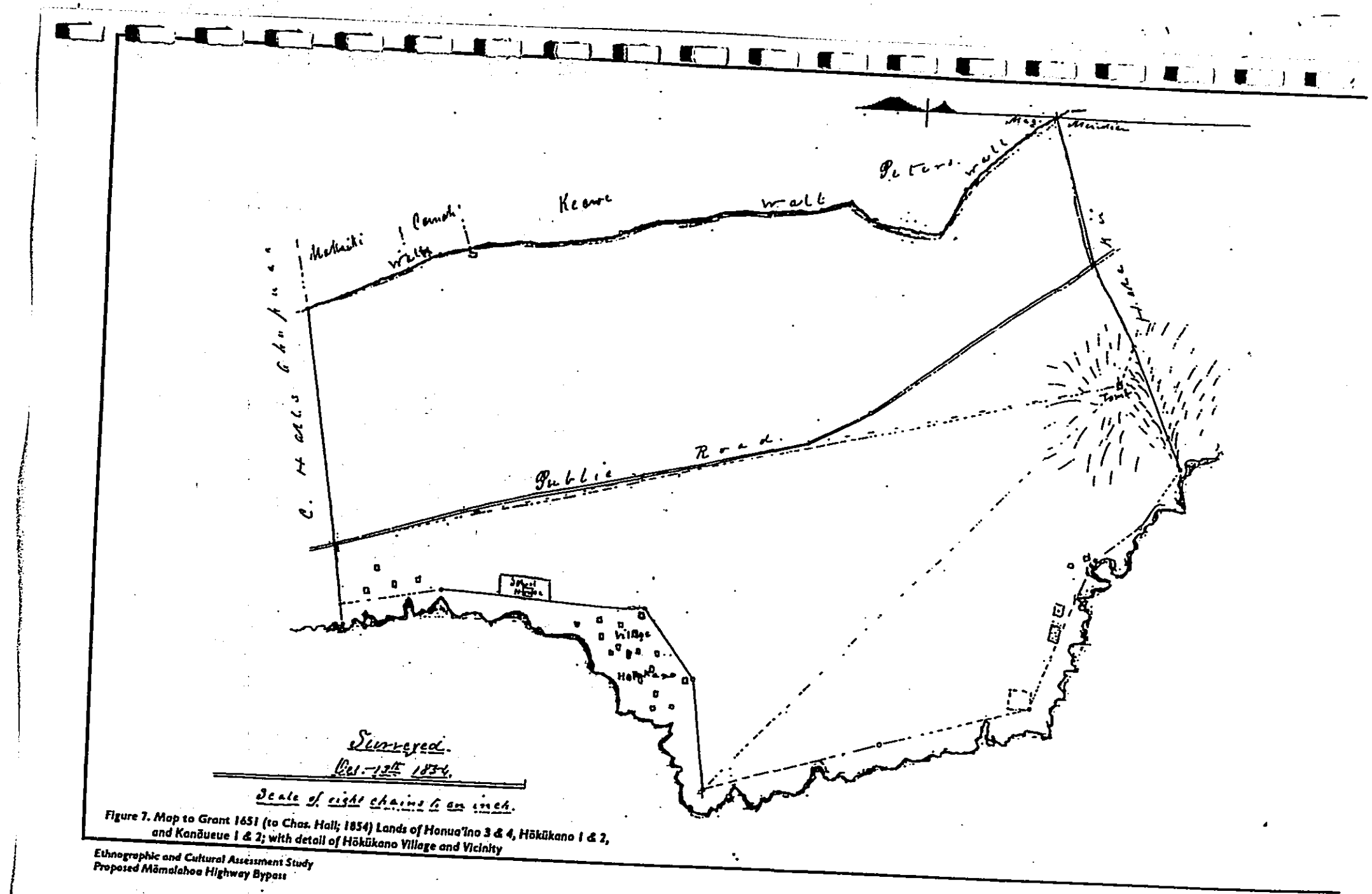

Figure 7. Map to Grant 1651 (to Chas. Hall; 1854) Lands of Honua'ino 3 & 4, Hōkūkano 1 & 2, and Kanāueue 1 & 2; with detail of Hōkūkano Village and Vicinity

Kanāueue was retained as government land at the time of the Māhele with six *kuleana* awarded to claimants. House lots are mentioned for all six *kuleana*: three in the *'ili* of Kioi; two house lots in the *'ili* of Pu'ekahi; and one in the *'ili* of Paepaehaniu. The lot of LCA 9415 (to Kaaloakauhi), located in the *'ili* of Kioi is identified as being at the 1,500 foot elevation, just *makai* of the present-day Māmalahoa Highway. Maps depict adjoining, small unmarked parcels next to LCA 9415, it is possible that these were adjacent *kuleana*. There was no clear record of the presence of coastal zone lots, and no record of the types of crops that were being grown by the native tenants.

Historic maps for this region of North and South Kona (e.g. Grant 1651 of 1854 and Emerson Register Map 1281) indicate that the coastal house lots were north of Pu'u Ohau. While there is apparently no record of coastal *kuleana* with corresponding upland parcels, it is likely that there was a pattern of coastal house lots (access to fisheries) and upland lots to support agricultural endeavors in Kanāueue. As in other *ahupua'a* of the overall study area, it is likely that *mauka-makai* trails and a variety of native sites may have occurred within the zone crossed by the proposed highway corridor.

Land Grants

Most of Kanāueue was sold by the Hawaiian Government as Land Grants in the period shortly after the Māhele. This includes three relatively large grants, with two of them (Grants 146 and 173) above the "*Mauka* Road" (i.e., present-day Māmalahoa Highway) and a large single grant (No. 865 to Nakookoo) below Māmalahoa Highway, extending *makai* to approximately the 350 foot elevation. Land use information is not recorded in these grants. Like neighboring *ahupua'a*, Kanāueue came under the ownership of H.N. Greenwell by the late 1800s.

Haleki'i

Haleki'i is translated as meaning "Image house" (Pukui et al, 1974:37). It is the northernmost *ahupua'a* of the district of South Kona. The *ahupua'a* of Haleki'i includes the southern half of Pu'u Ohau, with the northern side being situated below Kanāueue. The *mauka* portion of Haleki'i, is generally made up of the *pāhoehoe* lava flow which roughly bisects the project area. *Pāhoehoe* lava covers Haleki'i, from roughly the highest point of the project area (about the 1350 foot elevation.), to approximately the 400 foot elevation. Below the 400 ft. elevation to the base of Pu'u Ohau, the terrain includes large soil areas with *pāhoehoe* lava fingers extending off the edge of the flow.

The entire *ahupua'a* was awarded, under LCA 387, to the American Board of Commissioners for Foreign Missions (ABCFM). Haleki'i was but one of many land holdings throughout Hawai'i awarded under LCA 387 to the ABCFM. No individual *kuleana* were listed as being awarded within Haleki'i. Land use data is generally absent though there is some indication that portions of Haleki'i were used to grow crops for subsistence and additional income for the Mission.

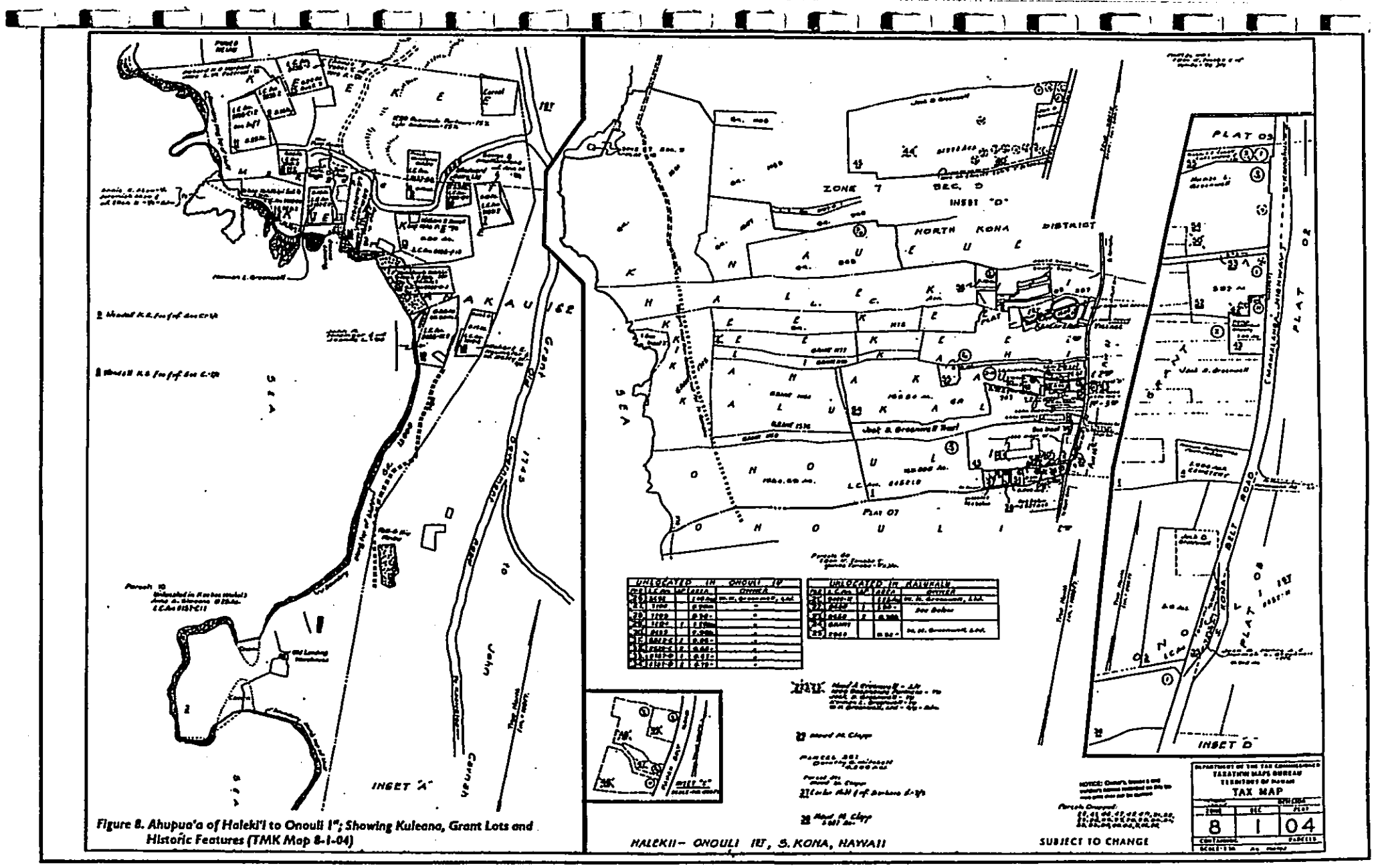

Figure 8. Ahupua'a of Haleki'i to Onouli 1st; Showing Kuleana, Grant Lots and Historic Features (TMK Map 8-1-04)

Though the *ahupua'a* was granted to the ABCFM under LCA 387 by 1856, the Rev. John D. Paris & wife are listed as "grantors" of the 300+ acres of Haleki'i to Henry Smith (deed of Nov. 20, 1856, Dec. 15, 1856; Bk. 8:345). In 1871 T.H. Martin Smith and wife sold the 300+ acres of Haleki'i, inclusive of fishing rights, to H.N. Greenwell for the sum of $300. Though specific land use information for grant-related activities is unclear, the sale of the bulk of the *ahupua'a* to H.N. Greenwell in the 1870s represents the further consolidation of Greenwell's land holdings and is generally related to expanding cattle operations.

Ke'eke'e 1-2

Ke'eke'e may be interpretively translated as meaning "Crooked" or "Fault" (cf. *ke'e*; Pukui & Elbert 1971:131). This may be a reflection on the boundary that distinguishes the North from the South Kona districts. Nāwāwā Bay, the canoe landing of Ke'eke'e, and the associated village are located in Ke'eke'e. Nāwāwā reportedly refers to the "roar, din or noise" made by the boulders, along the rocky beach, during high surf (J. Greenwell, Kona Historical Society Boat Tour Narrative).

The *ahupua'a* of Ke'eke'e 1 and 2 were also government lands, but, there were a number of *kuleana* awarded to claimants as well. Eleven of the LCA included house lots at Nāwāwā Bay, and six included upland lots (*Figure 8, TMK:8-1-04*). The largest concentration of upland lots are five parcels at elevations between 1,200 to 1,400 feet above sea level, slightly lower than the upland lots of Kanakau, Kalukalu and Onouli. Of the remaining four upland lots, one (LCA 8445:6) is located at approximately the 1,500 foot elevation within Kanakau 1 and three are presumed to be located at about the 1,550 foot elevation within Ke'eke'e 1. Only for LCA 8157 (to Kuapehu), included a record of agricultural resources. LCA 8157, *'āpana* 1, consisting of approximately 1.8 acres between the 1,200 to 1,400 foot elevation contained "2 taro *mala* [dryland gardens] and 1 gourd *mala*."

The LCA data for the *ahupua'a* of Ke'eke'e, Kalukalu, Kanakau, and 'Ilikahi provide evidence that Nāwāwā Bay was the focal point of permanent habitation of all four *ahupua'a*. Though upland agricultural lots were awarded in each of the individual *ahupua'a*, Nāwāwā Bay was the focal point of coastal dwellings for these *ahupua'a*. Twelve LCA are identified on TMK:8-1-04, as being situated at Nāwāwā Bay, they are:

Awardee	LCA	Primary *Ahupua'a*
Kaiwaiwa	7035:2	Kanakau
Kamahele	7197:2	Kanakau
Kaiaino	7212:2	Kalukalu
Kalamaia	8157-BB	Keekee
Kamakahiona	8157-C:2	Keekee 2
Kamahesiku	8157-E:2	Kanakau
Kuluiki	8455-C:2	Keekee
Ialua	8455-F:2	Kanakau
Makauwaa	8455-G:1	Keekee
Makole	8455-H:2	Kanakau
Nawai	8455-I	Keekee
Paiwa	9753-B:2	Keekee 2

As in other *ahupua'a* of the overall study area, it is likely that *mauka-makai* trails and a variety of native sites may have occurred within the zone crossed by the proposed highway corridor.

Nāwāwā Village

The coastal village at Nāwāwā was a thriving community during the mid 1800s. Rev. Forbes notes in his journal on Oct. 25, 1843, that be preached at Nāwāwā and that there were 44 church members at Onouli and Nāwāwā. Chester Lyman, while walking from Kealakekua to Kailua in 1846, made the following observations and referenced the hill (Pu'u Ohau):

> ...it gave me an opportunity to pass for a few miles through a new region of country and especially by the old crater on the coast. The road which is most of the way a very fair one for horses, passes just in the rear of this hill [Pu'u Ohau]... Just south of the hill is the village of Nawawa and on the north side of it that of Hokukano... (Lyman 1924:142).

A description of a village referred to as "Hauhauha" by Samuel Hill, may very well be Nāwāwā. This description by Hill was made ten years after Lyman's visit:

> Traveling by foot from Kaawaloa to Kailua- At about 3 miles the village of Hauhauha. About half dozen huts. Whole population about 80 men women and children. They ask for water found it to be the greatest of the wants of our hosts, and to procure which they were obliged to send two miles up the elevated county in the rear of them (Hill 1856:188).

Hill also described a conversation with an old woman at the village. The woman said that in the old days the villagers might have eaten the travelers in time of scarcity. The woman also discussed the plight of women in the old days. Their dwelling had been placed at 30 to 40 yards from the point of a piece of land projecting from the bottom of a broad rising vale, lying open to the sea at a distance of about 1/2 a mile (*op.cit.* 186:191).

Nāwāwā School

The school at Nāwāwā is the subject of various letters in Public Instruction files of the State Archives. Some of these communications provide us with an indication of the population of the coastal communities of South Kona, including Nāwāwā. A letter of July 13, 1864, from Papa'ula (school overseer) to Low, we learn, "expenses of the school building at Nawawa have been paid. The school buildings are fine...Nawawa, Napo'opo'o, [and] Ke'ei are furnished with chairs." A letter to Fornander from the teacher G.W. Kini, dated Nov. 6, 1866 states that there is a population of 71 regular students, 76 students altogether. "The students and I bought a clock for our school. We got a ringing clock for $10. The students are very happy that they have this. Our school begins at 9:00 a.m. and ends at 1:30 in the afternoon." Kini also requested 50 feet of lumber for chairs to be sent to Ka'awaloa Harbor.

Grants

Most of *ahupua'a* of Ke'eke'e was retained as Government land at the time of the Māhele. Like the other government *ahupua'a* in the project area, the land was parceled up and sold in grants by the Hawaiian Government, thus, land use information on the grants is absent. By the late 1800s sugar cane and coffee are indicated as the primary crops in the uplands. The

sugar and coffee were grown in walled lots, presumably to exclude foraging livestock. By the early twentieth century a sugar cane-related railroad was extended through Ke'eke'e to Keōpuka with the mill terminus located at Wai'aha, above Kailua Village.

Cane was grown in Ke'eke'e, above the railroad grade (above the 700 foot elevation) transported down hill to the railroad cars, then onto the mill.

'Ilikahi

'Ilikahi is a small narrow *ahupua'a* which apparently does not extend down to the coast. The *ahupua'a* ends at the Pā Kuakini, or Kuakini Wall (at about the 250 foot elevation). Based on his work in Kona, Reinecke translated 'Ili-kahi as "scraped bark or skin," (Reinecke ms. 1930). Records record that 'Ilikahi became Government land after Keōhokalole "surrendered" it. One *kuleana*, LCA 9428-G awarded to Keli'iwahanuku, is recorded in 'Ilikahi. The *kuleana* was a single 1-acre parcel at about the 1,500 foot elevation, with no land use data recorded. Interestingly, Emerson's Register Map 1281 from 1891 (*Figure 5*, Reg. Map 1281) also identifies a single house site as "Kealiiwahanuku's H" at Nāwāwā Bay. Thus, one can posit that there was a relationship between inland agricultural and residence use, and coastal residence and access to marine fisheries. As in other *ahupua'a* of the overall study area, it is likely that *mauka-makai* trails and a variety of native sites may have occurred within the zone crossed by the proposed bypass road.

Land Grants

Four grants (No. 866, 927, 1174, & 1175) were originally sold by the Government in the mid 1800s, covering all of 'Ilikahi. No land use information was recorded with these grants but in the late 1800s the Thompsons were leasing Grant 927 to rancher, Manuel De Gouveia. Grant 927 in 'Ilikahi adjoins Grant 1862 in Kanakau, both of which were being leased by the Thompsons for Manuel De Gouveia's dairy operations. This represents a pattern where in the mid to late 1800s, land grants were changing hands and being consolidated into larger holdings conducive to market-oriented activities, especially the livestock industry.

Kanakau 1-2

As a result of work conducted with local informants in 1929-1930, J.E. Reinecke translated Kanakau as meaning "to get sight of one's face." Little other place name information is available. The *ahupua'a* of Kanakau has two divisions and ocean frontage, inclusive of the southern side of Nāwāwā, thus having good access to the ocean fishery. Kanakau was originally claimed by chiefess Keohokalole, but was commuted to the Government, in payment for other lands retained by her. Nine individual *kuleana* were claimed in Kanakau, several of which had corresponding coastal house lots and upland agricultural lots. As noted above in the documentation for Ke'eke'e, several of the claimants of Kanakau also received *makai* lots overlooking Nāwāwā Bay (*Figure 8*, TMK:8-1-04). Thus, it is likely that *mauka-makai* trails and a variety of native sites may have occurred within the zone crossed by the proposed bypass road.

The agricultural parcels or *'āpana* were situated at an elevational range of about 1,450 to 1,550 feet. Five of the nine *kuleana* record agricultural land use data for their upland parcels. Crops mentioned include: two *māla* of taro (LCA 7212, *'āpana* 1); four taro *kihāpai* (for LCA 8455F, *'āpana* 1), three potato and gourd *kihāpai* (LCA 8455F, *'āpana* 2); ten taro and

potato *kihāpai* (LCA 7035, *'āpana* 1); one *māla* of taro and 1 of sweet potatoes (LCA 7197, *'āpana* 1); and ten taro and potato *kihāpai* (LCA 7035). All but one of these upland *'āpana* were at the 1,450 to 1,550 foot elevational level. LCA 9753B, *'āpana* 1, located in Ke'eke'e *ahupua'a* is located at a slightly lower elevation, of about 1,200 to 1,400 feet above sea level.

Like Kalukalu to the south, most of Kanakau, *mauka* of the Kuakini Wall was purchased from the Government by H.N. Greenwell in Grant 787. However, immediately *mauka* of the wall was Grant 1464 (*Figure 8*) to Ialua, who also claimed and received LCA 8455 with a coastal house (in Ke'eke'e) and an upland lot (in Kanakau). *Makai* of the wall was Grant 1745 to J. Cavanah. Records of land use at the time of sale of the grants was only recorded for Grant 787 to H.N. Greenwell (described with the records for the Kalukalu). *Mauka* of Māmalahoa Highway, beyond the upper limit of Grant 787 (at about the 1,600 foot elevation), was Grant 862, originally sold to Kapule in 1855. Subsequently, Kapule sold the land to William and Mary Thompson, who by the late 1800s were leasing the land to Portuguese dairy operator Manuel De Gouveia.

Kalukalu 1-2

Kalukalu 1 & 2 are situated on the south of Kanakau. There is no translation given for the name Kalukalu, though there is a type of grass which is known by that name, and it may indicate that the *kalukalu* once grew there (Pukui 1974:79). Kalukalu *ahupua'a*, like Onouli which is its southern neighbor, has an ocean frontage of relatively high cliffs.

Kalukalu was listed as government land with seven individual *kuleana* awarded (Indices 1929). Data from the seven *kuleana* and available maps indicate that the upland *'āpana* were at an elevational range of 1,400 to 1,550 feet above sea level and corresponding coastal house lots were at Nāwāwā Bay where there was access to the marine fisheries (*Figure 8;* see also the section on Ke'eke'e above). As with other *ahupua'a* in the project area, it is likely that *mauka-makai* trails and a variety of native sites may have occurred within the zone crossed by the proposed bypass road. Four of the seven *kuleana* have data that mention house lots, three of which were in Ke'eke'e (LCA 10750, 8157E, & 7197) and one which was in Kanakau (LCA 7212).

Cultivated crops were mentioned in the records of four LCA (10750, 7197, 9650 and 7212). LCA 10750, which lists three *'āpana* (*'āpana* 3, a house lot at Ke'eke'e), indicates that *'āpana* 1 contained "4 taro and coffee *kihāpai*," and *'āpana* 2 contained "5 taro *kihāpai* and a coffee *kihāpai*." LCA 7197, *'āpana* 1 contained "1 *māla* of taro and 1 of sweet potatoes." There were no specific *'āpana* references for LCA 9650, but "taro, sweet potatoes, gourds" are mentioned. LCA 7212; *'āpana* 1 contained "2 *māla* of taro." The elevation range of these upland *'āpana*, is between 1,400 and 1,550 feet above sea level.

Additional land use information concerning the mid-1800s for Kalukalu is found in association with a *mauka-makai* government road way. Documentation indicates that the road was constructed to exploit timber resources well *mauka* of the project area, though the road is crossed by the proposed bypass corridor. Among the historic references to this road are the following narratives:

> ...in the year 1834 a road was made by the government, by the order of Gov. Adams from the beach at Kalukalu into the forests *mauka*...and prisoners were employed in the formation of it....(Jarves 1855:21).
>
> "Mr. Paris has commenced services in English at the church *makai* of the road on Kalukalu" (H.N. Greenwell Journal, 1869).

This road is also the subject of a letter to Messrs. George Sherman, John L. Young, William Thompson and others, from the Interior Department, dated Nov. 18, 1871:

> ...the receipt of your petition concerning the road in Kona leading from Kalukalu *makai* to the forest *mauka*, and to say that no disputes between private individuals can have any effect on a Public Road and that the appropriation made by the legislature for roads are intended for the purpose of making new roads, building bridges, and making such repairs as the local road tax is insufficient for. In this case his Ex. is of the opinion that whatever repairs are required should be done by the local road tax... (Charles Gulick, Nov. 18, 1871).

The development and use of the road way along with the development of market-based resource exploitation practices is indicative of the shift away from the native subsistence-based cultivation practices of Hawaiian residents throughout the islands at that time.

During the same time frame that the *kuleana* were being awarded (1850), most of Kalukalu (the area *mauka* of the Kuakini Wall) was sold to H.N. Greenwell (Grants 787 and 1160) by the Hawaiian Government (*Figure 5*–Reg. Map 1281). The *makai* area (below Kuakini Wall) was sold to J. Cavanah (Grant 1745). Specific land use information is not recorded in the grant records, however, a short biographical sketch of Henry N. Greenwell, provided by the Kona Historical Society, relates some general land use data for his grant lands and subsequent land acquisitions. In 1849 Henry N. Greenwell arrived in:

> ...Honolulu and worked on Fort Street with an English import/export company. He was sent to Kona to open a store there. In 1851 King Kamehameha III began selling land to foreigners. He purchased and planted them in oranges. After 15 years, the oranges caught a blight and Henry went on a trip around the world, stopping in the West Indies where he met a lime planter's daughter, married her and brought her back in 1868, along with a new variety of oranges found in Brazil.
>
> Henry Greenwell is remembered for cultivating oranges, putting "Kona Coffee" on the European Market in the 1870s and for his temper. He raised sheep for wool at the higher elevations of his land after the civil war, dairies in the 1880s and later began extensive cattle ranching. He and his wife had 10 children. Henry N. Greenwell died in 1891 and his eldest son William H. Greenwell, born in 1869, inherited his estate which later became the W.H. Greenwell Ranch.

Mrs. Jean Greenwell's narrative for the Kona Historical Society's boat trip along this coast offers additional land use information.

> On the point, opposite of Nawawa, is the site of an old ware house built by Henry Nicholas Greenwell to store wool and goods for his store *mauka*. Mr. Greenwell arrived in Hawaii in 1850 shortly after the *Mahele* and the act which enabled foreigners to buy land had passed. He was able to purchase several pieces of property along this coast from the government. He later bought Dr. Trousseau's lease on the sheep ranch *mauka*. When Mr. Greenwell was raising sheep he used the same cart road Dr. Trousseau had made to Kainaliu, but continued the road further on to ship his wool from this point. There is a large cave under the point here on the south side. The small boat from the steamer would come in to the cave and the wool would be lowered into it. This of course was a very ticklish operation. The tide had to be high and the sea calm. This point of land acquired the name of Wool's Landing. It is located on the *ahupuaa* of Kalukalu. The old Greenwell Store, which today serves as the Kona Historical Society's headquarters, is also on the land of Kalukalu and was one of the first pieces of land purchased by Mr. Greenwell.

In Grant 2910 (to John Yates) *mauka* of Māmalahoa Highway, Bureau of Conveyances records indicate that by 1865 there were 50 acres of sugar cane and associated buildings. This parcel also became part of the Greenwell's land holdings by the late 1800s.

Onouli 1-2

The *ahupua'a* of Onouli (translated "Food for the goddess Uli" – Kelsey and Kekahuna ms. 1950) is fronted by relatively high cliffs (reaching from 50 to 100 feet above the sea). Onouli 1 (approximately 1,200 acres), was awarded (LCA 8452:11) to chiefess Keohokalole (mother of King Kalākaua and Queen Liliu'okalani). Additionally, there were eleven *kuleana* recorded in Onouli 1-2. These include 10 to individuals with Hawaiian surnames, and one to a foreigner:

Awardee	LCA	Area
Makaiwi	9277-F	0.20 ac.
Kapoi	7204	1.30 ac.
Kalawaiaiki	8157-D	1.42 ac.
Kanapi	8455	0.90 ac.
Kukahuna	7198	not recorded in indices
Atkins, James	925	not recorded in indices
Kaana	8523-C	0.30 ac.
Kahananui	7203	1.90 ac.
Kuniola	6985	1.40 ac.
Naiuiakolea	5692	1.40 ac.
Panaunau	9771	1.21 ac.

There is very little documentation on the locations of most of these *kuleana*. However, based on maps and LCA testimonies for adjacent *ahupua'a*, it appears that the upland *'āpana* were situated at near the 1,300 to 1,500 foot elevation, just *makai* of the present-day Māmalahoa Highway. House lots are mentioned for three of the eight *kuleana* with only two (LCA Nos. 7204 and 8157-D) indicating named locations. LCA 7204 indicates that the house lot was in

"Ililoa of Onouli 2" and LCA 8157-D records that the house lot was "in Keaweloa *ili* of Onouli 1." It is unknown whether there were corresponding coastal house lots for the *kuleana*.

Three of the LCA mention a mix of crops in their claims. LCA 8455 in Onouli 1, indicates a single *'āpana* of 0.9 acres within which were "2 *māla* of taro, 3 *māla* of sweet potatoes, 2 *māla* of gourds, 1 *hala* tree, and 1 *hau* tree." Data for LCA 7198 indicates two *'āpana* containing "2 taro *kīhāpai*" and the other, a single "taro *kīhāpai*." Additional land use information for Onouli 2 comes from LCA 925 to an Englishman, James Atkins, for some 113 acres *mauka* (east) of the present-day Māmalahoa Highway. The record indicates that in 1838, " the land was uncultivated" (F.R. Oct 20, 1847). The land was forested with *koa* and *'ōhi'a*, and was given to Atkins, a carpenter, for partial payment for 100,000 shingles "for the Stone church in Kailua" (F.T. Vol. 5:58).

Timber was an important economic resource in this region, and as with J. Atkins' property, a major land use focus was clearing the existing forest of *koa* and *'ōhi'a* trees. Further evidence of timber's importance in the region are found in communications regarding the Kalukalu Road that was in the adjacent *ahupua'a* (in preceding section), and in the records for Keōpuka, below.

Keōpuka 1 and 2

Keōpuka is bordered by Onouli on the north, and by Ka'awaloa and Kealakekua Bay on the south. Pukui interprets Keōpuka as meaning, "The perforated sand," explaining that the "ō" has been shortened from "*one*," the Hawaiian word for sand (Pukui et al., 1974:109). The traditional account of Akalele (presented earlier in this study) is the only legendary reference found that specifically mentions Keōpuka.

The lands of Keōpuka 1-2 were retained by the government, and it appears that there were no LCA awarded to native claimants. Shortly after the Māhele, there were at least five Land Grants awarded to four individuals in Keōpuka (Awahua, Grant 2862; P. Cummings, Grant 1171; D. Barrett, Grants 148 & 1584; and J.D. Paris, Grant 1161) (*Figure 5*).

Grant 2862 for 739 acres was awarded to Awahua, who is thought to have been a *Konohiki* for the land (Jean Greenwell notes). He willed the parcel to Likelike and his wife. They in turn sold it to Charles Kana'ina (heir of the Kalama lands) in 1863 for $219.25 to cover debts incurred by Awahua. Kana'ina in turn sold the land back to Likelike in 1871 for the amount of $160.

H.N. Greenwell's Journal (in the collection of the Kona Historical Society), provides us with documentation of use of the roadway from Ka'awaloa to the woodlands of Keōpuka in the later 1800s. Greenwell recorded that "battens and shingles were brought up by mules from Kaawaloa for the shoemakers house being built in the woodland of Keopuka" (March 7, 1885).

Like all of the lands crossed by the proposed bypass road, Keōpuka is within the "Kona Field System." Archaeologist Lloyd Soehren (1980) provided the following description of a portion of the field system in Keōpuka (TMK 8-1-07:portion 1):

> While...within the Kona Field System, the ground is generally so rough and stony that it is highly improbable that it was utilized to any extent, if at all, by the aboriginal Hawaiian farmer. Better suited land was available immediately to the north and also farther to the south in Kaawaloa (Soehren 1980:1).

Soehren does observe that despite the dominating *'a'ā* fields, trails of various construction and time periods allowed access through Keōpuka. At about the 400 foot elevation is the "old government road from Kealakekua *pali* to Kainaliu" beach, dating from c. 1840. Additionally at least seventeen sites were recorded in Keōpuka, most of them were temporary habitation complexes and shelters. Two sites (Sites 10-47-1958 and 10-47-1960) were identified as burial platforms, while two others (Sites 10-47-7727 and 10-47-7728) are foot paths across old *pāhoehoe* and *'a'ā* which lead to the top of the *pali* (Soehren 1980).

One interesting use of land in Keōpuka, *mauka* of the proposed bypass corridor, is that in 1896, Awahua's grant parcel was sold to the "Kona Vineyard." In 1982, Mrs. Jean Greenwell interviewed Joe Henriques regarding the cultivation of grapes in the area, and he recalled that a man named Cooper grew grapes in Keōpuka. The principal modern use for the *ahupua'a* has been cattle ranching by the Henriques family (J. Greenwell notes).

Ka'awaloa

Pukui translates this name as "the distant *kawa*," and explains "runners went to Puna or Waipio to get *kava* for the chiefs" (Pukui et al., 1974:61). Noted Hawaiian historian and Kona resident, Kalokuokamaile recorded that "When Keawe-nui-a-'Umi lived at Kaawaloa, he was known as the *awa* drinking chief and would send his runner to Waipio and Puna to get *awa*" (State Archives Letter File). In Judd's dictionary, *Hawaiian Language*, he translates it as "Ka awa - the harbor" (1939:18). Rev. Paris is cited as translating Ka'awaloa means "the long landing place" (Restarick 1927:18-19). Features of the *ahupua'a* include Kalaemano Point which John Papa I'i mentions when describing the canoe race of Akalele (1959:132).

I'i cites a canoe landing, "Near the harbor of Awili, where there is a narrow channel only large enough for a single canoe...(Ii 1959: 121;132). Other references to 'Awili in association with historic events include — "Kalani'opu'u returned with his warriors from Maui on January 24, 1779, he landed at Awili in Kaawaloa and stayed in Hanamua at the home of Keawe-a-Heulu" (Kamakau 1961:101); and "Cook landed with his company at Kaawaloa between Kalani'opu'u's place at Awili and Keawe-a-Heulu's at Hanamua" (ibid:102).

Like Keauhou at the northern end of the proposed bypass corridor, there are many references to Ka'awaloa in traditional and early historical accounts. The land was a place of political significance and as such is recorded as being a preferred place of the *ali'i*. Among the historical records of this land are the following citations:

> Kaahumanu deposits the bones of chiefs previously buried at Hale o Keawe and Waipio at [in] the cliffs of Kaawaloa and burned the debris (Kamakau 1961:322).

Ka'awaloa is recognized as the site of Captain James Cook's demise. Rev. William Ellis visited the cave in which the body of Captain Cook was deposited, "on being first taken from the beach."

> ...These rocks, which are entirely composed of lava, are nearly two hundred feet high, and in some parts very steep. A winding path of rather difficult ascent leads to the cave, which is situated on the face of the rocks, about half-way to the top. In front of it is a kind of ledge three or four feet wide, and immediately over it the rocks rise perpendicularly for a yard or two, but afterwards the ascent is gradual to the summit.
>
> The cave itself is of volcanic formation, and appears to have been one of those subterranean tunnels so numerous on the island, by which the volcanoes in the interior sometimes discharge their contents upon the shore. It is five feet high, and the entrance about eight or ten feet wide. The roof and sides within are of obsidian or hard vitreous lava; and along the floor it is evident that in some remote period a stream of the same kind of lava also flowed (Ellis 1979:83).

A number of *heiau* have been identified in Ka'awaloa. In c. 1815-1818 Kotzebue noted that Ka'awaloa had five *heiau* (Restarick 1927:14). Stokes searched for two *heiau* in Ka'awaloa with little success. He was unable to locate Hopupalali, reported as a *heiau* of the human sacrifice class for the god Kā'ili (Stokes and Dye 1991:94-95). He questions whether the small pens and platforms on the northern edge of the village, are that of the *heiau* Kauhi'a'ahu, as they "did not have the appearance of a *heiau*" (Stokes and Dye 1991:95).

Pukui places the *heiau* of Paikapahu in the area where the Captain Cook monument stands (1974). Stokes places this *heiau* in the *ahupua'a* of Kealakekua (Stokes and Dye 1991:95). Thrum (1908) references a *heiau* called Wa'aomalama, which is "North of Puhinaolono," the sacred place where Cook's body was said to have been burned (Thrum 1908:43-46) (*Figure 9*, HTS Plat 205). Puhinaolono or Kapuhiolono is located about one mile from the landing at Ka'awaloa on the hill and is identified as the place Cook's body was burnt (Menzies 1920:68; see also the interview with Wm. Billy Paris in this study). Literally meaning "burning of Lono" it refers to Cook who was originally mistaken for the god, it was here his body was burned and the flesh stripped from the bones, which were then taken aboard the ship (Kamakau 1961;103). Puhinaolono is at approximately the 450 elevation near the intersection of the Ka'awaloa *mauka-makai* trail and the old Government Road (Reinecke ms. 1930:196 & 202; cf. Cook's Heiau on USGS Quad-Honaunau Section, 1982). The site (at approximately the 1,280 foot elevation) is approximately 1.2 miles away from the proposed bypass corridor.

Nearer the coast there may still be seen the old *ala loa* (native trail) and the coastal government road. These routes link the landing at Ka'awaloa with the coastal villages to the north, including Kāināliu, Keaubou and Kailua.

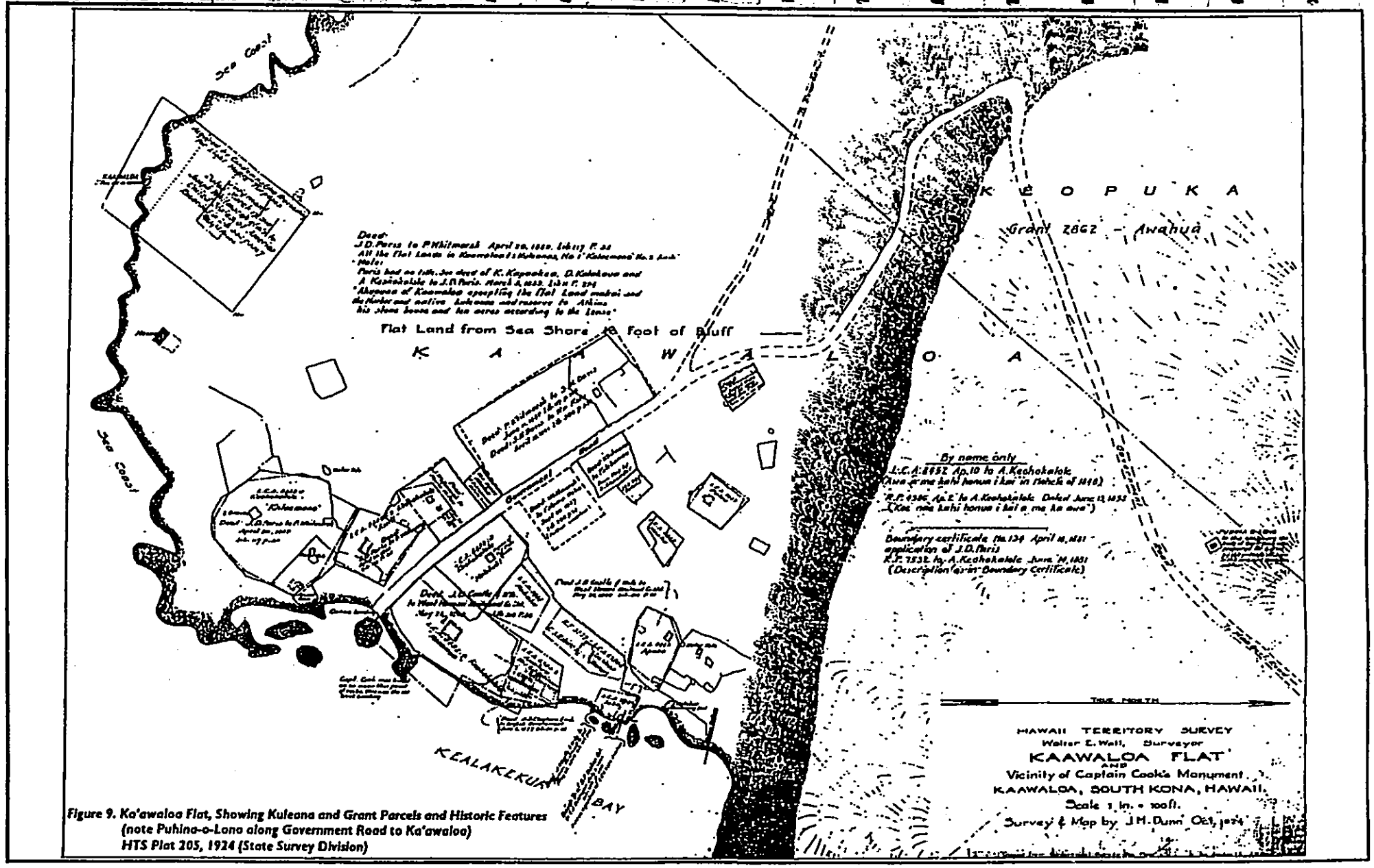

Figure 9. Ka'awaloa Flat, Showing Kuleana and Grant Parcels and Historic Features (note Puhina-o-Lono along Government Road to Ka'awaloa) HTS Plat 205, 1924 (State Survey Division)

In the Māhele of 1848, chiefess Keohokalole, received the bulk of Ka'awaloa (LCA 8452) in several parcels, the largest for 2100 acres. The other were for parcels of .75 acre, .57 acre, 1.50 acres and 1.47 acres. The shore and flat lands were retained by the Government. The area of 1.49 acre called Kuapehu was awarded to the American Board of Commissioners for Foreign Missions (LCA 7207). Several *kuleana* awards were made in Ka'awaloa, they include:

Awardee	LCA	Area
Apana	9443	0.30 ac.
Awahua	6750	0.633 ac.
Ioba	9446	0.14 ac.
Maka	9441	2.52 ac.
Nashu	9449	0.16 ac.
Nahaku	9444	0.28 ac.
Palahu	9447	0.09 ac.
Palau	9442	0.24 ac.

Agricultural land use information is present for five of these awards (LCA 9443, 6750, 9446, 9441, and 9444). For LCA 9443, there were "3 *kihapai* of taro and potato;" in LCA 6750, "Section 1 - 5 taro *kihapai*, Section 2 - 18 taro and potato *kihapai*;" in LCA 9446, "4 taro and potato *kihapai*;" in LCA 9441, "12 taro, potato and coffee *kihapai*;" and in LCA 9444, "Section 1 - 2 potato *kihapai*, Section 2 - 2 taro *kihapai*." All but one LCA (9449) identify at least one house lot in their *kuleana*.

Overview of Twentieth Century Land Use Practices

As indicated in the records above, by the time of the Māhele, Hawaiian residency and land use practices were being radically altered. By the late nineteenth century significant changes had taken place, and for many upland areas, dryland taro gave way to ranching in Kona. Additionally, the expansion of coffee-growing in North Kona was encouraged by rising prices and the sale of former Crown lands under the Provisional Government (Kelly & Barrere IN Schilt 1984:25). Although coffee prices fell in the late 1890s and sugarcane plantations expanded with U.S. annexation in 1898, coffee-growing persisted in Kona due to its adaptability to land that was too rocky for sugarcane.

In 1899, Kona's first and only sugar mill was built in Wai'aha and produced sugar until 1926. In the proposed bypass corridor, sugarcane was grown *mauka* of a railroad track that was built to support the mill. In World War II, the U.S. Army used the mill site and surrounding pasture lands as a training camp. Beach sand was trucked-in for use as tent pads and for lining (in sand bags) for machine-gun nests (Kelly & Barrere IN Schilt 1984:25).

In the early 1900s, the Kona Sugar Co., under the auspices of a number of affiliated companies, constructed an 11-mile railway line from Wai'aha, North Kona, to Keōpuka in South Kona (Site 7214). The railway was built at approximately the 700 ft. elevation.

A Centenary issue of the Honolulu Star Bulletin provides the following description of the plantation and railway in c. 1920:

> ...The cane land of the Kona Development Co. lies amidst fields of coffee. The lands cultivated by small farmers, gives employment to several hundred person... The Kona plantation [2,500 acres under cultivation in 1919] is favored by the fertility of its soil which does not make replanting at the end of two or three crops necessary. The stools of the cane continue to bear for many years. Under the management of T. Konno the planted area has increased 500 acres...
>
> ...The KDC operates a narrow gauge railway throughout its cultivated area for cane hauling. Employees: T. Uchimura, bookkeeper; T. Kudo, office Assistant; A.N. Smith, chemist; F. Sato, engineer; N. Tokunaga, sugar boiler; C. Suzuki, mill and railroad superintendent; D. Tatsuno, head *luna*; K. Sasaki, Kainaliu section timekeeper; T. Iseri, Holualoa section timekeeper; Manuel Silva & Frank Mederios, lunas; Henry deAguiar, Holualoa section luna; Y. Hatanaka, private secretary to T. Konno. (Honolulu Star-Bulletin Ltd. Honolulu April 1920:113)

Sugar cane was only grown commercially above the rail bed, where soil conditions were more favorable than in the lands below the rail bed. The Kona Sugar Co. was short-lived (ca. 1895-1926) ceasing operations in the late 1920s (Conde and Best 1973:86-91). Subsequently, the lands were returned to pasturage. Presently, the bulk of the land in the proposed bypass road easement is still exclusively used for cattle pasturage. The shoreline is almost entirely abandoned, though there are a few beach houses in the vicinity of the old Kāinālīu village area of Honua'ino, and one at Nāwāwā Bay.

Further descriptions of twentieth century land use practices is recorded in the oral history interviews and consultation records cited later in this study.

OVERVIEW OF HISTORIC ARCHAEOLOGICAL AND ETHNOGRAPHIC STUDIES

T. Thrum (1908) and J.F.G. Stokes (Stokes and Dye 1991)

By the late 1800s and around the turn of the century, a growing number of island residents, Hawaiian and non-Hawaiian alike, were growing concerned about the destruction of traditional Hawaiian sites and the rapid decline of native knowledge about those sites. *Heiau* (temples) and ceremonial sites were an area of particular interest for several writers in the islands. Thomas Thrum, historian and editor of *The Hawaiian Annual* compiled a substantial list of *heiau* and short descriptions of them. A list of *heiau* on the island of Hawai'i, with 15 *heiau* identified between Keauhou to Ka'awaloa, was published in 1908. In 1906-1907, John Stokes, an archaeologist from the Bishop Museum, traveled around the island of Hawai'i, and, with native informants in most localities, he visited *heiau* or sites of former *heiau*. Though the work was not formally published until 1991 (Stokes and Dye), it was available in manuscript form by 1919 and has served as an important resource for all subsequent archaeological surveys, including that of the proposed bypass corridor.

J. Reinecke (ms. 1930)

In 1929-1930, Bishop Museum contracted John Reinecke conduct a study of sites in the district of Kona (Reinecke ms. 1930). While Reinecke relied on the work of Thrum and Stokes, he also met with elderly native informants and other individuals who were knowledgeable about various sites in the district. Though Reinecke's work has not been formally published, it has been referenced over the years, and today, it gives us insight into certain sites and features for which no other early information is available. In some respects, Reinecke's work went further than Stokes in that he documented the occurrence of almost all sites that he came across. These sites include *heiau*, house sites, caves, burials, trails (*mauka-makai* and coastal), canoe landings, walls (e.g., *ahupua'a* boundaries and enclosures etc.), platforms, agricultural features (i.e. mounds, pits, terraces), and many other sites of undetermined use.

As a result of his survey, Reinecke recorded a minimum of 155 sites in the lands from Keauhou 2nd to Onouli (not counting 200-400 sites near the Lehu'ula and Hōkūkano shore line), and more than 250 sites in the lands of Keōpuka-Ka'awaloa. Most of the sites recorded by Reinecke, were situated on the coastal lowlands, though a few sites were located inland. These inland sites include: Site 70 in Keauhou 2nd (c. 60 ft. el.), the burial cave, Ke'ekuakapua'a; Site 85 (Site 1753) in Honalo, a *hōlua* track (extending from near sea level to the c. 150 foot elevation); Sites 58-61 in Kuamo'o (c. 150-250 ft. el.), small walls and platforms, with Site 61 being the *heiau* Lonohelemoa; and one unnumbered site in Ka'awaloa, Puhina-o-Lono, situated near the 450 elevation.

While Reinecke identifies Pubina-o-Lono on several of his maps (e.g. ms.: 196 & 202), he apparently recorded no information on the site. Though in Thrum's record (1908) for the *heiau* "Waaomalama," he reported:

> Waaomalama.....Kaawaloa, north of "Puhinaolono," the sacred place where Cook's body was said to have been burned; probably not a regular *heiau* (Thrum 1908:46).

The interview with Billy Paris in this study also includes a discussion about the site.

Kelsey and Kekahuna (ms.)

In the late 1940s, early 1950s, Theodore Kelsey and Henry Kekahuna, both of whom did occasional work with Bishop Museum, and much more work on their own, mapped and recorded sites and histories in Kona. One of their primary native guides and informants was an elderly Hawaiian gentleman by the name of Nāluahine Ka'ōpua (Nāluahine). Through their efforts, a great resource of documentation was compiled, but little new information for the project area was located in their notes (selected references are cited in text).

Table 1, below provides readers with a list of key ceremonial sites and a few other culturally significant features, that were recorded by Thrum, Stokes, and Reinecke. These are generally only sites for which they could obtain information, and the list is not exhaustive. Nearly all of the sites are situated on, or just above the coastal flats and promontories (generally, the area to which the studies were restricted). Thus, they are a significant distance *makai* (shoreward) of the proposed bypass corridor. It is noted here, that the occurrence of the ceremonial sites is indicative of the potential cultural significance that can be ascribed to native practices and associated activities of the lands in the present study area. The preceding section of this study—presenting detailed land history and residency practices—provides further documentation pertaining to the broader relationships between elevational zones of the larger study area *ahupua'a* and the neighboring region.

Table 1. List of Ceremonial and Cultural Sites Identified in Historical Archaeological Surveys (Keauhou 2nd to Ka'awaloa)

Heiau or Site *and Ahupua'a*	T. Thrum (1908)	J.F.G. Stokes (1991)	J. Reinecke (1929-1930)
Hookūkū Heiau (Keauhou 2nd)	×	×	×
Abu-a-Umi Heiau (Keauhou 2nd)	●	×	×
Lekeleke Burial Ground (Keauhou 2nd)	●	●	× (Keauhou Site 6)
Ka'ehukapua'a Burial Cave (Keauhou 2nd)	●	●	× (Keauhou Site 70)
Kualanui Heiau (Honalo)	×	×	× (Keauhou Site 1)
Mā'ihi Heiau (Mā'ihi 1)	×	×	?
Kekuaikalani Heiau (Mā'ihi 2)	×	×	× (Site 71)
Burial Site of Kekuaokalani & Mānono (near boundary of Kuamo'o-Mā'ihi)	●	× (with next site)	× (Site 72)
Lonoheleinoa Heiau (Kuamo'o 1)	×	×	× (Site 61)
Pā'o'a Heiau (Kawaaui 1)	×	×	× (Site 63)
'Ōkaipō Heiau (Lehu'ula 1)	×	×	× (Site 67)
Pahukapu Heiau (Hōlualoa 1)	×	●	?
Hoopalahuli Heiau (Hōlualoa 1)	×	×	?
Hopupalali Heiau (Kaawaloa)	×	●	?
Wa'aomalama Heiau (Kaawaloa) & Pahinaolono	×	●	× (unnumbered site)
Kauhi'a'aba Heiau (Ka'awaloa)	●	×	?

×=site recorded; ●=site not recorded; ?=unnamed *heiau* referenced

FINDINGS OF THE LIMITED ORAL HISTORY AND CONSULTATION PROGRAM FOR THE PROPOSED MĀMALAHOA HIGHWAY BYPASS

This section of the study presents readers with the historical narratives and recommendations provided by participants in the limited oral history and consultation program conducted for this phase of work. In all, the study includes oral history interview documentation from six interviewees (Wm. Billy Paris, C. Kapua Heuer, H. K. Weeks, C.T. Tyler III, L.N. Ha'ani'o-Kong, and D.K. Roy) in nine interviews and follow-up discussions. Additionally, consultation records—collected by the authors—from three individuals (J. Greenwell, T. Ide, and I. Birnie) with specific knowledge about the history and use of the study area lands are cited in the study. One additional individual contacted by Wong Smith contributed information to the study, but asked not to be identified. When the information contributed by this individual coincided with information provided by other consultation participants, it was incorporated into the report.

Further records from consultation with community members and xxx Hawaiian organizations conducted by staff of Oceanside 1250 are also cited in this part of the study. Over all, the interviews and selected consultation records demonstrate that there is continuity and time depth in the passing on and retention of various aspects of knowledge and customs of the people and lands in the study area.

Interview-Consultation Methodology

While conducting the interview and consultation program a standard format for undertaking such work (as set forth in Federal and State laws and guidelines reference at the beginning of this study) was followed. The participants were selected because they were known to have genealogical ties to past residents of the study area *ahupua'a*, or because of their knowledge about the history study area. While some of the interviews were conducted prior to initiation the present study, pertinent documentation was recorded. Subsequent to the participants being notified about the present study, they gave their permission for excerpts from larger interviews to be cited, and also added historical documentation and project specific recommendations to the narratives for this study.

During the interview/consultation discussions, historic maps of the study area were referenced, and when appropriate, the approximate location of selected sites were marked on the maps (*Figure 4* at the end of this study is a compilation of those sites). Following the recording of interview and consultation records (collected by Maly and Wong Smith), draft transcripts or expanded notes were returned to each of the participants for their review and comments. Following the review, participants then gave their permission for incorporation of the narratives in this study.

Primary Site Treatment Recommendations from Interview-Consultation Participants

While conducting the formal interview and consultation program, participants were asked their feelings about the proposed development of the bypass, and asked if they had recommendations that they would like considered in the review process. The interviewees all shared their concerns about the potential impacts of the bypass on various native Hawaiian

and historic sites. In particular, the battle fields and burial grounds of Lekeleke (in the *ahupua'a* of Keauhou) and Kuamo'o (in the *ahupua'a* of Kuamo'o) were of great concern.

All of the Hawaiian interviewees recommended that the corridor be moved a distance *mauka* (inland) of those sites and others along the alignment. It is noted here, that since collection of those recommendations, further archaeological work, and developer-landowner consultation has occurred which has resulted in the bypass being moved further inland (cf. Robins et al. 1999; and pers comm. R. Stuit, Feb. 9, 1999).

Other areas of concern and recommendations raised by interviewees and/or consultation participants included, but were not limited to:

(1) The "Kona Field System" (Site 6601). A nationally recognized feature of cultural importance; the field system represents many generations of land utilization practices—covering several environmental zones—during the periods of growth and expansion in native Hawaiian history. Large areas of the field system within the project area have been impacted by historic ranching and land clearing activities.

The present alignment has been modified in the northern section of the bypass to minimize impacts on significant features in or associated with the system.

(2) The Kona Development Company (KDC) railroad alignment (Site 7214). The KDC railway is an important facet of development and growth in the early twentieth century of Kona, associated with the development of Kona's plantations and transportation systems.

Where the corridor passes through the railroad alignment, architectural features of the alignment will be stabilized and protected.

(3) *Ala pi'i uka* (native and historic trails extending between the shore and uplands). While no evidence of any of the native and historic trails was clearly found in the 120 foot wide bypass corridor (cf. Robins et al. 1999), archival documentation and oral history interviews provide descriptions of such trails.

Because the land over which the bypass alignment crosses is privately owned, access on the *mauka-makai* (upland to shore) trails has been limited throughout this century and many of the trails destroyed. Most of the remaining *mauka-makai* accesses have been modified into ranch roads for four-wheel drive vehicles.

It is suggested that further research (both archival and oral historical) be conducted during the next phase of data recovery and preservation plan development, to further define the nature and significance of trails that may pass through the alignment.

Mr. Robert Stuit, Director of Planning for Oceanside 1250 has stated that the both sides of the entire length of the bypass alignment easement will be fenced. At appropriate locations, cross ways for ongoing ranching operations and land owner access needs will be installed (pers comm. Feb. 9, 1999); and

(4) Develop a plan for interim- and long-term protection of significant cultural resources such as caves, residences, components of field systems, and ceremonial sites once access through the study area lands is improved; and institute a program that will ensure care of preservation sites near the bypass alignment during construction.

As noted in the preceding paragraph, Oceanside 1250 will place a permanent fence along both sides of the entire length of the 120 foot wide bypass easement. Fencing will be set in place prior to initiation of construction, and construction crews will be notified of the meaning of the fencing and of the cultural significance of sites outside of the fencing (R. Stuit, pers comm. Feb. 9, 1999).

Several interviewees also suggested that there be some level of programs designed in conjunction with the highway's development that will inform the public of the importance of the cultural and historical resources—perhaps as interpretive signs—and that there be a monitoring protocol established to help minimize inappropriate use of, or impact to significant resources *makai* of the bypass.

Table 2 provides readers with a general overview of several key issues discussed, and recommendations made by the primary interviewees and consultation participants. It is likely that further work with interviewees, and consultation with appropriate native Hawaiian- and community-organizations will add important historical information and recommendations for long-term preservation actions to the record. It is suggested here, that such work be done in concert with the next phase of archaeological data recovery and mitigation work.

Table 2. Overview of Key Topics Discussed by Interviewees and Consultation Participants

Participant:	BP	JG	IB	TI	LK	HW/CT	DKR
Selected Topics:							
Knowledge of cultural sites:							
(In the project area)	yes	yes	n/a	no	no	no	no
(In adjoining lands)	yes	yes	n/a	no	yes	yes	yes
Knowledge of legendary events in region of project area	yes	yes	n/a	no	yes	yes	yes
Knowledge of historic events in the project area *ahupua'a*	yes	yes	yes	yes	yes	yes	yes

BP=Billy Paris; JG=Jean Greenwell; IB=Ian Birnie; TI=Takao Ide; LK=Lily Ha'ani'o-Kong; HW/CT=Helen Weeks & Curtis Tyler III; DKR=D. Kahelemauna Roy
n/a = not asked; • = not applicable; w/r = with reservations

Table 2. Overview of Key Topics Discussed by Interviewees and Consultation Participants (continued)

Participant:	BP	JG	IB	TI	LK	HW/CT	DKR
Knowledge of burial sites: (in the project area) (in adjoining lands)	 no yes	 no yes	 n/a n/a	 no no	 no yes	 no yes	 no yes
Knowledge of ranching and other historic land use practices in region of study area	yes	yes	yes	yes	yes	yes	yes
Feels that the proposed highway is an acceptable development	yes	no	n/a	yes	w/r	w/r	w/r
Recommends mitigative actions in conjunction with development of the highway	yes	yes	yes	•	yes	yes	yes

Overview of Historical Information Collected in the Oral History and Consultation Program

This section of the study includes a synopsis of interviews with Mr. Wm. Billy Paris, who participated in a series of detailed interviews with Maly (in 1996-1997) and a follow up interview with Maly and Wong Smith (1997). The complete released transcript of Mr. Paris' interview is included as *Appendix B-1* at the end of this study. The Paris interview also includes pertinent excerpts from an interview with his elder cousin, Mrs. Kapua Heuer. Excerpts from previously collected oral history interviews with Lily Namakaokai'a Ha'ani'o-Kong, Helen Kina'u Week, Curtis Tyler III, and D. Kahelemauna Roy (conducted by Maly), including specific discussion and recommendations for the present study area; and the records of consultation with Jean Greenwell, Ian Birnie, and Takao Ide, are included in their entirety below.

William "Billy" Johnson Hawawakaleoonamanuonakanahele Paris
(Interviews with Kepā Maly – March 7, April 24, May 15, 1996 & May 9, 1997)

William Johnson Hawawakaleoonamanuonakanahele Paris (Uncle Billy) was born in 1922, on O'ahu, at the Honolulu home of his maternal grandfather, Robert Hind. When he was three weeks old, his parents William Johnson Paris and Margaret Hind-Paris brought him home to the Paris residence of Mauna'alani at Ka'awaloa, South Kona. Uncle Billy is descended from several prominent Hawaiian and Caucasian families who have resided for several generations in the Kona and Kohala districts. Members of Uncle Billy's family have been active in Hawaiian ranching since c. 1815, when Kamehameha I first hired John Palmer Parker (Uncle Billy's great-great-great-grandfather) to hunt cattle for him. Following in the footsteps of his elders, Uncle Billy himself, has been active in managing ranching operations for most of his life. Uncle Billy is very familiar with the history of ranching in Hawai'i, and because of his love and appreciation of his Hawaiian heritage, he is also very knowledgeable

of Hawaiian history and land use practices. As a result of his background and expertise, Uncle Billy has participated in several oral history interviews with the Kona Historical Society and with the University of Hawai'i at Mānoa's Oral History Center.

The following documentation, primarily from an interview conducted on April 24, 1996 by Kepā Maly (with notes from a follow up interview on May 9, 1997), was recorded as a driving and walking tour, visiting sites from sea level at Honua'ino-Lehu'ula, to approximately the 2,500 foot elevation, at Waibou. The interview was in-part conducted to try and record some of the unique insights that Uncle Billy could share regarding the history of the lands and any significant Hawaiian sites, through which the proposed Māmalahoa Highway Bypass would cross. The interview provides readers with a rich account of the history of the lands between Keauhou to Ka'awaloa[3]. The interview is not confined to the proposed bypass road corridor, but records broader *ahupua'a* and regional practices, and provides readers with insights to the relationships between various native sites and environmental zones.

Of particular interest to the present study, in the formal interview between Paris and Maly (April 24, 1996) and subsequent notes collected during an informal interview between Paris, Maly, and Smith on May 9, 1997, Uncle Billy shared the following comments and recommendations:

> ***Changes in the Community of Kona Waena***
> As a youth, Uncle Billy recalls that in the entire Kona Waena region, there were only about 17 native Hawaiian families. It is his understanding that diseases; the arrest of followers of Ka'ona, who attempted a religious uprising; economics; cattle ranching; and later, sugar plantation operations significantly impacted the native communities. Thus, by the early 20th century, there was a deterioration—at times a purposeful destruction—of native sites, and a diminishing of the use of land-based resources and fisheries.
>
> ***A Bypass Road Needed***
> Uncle Billy feels that a new road of this nature is desperately needed, noting that when there is an accident, it can take hours before any traffic can move. Indeed, some years ago, there had been a proposal to use the Kona Development Company Railroad alignment, coming out at about where the Kuakini Highway meets Kamehameha III Road. Such an alignment made good sense and would have pulled traffic further *mauka*, and avoided the more sensitive lowlands.
>
> ***Occurrence of Hawaiian Sites***
> Because Paris family lands extend from Mā'ihi to Hōkūkano, Uncle Billy and his cousin Allen Wall have walked the proposed alignment corridor with field archaeologists from Cultural Surveys Hawaii. He feels that most of the significant Hawaiian sites are situated below the proposed highway corridor,

[3] e.g., residency, fishing, agriculture, rights-of-access, and cultural values.

and that all sites within their property have been identified. The only problematic areas he is aware of are the Lekeleke and Kuamo'o burial grounds, a habitation cave in Mā'ihi-iki (only a few hundred feet away from the corridor), and a residence complex at approximately the 400 foot elevation in Kuamo'o.

Recommendations

Uncle Billy's chief concern with the is the development of the Māmalahoa Highway Bypass Road corridor is how to protect the significant sites that will be clearly visible and more easily accessible as a result of the development.

Based on family histories recorded by Uncle Billy's father, as burial grounds, Lekeleke and Kuamo'o are sacred and represent an important part of Hawai'i's history. The elder Wm. J. Paris learned that the individuals buried at Lekeleke were those faithful to Liholiho and the *'ai noa* (setting aside of the *kapu*). The burials at Kuamo'o and above the cliff, are those of the supporters of Kekuaokalani, and the maintaining the ancient *kapu*. The actual spot where Kekuaokalani fell, is still marked by an *ahu* (cairn). The coastal sites like the *heiau* 'U'ukanipō[6] and other ceremonial sites, the habitation complexes, caves, burial sites, *ko'a*, and other features between Mā'ihi and Hōkūkano, which have been relatively isolated, will now have increased visibility and access. He acknowledges that not every site can always be preserved, but he recommends that some plan must be developed and steps taken, to monitor access and the protection of these significant cultural resources.

> As a part of this planning process, Uncle Billy recommends that educational and interpretive material be prepared and made available to residents and area users, informing them of how important the cultural sites are, and what is required when visiting them, or traveling through the various complexes. (pers. comm. May 9, 1997)

While conducting oral history interviews with Aunty Kapua Wall-Heuer (Uncle Billy's elder cousin) on May 9, 1996, and with Uncle Billy on May 15, 1996, additional information regarding shark gods of the region was recorded. Those interview transcripts and accompanying summary of discussion notes were reviewed by Uncle Billy Paris—with clarification and additions to the narratives over the period of several months. The final transcript was formally released on May 16, 1997[7]. The following narratives are excerpted from those previously released interviews:

[6] Also written, 'Ukanipō, this *heiau* is located in the *ahupua'a* of Lehu'ula, south of 'U'ukanipō cave; the *heiau* was reportedly dedicated to a shark by the same name.

[7] See Personal Release Interview Records; Interview Notes:4, at the end of the interview transcript in *Appendix B1*).

1 – The Shark God, Keōpulupulu

As a child, Kapua often heard stories about a shark god of Kona who was named Keōpulupulu. Keōpulupulu was reportedly a very large shark who traveled the waters north towards Kawaihae, and south to at least Ho'okena. Kapua notes that though she never personally saw Keōpulupulu while she was out with her father, the Kalawas, Ho'omanawanuis, or other families, she heard many stories about the shark. She recalls that the shark figured as an important part of the traditions and practices of area fishermen through the 1930s. After that, he was not seen again. It was generally believed by Kapua's elders that the disappearance of Keōpulupulu coincided with the rise of commercial fishing in Kona—non-native fishermen are thought to have killed or driven Keōpulupulu away.

Kapua's Uncles John Johnson and William Johnson Paris told her of many experiences they had with Keōpulupulu. The shark's back was covered with barnacles, *'ōpihi*, and *limu*. While they were out in their canoes, fishing, Keōpulupulu would rise up next to the canoe. The fishermen would scrape his back and clean him, and then whatever fish they had caught prior to Keōpulupulu's visit, would be fed to the great shark. After eating, Keōpulupulu would depart, and in a short while he would drive schools of *'ahi*, *aku*, or *'ōpelu* back to the fishermen, and they always went home with plenty of fish to share with the family.

While discussing the various forms and the nature of sharks, Aunty Kapua recalled that at Lehu'ula *makai* is the *heiau* that 'Ūkanipō, dedicated to a shark god. On the shore below the *heiau* is an ancient canoe landing, within a somewhat protected cove. It has been a popular swimming area for the families. Kapua recalls, though, that one of the Ho'omanawanuis was killed by a shark there, and to this day, she will not swim at the landing. She prefers the protected *kāheka* (tidal pools). Kapua's *mo'opuna* (grandchildren) will call out to her "Nana, come swim with us." She responds "You're not going to get me in there, the kahekas are fine!" (laughing) (pers. comm. May 9, 1996).

Following the interview with Aunty Kapua, Maly spoke with Uncle Billy, who recalled hearing about the shark from his father, and Sam and Hailama Ho'omanawanui *mā* (folks). His recollections were like those recorded in the notes from Aunty Kapua, though he was very pleased to learn the name of Keōpulupulu. Uncle also recalled that his family was familiar with another shark, which lived in the waters between Kauna and Kaulanamauna. The stories of this shark are much like those of Keōpulupulu (pers. comm. May 15, 1996).

2 – Kāināliu

The following narrative, recording the variations of pronunciation and meaning of Kānāliu-Kāināliu, is excerpted from the interview between Uncle Billy and Kepā Maly, on March 7, 1996 (Tape 2–Side A; Maly 1996):

BP: [looking at the 1924 Quad] Kāināliu is a spot at the ocean. Where's our area ?

He'eia Bay, we come over here...

KM: Let's see, we may not, oh, here's Kanāueue.

BP: Yes.

KM: Here's Pā'ao'ao, yes

BP: Pā'ao'ao, Well Kāināliu is right here (see *Figure 10* for sites referenced in interview).

KM: Oh, right in Honua'ino, right in the little cove there, yes.

BP: Yes, yes, that's where they used to come in, and some people say the proper name is Kānāliu. That's where they used to come in and bail the bilge.

KM: Oh, I see.

BP: Yes, of the double canoes. They would come around Keikiwaha Point. And usually, if it was rough, they'd come into the lee, here, bail the canoes out before they proceeded, or vice a versa if they were coming from the north. Before they'd go out of this area, they'd bail the canoe bilges out. So Kānāliu, or Kāināliu is here. The village was... Honua'ino Village is the proper name. Honua'ino is the name of the land, Lehu'ula, then Honua'ino...

During follow up conversations on June 4, 1996 (Paris and Maly), and May 9, 1997 (Paris, Maly and Smith), Uncle Billy added the following comments on pertaining to practices and place names:

> Lānai-o-Kauhi (sheltered porch of Kaubi). Kauhi was a chief who resided in the coastal village of Hōkūkano, he enjoyed watching the fishing canoes returning to shore with their catch of *aku, akule*, and other fish. On the rocky point that is known by the name Lānai-o-Kauhi, an open air shelter was erected so the chief could watch the canoes return to the shore (see *Figures 4 & 10*).
>
> Monohā and Palena'āina (*mauka* Lehu'ula-Keauhou, below Pūlehua) were among the last sources of good canoe logs in this area. In the early 1930s, there was a revival of canoe racing. Old Charlie Hua and Charlie Moku'ōhai went to Monohā and Palena'āina to cut logs for the canoes. I went with them when I was just a kid, and I remember that they would choose the trees, and cut them down. They'd clean off the foliage, and then leave the trees to cure for about one year. After the year was up, the *kālai wa'a* (canoe makers) went back up and roughed out the canoes, leaving the *maku'u*, knobs at the two ends of the hull. When it was time to move the canoes, ropes were tied to the *maku'u* so they could be hauled off of the mountain. In the areas where they crossed *'a'ā*, they laid out *'ōhi'a* bark, greens and ferns to cushion the hull. Another youngster and I rode on our horses at the back of the canoe, with a rope from the *maku'u* to our saddles, and each time they needed to make a turn on the trail, it was our job to pull the hull in the right direction. We hauled the canoes down the Trousseau Trail, right down here to the village,

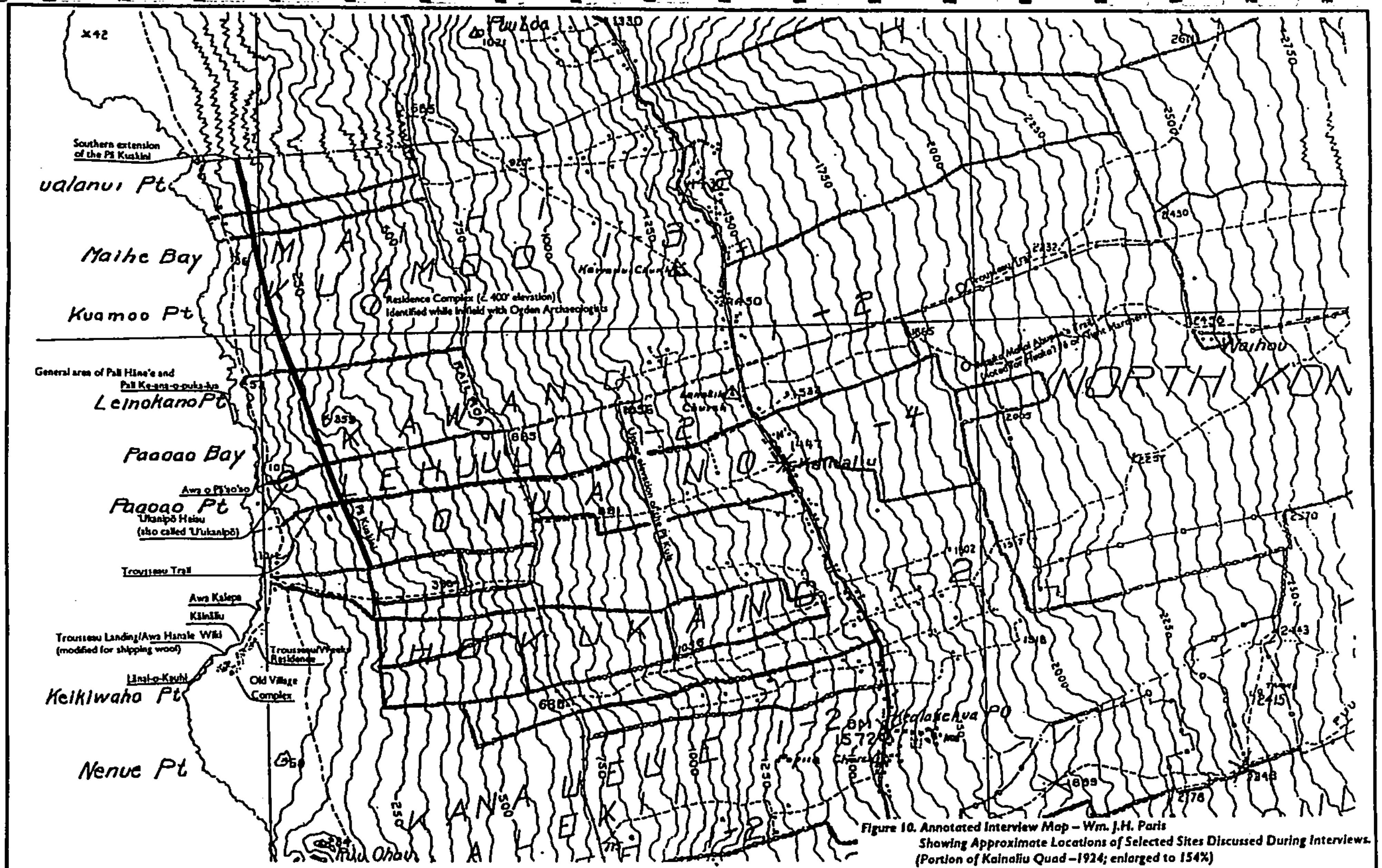

Figure 10. Annotated Interview Map – Wm. J.H. Paris
Showing Approximate Locations of Selected Sites Discussed During Interviews.
(Portion of Kainaliu Quad –1924; enlarged to 154%)

where the finishing work was done. The canoes Ka'imiloa, Kākina, and Leilani were built in this period.

Back then, there were several "mountain men," guys who lived on the mountain and harvested *koa* to ship to Honolulu. The *mauka* camps were at places like Monohā, Palena'āina, Nāhuina, and Pūlehua. There was a Medeiros who married one of the Kekā's, that lived up at Monohā. Nishihara and Susaki were among the last *koa* haulers, CQ Hop purchased most of the *koa* in Honolulu. (chuckling) Those guys would live alone up on the mountain, and when they were ready to ship to Honolulu, they'd get their money and go to Honolulu for a couple of weeks, have a great time, and come home broke. They'd go back up the mountain, and start all over again. There were a number of times when my dad would have to advance them the money just to get home.]

Ka'awaloa. It has been said that Ka'awaloa means something like "*'Awa* gotten from far away," and this was because the people of Kona had to go all the way to Puna to get their *'awa*. This isn't true. Kona always had plenty of *'awa*. Old Charley Aina always said that Ka'awaloa described the "Long, or distant canoe landing" of the area. (pers. comm. June 4, 1996)

Jean Greenwell
(Consultation with Helen Wong Smith – May 2, 1997)

Kona historian and owner of *ahupua'a* lands through which the corridor traverses, Jean Greenwell was contacted as a part of this study. She asserts that the numerous refuge caves found during the archaeological survey for the housing development by Hammatt (1995) is indicative of what may be found in the road corridor. Jean agrees with Billy Paris in citing that the warrior's belonging to Libolibo and Kalanimōkū are buried at the Lekeleke battle field within the *ahupua'a* of Keauhou. Kekuaokalani and his warriors are buried in the *ahupua'a* of Kuamo'o (pers. comm. May 2, 1997).

The following expanded notes highlight key thoughts and recommendations of Jean Greenwell:

> Jean spoke of a petroglyph cave (Site 16570) in Halekiʻi which was covered in Hal Hammatt's 1997 report[8]. Jean also noted that *makai* of the railroad berm are many caves at the same elevation as this cave. Many of these caves were used as refuge caves. *Mauka* of the railroad was an area of intensive activities associated with use of the Kona Field System.
>
> In discussing the railroad and it's associated sugar operations, it was reinforced that transport was by donkey. Jean pointed out that the only sugar flume was in Wai'aha. In keeping with her historical notes[9], Jean notes that sugar cultivation occurred *mauka* of the now abandoned train berm. Sugar was hand cultivated, so this activity would have had limited impact on the land.
>
> Following the suspension of sugar cultivation, the Greenwells utilized the area for cattle ranching. During this period, her late husband, Norman, would purposely create new jeep trails for ranching operations, instead of following historic trails. Only the *makai* areas were bulldozed due to the *pānini* which was extremely thick there. He would chain drag during the wet season so the *pānini* would rot instead of seeding. Indeed, one of the paddocks in Halekiʻi was named, *Pā pānini* (the prickly pear cactus corral) The Greenwells conducted common pasture improvements through mechanized clearing (i.e. bulldozing, chain dragging) after World War II.

(Mr. Howard Ackerman offered additional information concerning chain dragging and/or bulldozing, the "Old Government Trail," and other ranching-related activities. In reference to the Old Government Trail, Mr. H. Ackerman indicated that it could be traced, in part, by the large flat *'Alā* stones and by the smaller, narrower gates in walls or fences, specifically mentioning an old gate in the Kuakini Wall in Kalukalu.)

> The land belonging to the Greenwell's that is impacted by the corridor was only used for ranching by the family. They started ranching operations in the 1850 and continued until about 1985.
>
> Sites of importance were discussed by Mrs. Greenwell, who also brought up the fact that sensitive sites will have increased visibility and accessibility once the road is constructed. She is concerned about the liability of unwelcome visitors in the refuge caves mentioned above. She advocates that these caves be fortified to prevent destruction.

Ian Birnie
(Consultation with Helen Wong Smith — May 16, 1997)

State Harbormaster, Ian Birnie, is also a respected authority on railways in Hawai'i. He was contacted because the proposed bypass road passes through the old Kona Development Company railway alignment (also identified on some maps as the West Hawaii Railroad). Birnie shared the following observations:

> In the early 1900s, the Kona Sugar Co., under the auspices of a number of affiliated companies, constructed an 11-mile railway line from Wai'aha, North Kona, to Keōpuka in South Kona. The railway was built at approximately the 700 ft. elevation. The train that ran on this railroad was a 3 ft. wide narrow gauge. Birnie has visited a private residence located on Nohealani Street, *mauka* of the Kamehameha III Road, where remnants of the 20 ft. stone trestle separates the property lines of neighbors. He stated that the

[8] Site 50-10-37-16570, identified as a lava tube-petroglyph cave, used as a temporary habitation/burial site. The identified entrance of the cave is situated *makai* of the railroad bed (Site 7214), at the c. 700 foot elevation, and runs north-south for a distance of 128.0 m (420 ft.). (Hammatt et al., 1997:143)

[9] Presented earlier in this report in the sections that discuss land use of each *ahupua'a*.

stone work is superior to those he has seen at Nāpo'opo'o which was part of the Kona-Ka'ū railroad.

The KDC railroad trestle in the project area was generally not built up as high as that of its northern extension. Due to this factor, and the ranching activities within the area, many parts of the railway have already been significantly damaged.

Takao Ide
(Consultation with Helen Wong Smith — July 26, 1997)

Mr. Takao Ide, born at Ninole, but as a young child, his family moved to Keōpū, Kona. Then in 1932, when Takao was 8, he and his family moved to Kawanui. The land that they resided on is part of LCA 7347 *'āpana* 1, and Lots 1 and 2 of LCA 8559 B:10. His father leased, and subsequently purchased the land from William Roy. At the time, the land was already in coffee cultivation. From his home, one can see the boundary wall between Kawanui and Lehu'ula. Mr. Ide relayed that in his sixty-five years in Kawanui, the agricultural land in the area has been primarily planted in coffee, avocado and pasture all the way to Kāināliu. The following expanded notes provide readers with an overview of the primary historical recollections shared by Mr. Ide:

Mr. Ide shared several observation about historic plantation activities around his home, and the larger Kona Plantation — By 1932, the sugar cane land of Lehu'ula had been abandoned, sugar cultivation had ended, and the land converted to pasturage. The Kona Development Company railway ran all the way to the sugar mill that was at Wai'aha, by the home of Joe Gomes. He thinks that the railroad ran from there to Nāpo'opo'o [corrected to Keōpuka with another rail running from Nāpo'opo'o to the south].

Mr. Kondo was the owner of the railroad, and there is a monument to Mr. Kondo in Hōlualoa cemetery. A man by the name of Koyanagi was the engineer of the train. Koyanagi lost his hand when it became caught in an engine crank.

In Kona, the sugar was transported to the railway by means of cables, cultivation took place *mauka* of the railway. Mr. Ide remembers hearing from Jack Greenwell, that Masao Kuga invented a trigger on the cable from which the sugar would fall when it reached its destination near the railway.

When Mr. Ide first moved to Kawanui in 1932, there were still a few Hawaiian families living along the coast. The concentration of Hawaiians were at Pā'ao'ao Bay. He recalls the Keli'i, Kini Kā and Ho'omanawanui families there. These families often spent weekends down by the coast. Kini Kā also had a home site near Lanakila Church. Charles Aina resides next to the church now.

Mr. Ide said that by the time he moved to area, there weren't any Hawaiian families residing near shore at Pu'u Ohau. As a youth, he used to go fishing

down at Pu'u Ohau, and there were good grounds for *moi*, *menpachi* [i.e., *'ū'ū*], and *mamo*. He remembers that all the lands in the Hōkūkano area between the coast and the Māmalahoa Road were in pasture. He does recall the Keli'ikipi family living further *makai* in the Hōkūkano vicinity.

During the early 1940s, Allen Wall leased pasture land in the *ahupua'a* of Lehu'ula to Mr. Kobayashi. Mr. Kobayashi raised watermelons and tomatoes and supplied both area residents and the U.S. Army with produce. This was a successful venture due to the suspension of certain imports from the mainland. This truck farm cultivation occurred above the KDC railroad and is indicated on the map (*Figure 11*). Other sites pointed by Mr. Ide included Keli'ikipi's residence; *'ulua* fishing grounds; a tomb (he was unaware of any additional information regarding the tomb); the location of a one-acre parcel where honeybees were kept; and the stone wall that marks the Lehu'ula-Kawanui boundary (*Figure 11*).

Mr. Ide shared the following recollections about military activities in the area, during World War II. Marine barracks were set up in the yard of the Nobriga home on Māmalahoa Highway, and at the playground of Konawaena School. Marines also set up camp in the yard of the Daifukuji Mission in Honalo. Mr. Ide recalls that due to the black outs, his 1942 high school graduation occurred in the Aloha Theater and they all wore gas masks during the ceremony.

Mr. Ide was shown a map of the proposed highway corridor and stated that it covered lands that were always in pasturage. There is however, some volunteer sugar from that industry along the railroad. Mr. Ide knew of no significant sites along the proposed corridor.

Lily Namakaokal'a Ho'ani'o-Kong
(Notes from Lily Kong and Interviews with Kepa Maly March 7 & July 24, 1996)

Lily Namakaokai'a Ha'ani'o-Kong (Aunty Lily) was born in 1927, at her family homestead overlooking Keauhou Bay. Her mother was Mary Ahlo (also written "Alo")-Ha'ani'o, and her father was Harry Ha'ani'o. Aunty Lily's *kupuna* was Tutu Beni Ha'ani'o, and her family has lived in Keauhou for generations. As a child, Aunty Lily was surrounded by the *kupuna* of her immediate family and those of the community. As a result, she became familiar with many aspects of the history of Keauhou and the neighboring lands. Because of her knowledge of the history and cultural sites of the area, Aunty Lily has recently worked in a special program of the Kamehameha Schools-Bishop Estate (KSBE), called "Hana Pono." Her goal is to try and help KSBE become better stewards of its Hawaiian assets in Keauhou-Kahalu'u.

Aunty notes that protection of the Great Hōlua of Keauhou, the Lekeleke burial grounds and other Hawaiian cultural sites is very important to her. She expressed concern about the development of the proposed Ali'i Highway, and what looks like preparation work to extend

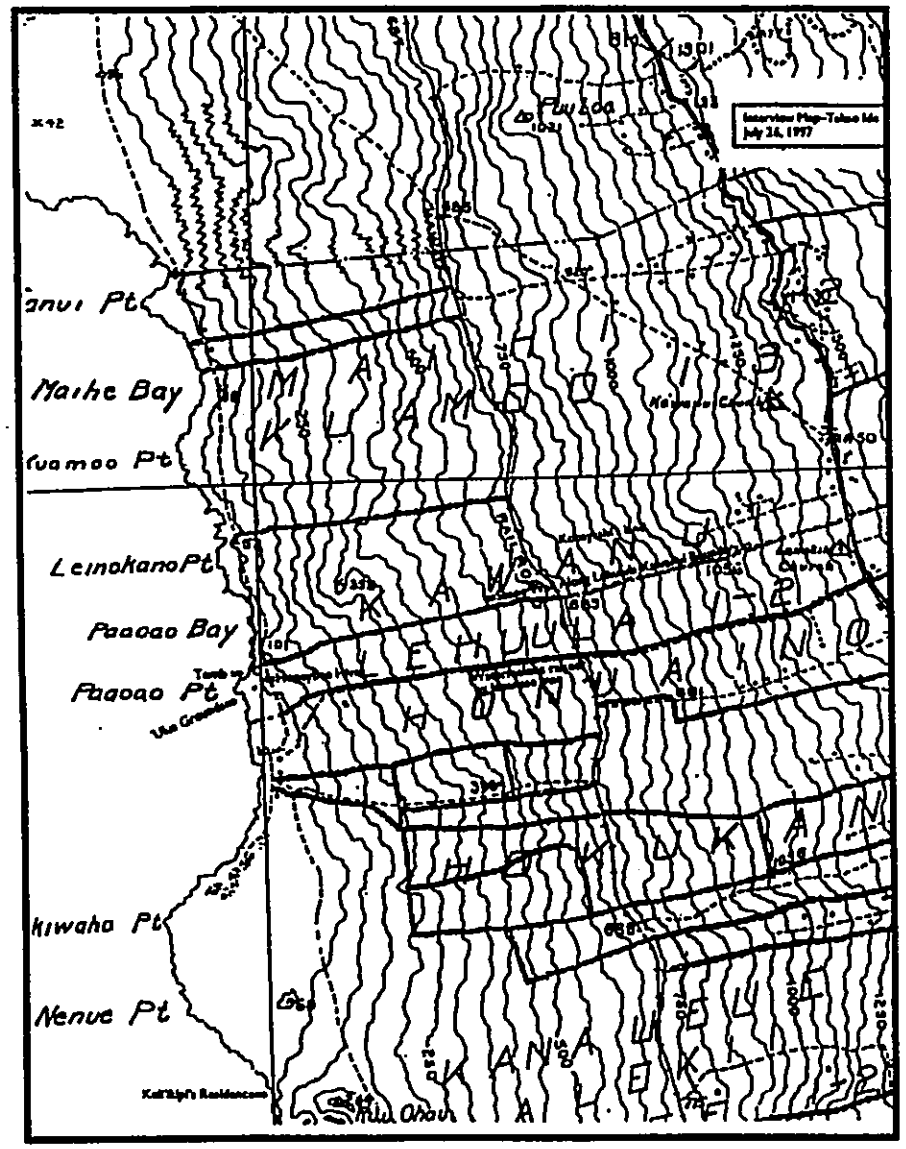

Figure 11. Annotated Map—Showing Selected Sites Discussed by Takao Ide (July 26, 1997)

the Māmalahoa bypass road further south, as evidenced by the new Ali'i Highway intersection developed below the Keauhou Shopping Center.

On April 23, 1996, and August 10, 1997, Aunty Lily gave permission for use of both the paraphrased and taped interview transcripts in the present study:

(handwritten notes of an informal interview)

KM: Explaining the purpose of the interview, being done in conjunction with the proposed Ali'i Highway Realignment—seeking information from knowledgeable elders and area residents in order to help make culturally responsible decisions in planning the road alignment.

LK: I've noticed the new signs they put below the new shopping center, calling it "Ali'i Highway." The road has come out in a different area than I thought it was supposed to. I'm very concerned about how it looks now, like it's also going *mauka* [pointing south into Keauhou 2]. I want to know if they're planning to take the road farther out, how are they going to protect the Hōlua and other Hawaiian places.

On July 23rd, 1996, I went to a meeting with community members and OHA and spoke about the southern extension of the road that is planned to go to the Hōkūkano 1250 development. I've also spoken with representatives of Bishop Estate about the rich cultural sites that may be impacted by this 1250 road, and I am particularly concerned that the proposed 1250 road runs too close to the sacred burial area of Lekeleke. This is not a good idea!

Over the years, Bishop Estate development has already destroyed portions of the Hōlua, what's left must be preserved.

At one time, Bishop Estate Staff (Bob Lindsey and Joe Spencer and others) asked me if I would restore the Hōlua, and I told them "No, every rock was originally laid in place with a prayer, we don't know the right way to build it, but we should clean the area around it and take care of it."

KM: You express an important thought here about the difference between restoration and protection of ancient Hawaiian sites.

LK: Yes, we don't know all the things that the *kūpuna* did, we don't live in their way. And when we go mess around with things and "restore" them, it's like we are rewriting the story. It's no longer their work, their story, but our work. And if we don't do the right thing, it can come back to you, and be very heavy. Protecting the places as they are, keeps what's left of our old people's work...

...One of my favorite places in Keauhou to this day, is Lekeleke. I love to go on the cliff above that area and look down. From up there, you can see all the old *pū'o'a* (burial markers), it's a very important place. And just on the north of Lekeleke is the place called Kahō'e'e. My mother told me that that place was used in the 1800s as a holding area for people with leprosy.

There is a *pā* (enclosure) there that you can still see today, but not too many people know the history of these places any more. I'd also asked my mother why they named the area on the bay "Kauikeaouli," and she told me that Kamehameha

III had been born there. When he was born, he was stillborn, but he was brought back to life, and the name Kauikeaouli describes the dark clouds that were in the sky when he was born...

Walking the Old Keauhou-Ka'awaloa Trails (Fishing with Mama)

As a youth Aunty went with her mother, walking along the shore line to Kahō'e'e. Her mother loved to *ka mākoi* (pole fish) for *kole maka onaona* by Kahō'e'e. Aunty recalled that:

> We would walk part of the way along the old government road, and at various places, mama would point out the Hawaiian sites like Kahō'e'e, Lekeleke, and the old *'alā* [dense water worn stone] trail. The old government road used to go all the way to Ka'awaloa.
>
> I remember when I was young , that the old *'alā* stones still marked the trail and were even used to line the smaller trails that people traveled to the shore side. The cowboys lifted up a lot of the *'alā* stones on the trail, so they could safely ride their horses on the trails.

Aunty also noted that at places like the Hōlua of Keauhou, her mother and father always taught her and her siblings "*mai 'oukou hehi*" (don't step on these places). These are sacred for our *ali'i*. My mama and papa always taught us that, "respect our cultural sites" (pers comm. August 11, 1997).

Remembering Keawe (Nui) Ka'ilikini

One of our old *paniola* was Keawe (Nui) Ka'ilikini. His horse was his transportation, he never went anywhere without his horse. He always wore a red bandanna over his head, I never saw him without this bandanna. You would know he was coming to Keauhou from a mile away, you could hear him singing away. His home was down Kāināliu beach where 1250 wants to build (Ka'ilikini was descended from an elder Ka'ilikini–residing at Mā'ihi–who provided testimony before the Boundary Commission for the land of Mā'ihi in ca. 1873).

Blessing of Lekeleke

On Wednesday August 14, 1996, at 9:00 a.m. there was a blessing at Lekeleke. We had about 25 people attending. The blessing was done by Leon Sterling, and the chants were done by Nathan Napoka, Nona Beamer. Kana'e Kapeliela of DLNR also attended. Nathan Napoka expressed the importance of saving the culture and history of our *kūpuna*. Gerard Jervis, of Bishop Estate promised that he would be sure, that all the historical sites like Lekeleke will be saved. The blessing took about an hour.

Joe Spencer called me a couple of weeks before this day to ask me, "What was the meaning of Lekeleke." I told him, the meaning was like "a meeting area for the battle," or "a boundary for Kuamo'o's battle ground, or a drawn battle line." The battle of Kuamo'o took place on the south coast of *Keauhou*, right above on the *pali*. And, this *pali* was called *"Lekeleke."* I had gone on

the top of *Lekeleke* and looked down. It gave me a good feeling and looking down from the top you could see all the formations of the burial mounds. It is something to see...

July 20, 1995

In a discussion about Keauhou with John Keali'i (77 years old at the time), he said he didn't know too much. John said he knew that Lekeleke was a battlefield, and that he also remembered there is a *heiau* 'Kaupō' in Kāināliu." This *heiau* "Kaupō" (also called 'Ūkanipō) was near Kāināliu. On special nights, you could hear beautiful music coming from the *heiau*, on other nights you could hear sounds like a baby crying.

Update on Proposed Māmalahoa Highway Bypass Project

Since we spoke last year, I have gone out into the field several times with representatives of Bishop Estate, Oceanside 1250, and the archaeologist for the Māmalahoa Highway Bypass. I have shared my concerns about the cultural significance of Lekeleke, Kuamo'o and our other Hawaiian sites. This road must not be put close to these sites. I have told them, that If they have to build the road, it needs to go well *mauka*—at least 1500 feet inland from the top of the *pali* above Lekeleke.

I also think that it is important that there be places where people can pull off of the road to scenic overlooks where people can look upon the beauty of the land, and learn about our history–what happened here, and why it's important to take care of our Hawaiian sites (pers. comm. August 10, 1997).

Helen Kina'u Wight-Weeks and Curtis Tyler III

(Interview with Kepa Maly March 15, 1996)

Helen Kina'u Wight-Weeks was born in 1919 (d. 1997), in Honolulu. On her mother's side of the family, she is descended from the Kauwē-Kaukamoa-Davis and Akana lines of Kona. That side of the family had resided in Keauhou since around 1839, and is tied to several families, including the Paris and Wall families. Aunty Helen returned to Kona in 1946, and was married to the late John Douglas Weeks (a surveyor who worked throughout Kona, and around the island).

Several individuals recommended Aunty Helen as an interviewee, because she was knowledgeable about Kona history, and very active with the Daughters of Hawai'i, Kona Outdoor Circle, and in Hawaiian issues. She also served on the Kamehameha Schools-Bishop Estate historic advisory council with other concerned and knowledgeable Hawaiians.

Aunty Helen's interview presents readers with a colorful, and at times, candid view into some of the heart-break and history of change in Kona's Hawaiian community. She also has fond recollections of *Tūtū* Nāluahine Ka'ōpua, from whom she heard stories, and learned more about the importance of Hawaiian cultural sites. Through experiences like those with *Tūtū* Nāluahine, and her own *tūtū*, Apō, she expresses a deep concern about the impact of development on Hawaiian resources. She also observed that her late husband was always

warning against over development along Ali'i Drive. She also lamented that that customary accesses have been severely limited as a result of development. It is noted here, that since conducting the following interview, Aunty Helen Wight-Weeks has passed away.
In her discussion about the proposed development of the Ali'i Highway, she commented:

> ...[Sites] should be taken care of because that's our history, you know, that's all old, old stuff. [Tape 1, Side B; Counter # 529-535]

Based on some of her comments cited below, it is evident that she shares the same view in regards to the proposed Māmalahoa Highway Bypass.

Of specific historic interest to the *ahupua'a* crossed by the proposed highway corridor, Aunty Helen shares with readers some of the history of the Weeks family and their ownership of land within Hōkūkano Village at Kāināliu. She also stated that her late husband's grandfather Henry Weeks (also known as Hanale Wiki), was buried near his house site at the seaward residence. Subsequently, because of the strong cultural attachment shared between elder members of the family and the *makai* lands, Wilama Weeks, her elder brother-in-law had his ashes scattered in front the shore of Kāināliu as well. In the first interview, Aunty Helen was joined by her nephew Curtis Tyler III, who helped to make arrangements for the interview, and also participated in subsequent interviews (the interviews with Helen Kina'u Weeks were formally released on April 26, 1996).

[Tape 1, Side A]

KM: 214 [discussing various lands of the Kona District] How about *makai* lands? So, you familiar with sites...

HW: Down *makai*? The beach area?

KM: Keauhou, Kahalu'u...

HW: Oh Keauhou to Mā'ihi and Kāināliu beach, 'cause that's where his grandfather [speaking of her husband] is buried, and his brother is buried down there.

KM: His grandfather being...?

HW: Henry Weeks.

KM: Hmm, okay.

HW: 219 He was buried down there [Kāināliu]. Wilama's ashes were scattered there. And that was the old place where he lived, and it was Kāināliu Bay. And then you have this point that comes out, and then you go where [the development] 1250 is going up.

CT: Keikiwaha Point.

HW: Yeah, and that's Hōkūkano Village. And he took care of the boats and made different things, and so forth, and he's the one that put up the money for old man Greenwell to buy all this property in Kona. And he'd [Greenwell] say, "Oh Henry, I found a place I want to buy but gee, I don't have any money." "Yeah, yeah, how much do you need?" "Oh I need $5,000." So he would put the money

up. But I have his diary, Greenwell's diary, and found everything in there. It was really interesting... But there's a lot about Weeks in there... [# 237]

HW: 310 ...And then you go down to Kāināliu Beach and then you get to 1250, where they're putting...trying to put that thing up and then you come to Mā'ihi and then Kuamo'o. That's where they had the battle, Kuamo'o, and lots of people were killed there. But that's the land I was fighting the Paris' for, because it belonged to my grandmother, and she needed $100, so she borrowed $100 from aunt Carrie Robinson and she was one day late...She said "You didn't pay on time so I kept the land..."

KM: So that had belonged to your gramma, Kamala Akana?

HW: Uh-hmm. So anyway if it makes 'em happy, fine... [331]

...And dad [William Weeks] died in '46...

CT: ...One month before I was born he died. My grandfather William, William Mahuia. You mentioned something earlier today which I don't think I heard you say before. And that was that Henry Weeks was buried at Hōkūkano Village? Did you say he's buried there?

HW: Uh-hmm.

CT: Well who's buried underneath the tree at Honua'ino?

HW: That's his son.

CT: Oh his son.

HW: Yeah.

CT: 'Cause I thought...I thought old man Weeks, this is the first Henry Weeks that came from England, right? I thought that he was buried in Hilo someplace.

HW: 357 Uh-huh. Old... if I can remember, old man Weeks married that Hawaiian woman in Hilo, okay. Then he came up to Kona and helped build Hulihe'e Palace. And then the son came out, Henry Weeks (2), that's what you call 'um, and he helped finish building Hulihe'e Palace 'cause the father went back to Hilo, where he was taken sick, and then was brought back here. And then they buried him under the pine tree, along with the 14 year-old daughter that died of asthma.

CT: Rebecca.

HW: Rebecca, yeah...

CT: But that was the second Henry Weeks that got buried under the pine tree?

HW: Yeah.

CT: But then the old man, Henry Weeks, the one that worked on Hulihe'e Palace...

HW: Yeah.

CT: Used to live in Hilo.

HW: Yeah.

CT: When he...I know that he kept dressing up and trying to go to Hilo is what I heard. He kept trying to go back to Hilo. So when he died was in about 1880... [thinking] 80-something, I think he died. They put his *iwi* down at Hōkūkano?

HW: That's what I understand.

CT: Who...do you remember who told you that?

HW: John [John Weeks, Aunty Helen's late husband].

CT: 381 Oh, Uncle John said that, said he was buried over there, at the house site? Say, whereabouts in the house site?

...Did uncle John used to go to down there as a child or was the land already sold by then?

HW: No, it was sold after that. I don't know, because I know he went to Henry [Greenwell] and said "I'd like to buy my grandfather's property." "Well you gotta go see Jack." So he went to see Jack.

CT: This was Greenwell, now?

HW: Yes. And he said, "I'd like to purchase my grandfather's piece." "Well you gotta go see Henry." He said, "I just went to Henry. Henry said come see you." He said "Well then you gotta talk to Norman."

CT: The other brother, yeah. It's the Greenwell brothers she's speaking about.

HW: But it was the Weeks' money that was loaned to old man Greenwell. So that he could buy all this property in Kona...

KM: 613 What do you feel about Kona and the changes you've seen?

HW: Aren't they terrible? I think they're just awful. What are you smiling at [speaking to Curtis]?

CT: Well, I agree.

HW: Just...and now they gonna open 1250. That's gonna take away that beautiful hillside, you know, down to the water. Golf course, all kinds of stuff they putting up...

...What are they, what are they gonna do with all the archaeological sites they're gonna find?

KM: What do you think they should do with them?

HW: 627 I think they ought to preserve 'em...

KM: ...Let's come back to Kāināliu for a moment. 'Cause I think that's an interesting example of how history gets changed.

HW: 840 Kāināliu?

KM: Yes. You were describing

HW: *Mauka* or *makai*?

KM: Well, that's just it. Where is Kāināliu that you understand?

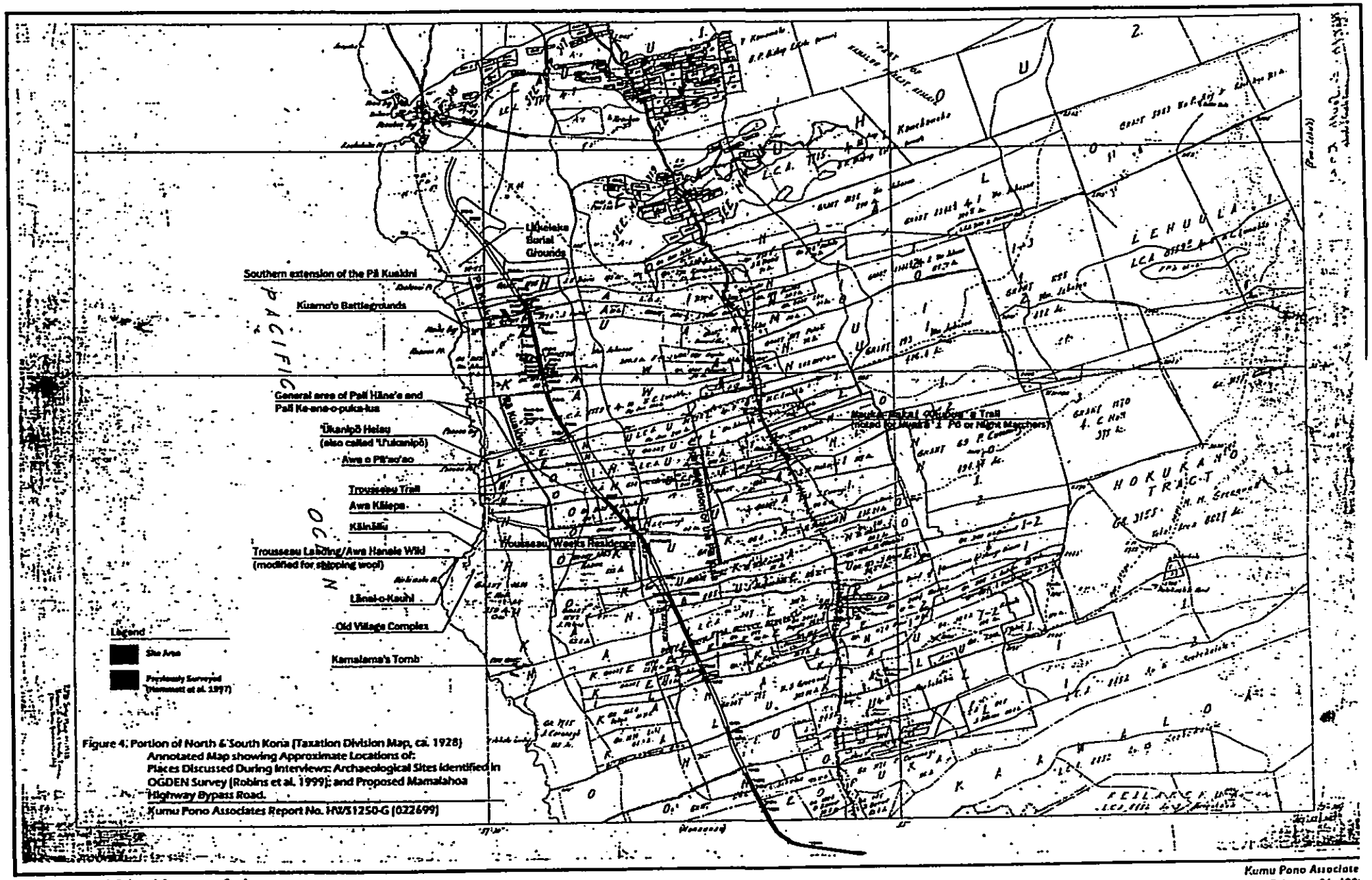

Figure 4: Portion of North & South Koria (Taxation Division Map, ca. 1928) Annotated Map showing Approximate Locations of: Places Discussed During Interviews; Archaeological Sites Identified in OGDEN Survey (Robins et al. 1999); and Proposed Mamalahoa Highway Bypass Road.
Kumu Pono Associates Report No. HWS1250-G (022699)

APPENDIX B II:

ORAL HISTORY INTERVIEWS WITH WM. "BILLY" J.H. PARIS JR.

PART OF A REPORT ON ARCHIVAL-HISTORICAL DOCUMENTARY RESEARCH, ORAL HISTORY INTERVIEWS AND ASSESSMENT OF CULTURAL IMPACTS

PREPARED IN CONJUNCTION WITH THE ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MĀMALAHOA HIGHWAY BYPASS

Kumu Pono Associates
Kepā Maly, Cultural Resources Specialist
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Historical & Archival Documentary Research • Oral History Studies • Partnerships in Cultural Resources Management • Developing Preservation Plans and Interpretive Programs

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HE WAHI MOʻOLELO NO KONA,
NĀ AHUPUAʻA O –
KEAUHOU 2ND, HONALO, MĀʻIHI 1-2, KUAMOʻO 1-3, KAWANUI 1-2, LEHUʻULA 1-2, HONUAʻINO 1-4, HŌKŪKANO 1-2, KANĀUEUE 1-2, HALEKIʻI, KEʻEKEʻE 1-2, ʻILIKAHI, KANAKAU 1-2, KALUKALU, ONOULI 1-2, KEŌPUKA 1-2, & KAʻAWALOA; DISTRICTS OF NORTH AND SOUTH KONA, ISLAND OF HAWAIʻI

PREPARED IN CONJUNCTION WITH THE ENVIRONMENTAL IMPACT STATEMENT FOR THE PROPOSED MĀMALAHOA HIGHWAY BYPASS

Prepared by: Helen Wong Smith, Archivist
and Kepā Maly, Cultural Resources Specialist
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William Johnson Hawawakaleoonamanuonakanahele Paris Jr.
Oral History Interview with Kepā Maly
at Lehu'ula-nui and Honua'ino, April 24, 1996
(with interview excerpts from March 7, May 15, June 4, 1996 and May 9, 1997)

William Johnson Hawawakaleoona-manuonakanahele Paris Jr. (affectionately called "Uncle Billy" by most people in Kona), was born in 1922, on O'ahu, at the Honolulu home of his maternal grandfather, Robert Hind. When he was three weeks old, his parents William Johnson Paris and Margaret Hind-Paris brought him home to the Paris residence, Mauna-'alani at Ka-'awaloa.

Mr. and Mrs. Wm. Billy Paris Jr.

Uncle Billy is descended from several prominent Hawaiian and Caucasian families who have resided for several generations in the Kona and Kohala districts. Members of Uncle's family have been active in Hawaiian ranching since c. 1815, when Kamehameha I first hired John Palmer Parker (Uncle Billy's great-great-great-grandfather) to hunt cattle for him. Following in the footsteps of his elders, Uncle himself, has been active in managing ranching operations for most of his life.

Uncle Billy is very familiar with the history of ranching in Hawai'i, and because of his love and appreciation of his Hawaiian heritage, he is also very knowledgeable of Hawaiian history and land use practices. As a result of his background and expertise, Uncle Billy has participated in several oral history interviews with the Kona Historical Society and with Kepā Maly (pertinent excerpts and historical citations are included with this transcript).

The following narrative—primarily an interview of April 24, 1996, with follow up notes from May 9, 1997—was recorded as a driving and walking tour. During the interview, we visited various sites, extending from sea level at Honua'ino-Lehu'ula, to approximately the 2,500 foot elevation, at Wailiou. The approximate locations of selected locations described in the interview are marked on *Figure 1* at the end of this transcript). The interview was as a part of an effort to record some of the unique insights that Uncle Billy could share regarding

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the history of the lands and any significant Hawaiian sites of the lands extending from Keauhou to Ka'awaloa. Subsequently, follow up discussions regarding his thoughts about, and recommendations regarding development of the proposed Māmalahoa Highway Bypass were recorded as well. Readers will find that the interview provides them with a rich account of the history (e.g. residency, fishing, agriculture, rights-of-access, and cultural values) of the land. The interview compliments the study to which this interview is included as an appendix, and helps us to understand the relationships between various native sites and environmental zones.

Of particular interest to the present study, the formal interview (April 24, 1996) and subsequent notes collected during a discussion on May 9, 1997, Uncle Billy shared the following comments and recommendations:

Changes in the Community of Kona 'Wzena
As a youth, Uncle Billy recalls that in the entire Kona Waena region, there were only about 17 native Hawaiian families. It is his understanding that diseases; the arrest of followers of Ka'ona, who attempted a religious uprising; economics; cattle ranching; and later, sugar plantation operations significantly impacted the native communities. Thus, by the early 20th century, there was a deterioration—at times a purposeful destruction—of native sites, and a diminishing of the use of land-based resources and fisheries.

A By-pass Highway Needed
Uncle Billy feels that a new road of this nature is desperately needed, noting that when there is an accident, it can take hours before any traffic can move. Indeed, some years ago, there had been a proposal to use the Kona Development Company Railroad alignment, coming out at about where the present highway meets Kamehameha III Road. Such an alignment made good sense and would have pulled traffic further *mauka*, and avoided the more sensitive lowlands.

Occurrence of Hawaiian Sites
Because Paris family lands extend from Mā'ihi to Hōkūkano, Uncle Billy and his cousin Allen Wall have walked the proposed alignment corridor with field archaeologists working for Ogden. Uncle feels that most of the significant Hawaiian sites are situated below the proposed highway corridor, and that all sites within their property have been identified. The only problematic areas he is aware of are the Lekeleke and Kuamo'o burial grounds, a habitation cave in Mā'ihi-iki (only a few hundred feet away from the corridor), and a residence complex at approximately the 400 foot elevation in Kuamo'o.

Recommendations
One of the problems that needs to be addressed in conjunction with the development of the Māmalahoa Highway Bypass, the Hōkūkano housing, and coastal park, is "How to protect the significant sites that will be clearly visible and more easily accessible as a result of the development."

Based on family histories recorded by Uncle Billy's father, as burial grounds, Lekeleke and Kuamo'o are sacred and represent an important part of Hawai'i's history. The elder Wm. J. Paris learned that the individuals buried at Lekeleke are

of the fallen warriors who accompanied Kalanimōkū to the *kaua 'ai noa* (battle to set aside the *kapu*), in support of Liholiho. The burials above the cliff and at Kuamo'o, are those of the supporters of Kekuaokalani, who sought to protect the ancient religion and *kapu* system. The actual spot where Kekuaokalani fell, is still marked by an *ahu* (cairn). The coastal sites like the *heiau* 'U'ukanipō and other ceremonial sites, the habitation complexes, caves, burial sites, *ko'a*, and other features between Mā'ihi and Hōkūkano, which have been relatively isolated, will now be very visible. Uncle acknowledges that not every site can always be preserved, but he recommends that some plan must be developed, and steps taken to monitor both access and protection of these significant cultural resources.

As a part of this planning process, Uncle recommends that educational and interpretive material be prepared and made available to residents and area users, informing them of how important the cultural sites are, and what is required when visiting them, or traveling through the various complexes. (pers. comm. May 9, 1997)

The interview transcripts were reviewed by Uncle Billy Paris, and the final transcript was formally released on May 16, 1997 (see Personal Release Interview Records at the end of this transcript).

[Tape I, Side A]
Counter #
and Speaker

KM: It's Wednesday, April 24, 1996, it's about 9: 50 a.m. I'm back with Uncle Billy Paris... *Mahalo* again, thank you so much for taking the time, because the history that you share is important for us as we go into the future...

Well, if we could, when we were closing up last month, you went and showed me some things that your papa and them had made, and then you started sharing with me some of your sense about the traditional *ahupua'a* and collection, gathering rights, and access, and things like that. And I thought maybe we could talk a little bit about what you feel about that. How it was practiced in your time.

011 BP: Well, as far as *ahupua'a* went, we had the trail that...we had one, two, three *ahupua'a* trails in the land of Honua'ino, which is to our south. In Lehu'ula, we had one. These trails were used by the people that had places at the ocean, like the Ho'omanawanuis and the Keli'is and the Keles, and others. And they had free access to go up and down, as did any of the tenants or coffee farmers, or any of those people that lived within our *ahupua'a*. They had *carte blanche* to go up and down. And they respected that right, and they were very...those people when they went to the ocean to fish, or anything like that, they only got enough for their family, and they would dry some of the fish, to preserve it so they could eat it during, or until the next fishing time. Salt some, etc. And things like this were done.

025 For medicinal purposes, they would go *makai* to gather the herbs and plants that were used in their various medicines. That time, you took care of colds and infections and things like that by using the native plants. Most Hawaiian people...you used *laukāhi* for infections and things of that nature. You used *pōpolo*, both the fruit and the leaf, pound the leaf with a little *pa'akai*, you have a sore throat, that's good medicine. So, they had the right to that. Get *'uhaloa* for sinus and things of that nature. these rights they had. Go down the beach to pick *lau hala*.

KM: So the Hawaiian families were still practicing within the *ahupua'a* these *mauka-makai* accesses?

035 BP: That's right.

KM: Now, you'd shared with me, if you don't mind, a little earlier, a story that your father had told you. I had asked you, "What *'āina* is Waihou in?" And you had explained that the house was actually in one *'āina* and that the spring was in another.

BP: Yes.

KM: Your father had told you a story that he had heard about how the *ahupua'a* of Kona, I guess, were made by the *ali'i*.

039 BP: Well, his version is that the chiefs had their runners start on either side of what were considered their land at the ocean and they ran towards the mountains. Of course, you know, your uplands were where you did your farming and things of that nature. Your forests, you got certain items that they used, like your *mamaki*, and other plants that were used in making *tapa*, fibers, and things of that nature. And so they started these runners off, the weaker ones were cut off by the stronger ones.

KM: Ahh, so as they *pi'i i uka* [ascended the uplands]?

BP: Yes.

KM: Going to climb the mountains, the stronger ones cut off [the weaker runners]... So that's why your father was explaining that some of the *ahupua'a* were...?

BP: Much larger than others. Some of them only go up a short ways, and they're chopped off. That is his description of the *ahupua'a*, when they were first started. They were divided by runners. Of course, you notice some of them were disproportionate to begin with. Some of the *ahupua'a* are much wider at the ocean than they are at the top. And so he said that's what he gathers, at that time this was to prevent the squabbling and everything up *i uka* [in the uplands], it was less defined than they had started out with.

KM: Did Papa give you any indication when, or who's time this may have been?

BP: No.

KM: May have been 'Umi or...no?

056 BP: I have a hunch it would be in that era, because 'Umi loved the mountain, just like he did at Hale Lā'au and ka Ahu-a-'Umi, and Kahua-bō'ike-o-kanaka. They knew how to live in the mountains; they knew where the drip-caves were and where you could lift the *pōhaku* and there would be water underneath. And those guys were...I mean they were *akamai* [intelligent]. He ['Umi] loved *mauka*.

KM: So in 'Umi's time *paha* [perhaps]?

BP: *Paha*. I think so.

KM: You know, you were describing, like in your *ahupua'a* here at Honua'ino or Lehu'ula, the *mauka-makai* accesses that residents within the *ahupua'a* maintained, eh?

BP: Yes.

KM: What was the practice between inter-*ahupua'a*? Like in, you know, do you recall hearing, did people just go take what they wanted, where they wanted?

066 BP: They always asked. [phone ringing, tape off, back on — 068]... But like you had the main areas, like this Māmalaho'a. Okay, cause Kamehameha gave the right for free passage on this, any body could go. They wouldn't be molested. Then you had the trail like, what they call the King's Trail, the coastal trail.

KM: How about the *ala loa* [the main trail system around the island], did you hear that term, *ala loa*?

BP: Uh-hmm.

KM: *Makai*?

BP: Yes.

KM: How about, like your *'āina* before? I think you were even sharing that from like Keauhou, there is a trail that ran *makai*, all the way...

BP: To Ka'awaloa.

KM: Ahh, what is that trail, what kind of access do you think?

BP: That was for free access, you passed through, that's how the people lived, say at Nāwāwā, that is, by Pu'u Ohau, or our area, Honua'ino, all the people who lived (here), they had free access to Keauhou or wherever they wanted, and that's... Ali'i Drive was all a part of that same *ala nui* [trail system].

KM: The old *ala loa, 'ae* [yes].

079 BP: You know, so those trails...the trail that went all the way to Kawaihae along the... But what I get from like my father and Sam Hook, and those people, when they went from Kona to say, Kawaihae, they never went along the coastline. They went to Hu'ehu'e where John Maguire was, and then from there they had a trail that went on a diagonal down to Kiholo. Then they would go across. But they said the trail, because of the 1801

flow, and others, that in the northern part of Kona, from Kiholo, south, the trail was not too good *makai*.

089 KM: I see. Did you hear the name, Ke-ala-chu, for the old trail that ran, like down to Kiholo, or up from Kiholo?

BP: No, but have you talked to Hannah [Springer] on that subject?

KM: Yes.

BP: She's done some research on that.

KM: Yes. So, people in your recollection, were respectful of resources within an *ahupua'a*? If you were traveling from one area to another, would you just go and take what you wanted?

095 BP: No. We were always...like all of us ranchers, we had more or less the right to pass through other people's property, but we always, the old timers, we'd always call on the telephone, "We plan to move cattle through your area, tomorrow, at a particular time...or next week." We'd give them [notification]...so we didn't want to interfere with their internal operations. So, it was not just "Go." We always asked.

KM: Is this your understanding that this is a carryover from earlier practices?

BP: That's right.

KM: You respect...?

102 BP: Respect. My grandmother Paris, she pounded it in your head, "If you don't know whose land that is, don't go until you find out," you know. She was...they were...my aunt Carrie Robinson, my Grandmother Paris, all those sisters, Mary Shipman, married to William Shipman, those sisters, boy, they believed in that!

It was not just boom [striking the table]. But *in the ahupua'a, there was great freedom for the people who lived within. And I wish it would be that way today. Then the ahupua'a, the people who lived there in, would take good care of their resources, they would have plenty.*

KM: That's right. How about even going into the ocean for fishing, was there kind of respect of the land area fronting...?

111 BP: In the old days, you owned right to the *limu* line. You go look at our property markers, they're right...your high tide washes right over some of those "Xs" in the stone.

KM: Did they have...did the *'āina* have, that you recall, did lands have fisheries like, and even if you go out fish, and look back at the land you would triangulate, like *ko'a* [dedicated fishing grounds or fishing stations]?

BP: Well, that I don't know too much here, but on O'ahu, definitely so. Your land rights, like the Lucas' out in Kuli'ou'ou, that area, went right out into the *lau papa* [reef flats] outside. They had the reef and everything. They owned the water rights because, I remember, even after World War II, when Jimmy Flugger got a great big D-8 tractor, and I said, "What the heck you doing out in the water, getting all that coral?" He said, "The

heck, this is ours, they're not going to tell me what I can..." He's from that Lucas line. I said, "*'Auwē!*" But that has all changed since statehood. Once we became a state, seems...In the Territorial time, boy, a lot of that *ahupua'a* tradition was practiced...

128 Like down here on Mā'ihi, we have the Kū'ula *heiau*, that is used as a marker for the *'ōpelu* and *'ahi ko'a* that is outside. In the old days, before you had *kiawe* trees, those things stood out. So that's how people lined up to get [to their fishing ground]...and then up on the hill further up, there is another smaller one, and these were all used in triangulating to get to the *ko'a* that were outside.

This *Kū'ula* is on a *makai* section of the Paris' property at Mā'ihi. Uncle Billy recalls that when he was young, there was much less vegetation on the *makai* lands, and it was easy to get bearings off of the *Kū'ula* [fishing deity and temple or shrine] and on-land *ko'a* [shrines or markers] to locate the *ko'a 'ōpelu* and *ko'a 'ahi* (pers. comm. June 4, 1996).

KM: Still in your time?

BP: In our time. But when the *koa haole*, and the *kiawe* vegetation grew, they hid a lot of these. They did not remain prominent. That's why, when they were putting the...I forget the name of that place, right at Kahalu'u, the Keauhou boundary, down here...

KM: Yes.

138 BP: Has the Keauhou Surf and Racquet Club and all that stuff near that area. And they had the Kū'ula *heiau* down there, ['Inikiwai] and all the worry was... They didn't care too much, they were making a lot of noise that the thing...the people were making suggestions that that *heiau* should be seen from *mauka* [chuckles]. But I said, "You know, a Kū'ula *heiau* has significance with the ocean. It relates more to the fishermen, and it should be...it's vision from the ocean, should not be blocked." It served that purpose in time. So they did make sure that they had not blocked it.

KM: So they left a view plain from the ocean?

148 BP: Yes, and then they left a small plain so you could see it from *mauka*, but that was quite a significant Kū'ula *heiau*. And of course, there's other *heiau* structures all around that Kahalu'u-Keauhou area.

KM: *'Ae*. What do you think about the preservation of sites like those, particularly...

BP: ...You know, the *heiau* proper, the prominent ones, if they can bypass them and everything and preserve them, that's fine. Like, there are many, many *heiau* that are...well, it's hard for us to say. They would pertain more to the people who were in that area, of that time.

KM: That's correct. And that's a very Hawaiian attitude, that you just stated.

BP: Yes.

KM: Because it's their *'āina*, their land...

BP: Yes.

KM: So they should speak for it.

BP: Yes.

KM: I see what you are saying.

169 BP: But like myself, and others, we've been pretty good about taking care of what is significant in our own property.

KM: Additionally, so many families are gone now, so sometimes there is no one to speak.

BP: Yes.

KM: So *kānaka*, people of care and concern, need to speak out at other areas too... [175]

[discussion regarding the proposed Ali'i Highway and "Judd Trail," leading into a discussion of other trails and access]

BP: ...Where you have the 'Ōla'a Trail, or the Pu'u 'Ō'ō Trail and everything that used to go down to Hilo from Pu'u 'Ō'ō down, you have those trails going up. But on this side, our trails—like to Mauna Loa and to other areas—to go up to Moku 'Āweoweo, [chuckles] if you didn't have a good trail guide, they were hard to follow. Like Old Man Charlie Kā and Nāluahine, them, they knew those trails. My father, my Uncle Johnny Johnson. But they were not easy trails to follow, not well marked.

208 And today people go along and first thing they do, they get along a trail...Some *ahu* were put on the land, either as a boundary marker or for a significant marker for a crossing, or something, they were critical. But today, you've got idiots making ahus all over the place eh.

KM: Your right. How about your *makai* trail that cuts through the land you folks have *makai*? There is some talk about...and the term is a misnomer, they're calling it "*Ala Kahakai*," simply because it's the trail along the shore, but there were earlier names for it. But there is a proposal, and I think, during our last discussion you'd mentioned [that] there is some *pilikia* [trouble] with the kind of access that's being...

217 BP: Originally, that trail was not vehicular. That's the part that bothers many of us. It was for foot traffic and donkeys, horses, and things of that nature. You know, many of those trails were paved with *'alā* [dense basalt] stones, the steppingstones. But they caused the *lio*, especially shod horses...they'd trip on 'em and everything. And in many places, those stones are thrown on the side.

KM: Oh, how interesting.

BP: Yes.

KM: So purposefully, they took the *'alā* off, because the shod horse...?

225 BP: Would trip on them, so slip. So, they'd take those out, that was more for humans. Because you go down in South Kona, down Okoe, Kapu'a, you see the old stones still on the *'a'ā*, the crossing. But I know, in our area, in many places, the trail between Kāināliu Beach and Mā'ihi, especially

where we used to use, you'll see most of those round stones on the side. They were purposefully removed.

KM: That's important for the historical record, also, because it tells us about the time that this may have occurred, and that the function of the trail changed.

BP: Yes.

KM: No longer by foot, but *holo lio* [ridden on horse].

236 BP: *'Ae, holo lio*. But they were not built for wagons and everything else, and I can think of [chuckles] say, Ronald Von Holt at Kahuā, on all his gates, he'd have a sign, "Fishermen welcome, it's a six-mile walk to the Ocean" [laughs]. In other words, if walk, you were welcome [laughing]

KM: Oh, Pu'uhue side?

BP: Yes [laughing].

KM: *'Auwē*.

BP: I can still see those signs. That is the part that bothers us, because we've had vehicles go down the...that was a Government Trail. The trail from where my sister lives, down to Ka'awaloa.

KM: Ahh, where does your sister live?

248 BP: She lives right at, near the Nāpo'opo'o Road junction, and that road that goes down to Ka'awaloa, Captain Cook's monument. That was one of those *mauka-makai* trails that was used by everyone. And then you get down to Ka-puhi-o-Lono, that's where they steamed Captain Cook's *iwi* [bones].

253 KM: Oh, Ka-puhi-o-Lono, how far from the monument is that?

BP: It's *mauka, mauka* of the *pali*.

KM: Oh, how interesting.

BP: Yes, Puhi-o-Lono. That's where the small *heiau*-like structure is, where his flesh was steamed from his *iwi*.

KM: What *'āina* would that be in, do you think?

258 BP: Ka'awaloa.

KM: Ka'awaloa, and it's on top of the cliff?

BP: Yes.

KM: The high cliff?

BP: Yes, *mauka* on the Kohala side of the trail. And then, right *mauka* of Ka-puhi-o-Lono, is a diagonal trail that cuts across. That also was a government trail, but the people coming north-south who didn't want to go to Ka'awaloa could come up to the trail that goes up to Kuapehu. Kuapehu is actually the name of that area.

KM: Oh, Kuapehu, that *'āina* there?

BP: You had that Government Trail, then it went up across the top of the *pali*, and if you get to where the Hikiau Heiau is, you look in dry weather, you can see that trail zig-zagging down the *pali*.

KM: The Pali-kapu-o-Keōua?

272 BP: Yes. So, you see, they couldn't come along the base of the cliff, except at exceptionally low tide periods, so they would go *mauka* and then come across Nāpo'opo'o.

KM: Now, is this what was related to you from your grandparents?

BP: Yes, those were free trails used by everybody.

KM: Were they still in any use when you were a child?

278 BP: Well, I know the *mauka-makai* trail from Ka'awaloa to Kuapehu, was in great use. You have the Kani'au family and all those people, Loheau family, the Kani'aus and everything that used to go down there and fish *'ōpelu*. And every morning, they would bring the *'ōpelu* up on the *kēkake* [donkey], and they'd carry the old kerosene rectangular cans with...They would clean the fish near the shore, salt the *ōpū* [stomach], and then use *lau hau* [*hau* leaves], *lau milo* [*milo* leaves], and the *limu 'aki'aki*, and pack it around the fish to keep them fresh. They'd wet the *limu 'aki'aki* and then they'd put that in there and keep the fish fresh, and bring it up *mauka*.

KM: Oh, so interesting, so the *'aki'aki*, and with the *lau milo*...interesting.

289 BP: So they all used those leaves, too. My dad always put *limu 'aki'aki* in his *lau hala* basket. He'd clean the fish at *kahakai* [the shore], salt the *ōpū*, and put the *lau hala* basket with the *limu* and everything, on the horse and start up the hill. And our fish never spoiled [chuckles].

KM: Wow, so much [history]...

[Brief conversation regarding sites in the vicinity of the proposed Ali'i Highway.]

307 ...Now, I know like you described last time, when we were just talking story, in the *mauka* sugar fields, the Japanese would gather, and actually made some beautiful stone mounds.

BP: Yes.

KM: How about *makai*, in some of the *kula* pastures, do you recall hearing about a practice of maybe gathering some stone and just tossing it into piles...?

315 BP: Wherever we...like our lands in Mā'ihi and Kuamo'o, where we gathered our cattle to hold them before we went along the trails to go over, many places, we'd make those piles, to open up, and help us hold the cattle. Remove the stone from those areas so we could move better and keep better control. So we have those kind of practices, and I'm sure it would be done if they decided, to plant something especially in a soil pocket or something, they remove the stone and pile it around. And it's a great

practice, even we do it if you have a *pā kuni* [branding pen] or anything else and there's a tree growing in it, we make, cleaning the stone and pile it around the tree. We even do that today.

KM: So it is possible that some of those kind of toss-mounds...?

BP: Yes.

[Brief conversation regarding sites in the vicinity of the proposed Ali'i Highway, and his primary area of cattle operations.]

334 BP: ...My *kuleana* has been Kāināliu, and this Lehu'ula, Honua'ino, this area, plus Pu'u Wa'awa'a, Pu'u Anahulu. That I'm *kama'āina* to, really...

[Interview continued with discussion of families and history of the Ka'ūpūlehu-Kiholo region; and the then proposed development of shoreline ponds fronting the Four Seasons resort.]

KM: You'd mentioned oranges, and it made me think, you know, your family home, Mauna'alani...?

BP: The same orange tree is still there.

KM: Ahh, so it was called that because grandpa had...?

BP: An orange, actually, a Valencia orange tree. The original tree in that yard, started to die back and our old Japanese family, Kanimasu, he cared for it and brought it back to life)...

[Further discussion on the proposed dredging project at Ka'ūpūlehu.]

KM: ...Your papa used to still make *pā* [mother of pearl *'ahi* and *aku*] lures?

BP: Oh yes.

KM: Can you share with us some of that story, and also about the *'ala'ala* [squid liver] bait, because you were telling a wonderful story about mixing the...

[619 — end of Tape 1, Side A; start Side B — 620] ...[*'ala'ala* and various ingredients]...

BP: [speaking about preparing the *'ala'ala*] You clean that and then you dry it, get all the ink out, dry it, and mix with salt, and you keep it in a dry place, see.

KM: Uh-hmm.

BP: It keeps for a long, long time. Then, you wrap that *lā'i* [ti leaves], bake it in the oven at about 225 ° degrees, not too high a heat. Bake it for maybe, at least...usually about 45 minutes. But his test was, it would start to sing "weeeee," making a noise when it's cooked. Then after you get that, he used to mix it in a coconut shell cup, you can use any bowl, smooth stone, or what ever. Then he would put a little salt, and flour, and he would work that, and then you would add your seasoning. A little chili pepper, and he'd use the oil from the orange skin, you squeeze that. He also used to put a few drops of kerosene in there. The old kerosene was not toxic, the old Pearl Oil. A couple of drops of that and then he'd get dry corn and

he'd cook that and grind that, real fine. Put a little in there. And you mix that...Some people use a little cinnamon also.

KM: Oh, you're making a paste like that with the *'ala'ala*?

BP: A paste, yes. And he would vary his recipes, he says, "It's dependent upon the *limu* that is in season." The fish are feeding on *limu*, and I guess the bait has to smell and taste something like that. So he'd make about three basic recipes, get that paste fine. You spread it on the bamboo, you make a little flat spoon or spatula of bamboo, then your hook, the tip has to be round, no barb. You get that on, and you roll it till it forms a little ball on the end of the hook. And that's spread on two hooks, you drop that in and usually, you'll come up with a double catch, almost every time.

KM: Ahh, what kind of fish would you catch with that *'ala'ala* like that?

BP: *Kole*, *kole nuku heu*, *maiko*, *'api*, even *uhu* will come after that.

KM: Oh, so they catch the smell?

647 BP: Yes. If, you see an *uhu*, you have to use a bigger hook and a little heavier line, you know. They catch the smell, but the secret is in the cooking. You have to cook that *'ala'ala* just right. You cannot overcook it or undercook it. Because I've seen people just use *'ala'ala*, and some of them just put a little... When you make your *inamona* [*kukui* nut relish], the oil floats on top, put some of that inside. They are basically...some of them are relatively simple recipes, and they work. But my father was a great one to experiment with various things...

KM: So, Dad would make this *'ala'ala* bait and go fishing like that from the shoreline?

BP: He, my uncle Johnny Johnson, the Ho'omanawanuis, they all made *'ala'ala*.

KM: How about the *pā* [lures] that he made. And I see that you still have some of these lures, mother of pearl. Where did he get his shell from? Locally or...?

682 BP: Some were local, some were shells that were brought in from Fiji and other places. But most were from the people who got the shell here. But it took a lot of doing, you had to cut them out, file 'em, put 'em in the vice. Then you make that hook, he didn't use the bone, he used the straight metal. And then you get the right *heu pua'a*, or bristles. And the tying is the art, oh... [shaking head, so fine].

KM: The lashing is so amazing. And he would go out on boat and still trail the...?

691 BP: Oh yes. Most times they would get into the school of *aku*, and they would just *kākele*. Hey, those days, you looked down from *mauka* here, and those schools of fish...the ocean would, you'd see these purple blobs out there. It was alive with fish [they would *ho'olili*]!

KM: Oh, so you could see it glistening even from *mauka*?

BP: Yes. Then he'd call up my uncle Leighton, and uncle Leighton would get his man Keawe Alapa'i, "Get the boat ready," and out they'd go. In no time, he'd be back with 90 *aku* or something.

698 But today, the people don't *mālama* the schools. You get these charters, the fishermen, they just want to get the hook so they can drop it down to the...So they come busting through the schools of *aku* and *'ahi*.

KM: Run?

BP: Oh, before you went around.

KM: Oh, *mahalo*. Thank you so much... [700]

[Brief discussion regarding the old Pu'u Anahulu-Waimea Road, built under the supervision of Uncle's great grand uncle Eben Low, with comments on the roadways in the 1920s.]

BP: ...[Y]ou know, Kona in those days, when I was a kid, pavement ended at Honokōhau. So Palani Road, going to Kailua, was a gravel road. It had not been paved yet.

KM: Oh, so Māmalahoa at Honokōhau, pavement ended.

BP: *Pau*.

KM: Palani, going *makai* was gravel.

715 BP: The only paved roads then, going *makai*, was Hualālai road, to Kailua, and the road down...the Pali Poko Road to Nāpo'opo'o, that was built in about the year 1921. The road to Nāpo'opo'o, prior to that, that was gravel. So, our other roads, Middle Ke'ei, the road down to Pu'ubonua o Hōnaunau, and the Pu'ubonua Road across from Nāpo'opo'o to Hōnaunau were all gravel. And pavement ended at Hōnaunau *mauka*. From there, all the way to Ka'ū, was gravel road. So in the late 1920s, 1926 through 1929, that is when we, West Hawai'i had clout on the Board of Supervisors. We got all the internal roads in Kona paved, plus, they paved the road from Palani Road junction at Honokōhau all the way through Kalaoa. And then in 1932, they got the appropriation to built the road from the Parker Ranch boundary to Ka'ūpūlehu. But they only paved one side. They had the presence, but they didn't have enough money. But they built the base wide enough so you could have a second lane that could be paved at a later date. That was 1932, and then in the mid 1930s the WPA...we widened this road [pointing to the area below his house] from Keōkea to Kīināliu. And there was some miscue in funds, a lack of matching funds, so it was supposed to go all the way to Keauhou, but it ended here.

KM: So your grand-uncle used prison labor...?

BP: Prison labor.

KM: So all that beautiful stone work the old road...

BP: That's right.

KM: Was wide...the old trail was made around the turn of the century?

BP: Uh-hmm. Eben Low, with prison labor...

[Additional discussions regarding roadways and the Humu'ula-Saddle Road; and then preparations for the traveling interview recorded below.]

[Tape 2, Side A]
Counter #
and Speaker

BP: [driving along the *mauka-makai* jeep trail of Honua'ino, in the vicinity of the Kona Sugar Company railroad track berm; speaking of the Hawaiian apostle Ka'ona and his church followers.]

003 He and his followers asked if they...The Lanakila Church was not completed as yet. Grandpa hadn't quite finished it. This was in 1867, and he asked if they could store their... It was a rainy period of time, they were all wet. He and his followers, asked if they could store their bibles there. [chuckles] They took over our church for a period of time. Finally, they were evicted, then they settled down in this area.

KM: So we're right along the railroad berm now, this section here?

BP: Yes.

KM: We're in Honua'ino II?

BP: No, this is still Honua'ino I...Oh, yes, we're in Honua'ino II.

KM: Yes, because we've cut through the [Pā Kula] wall [see *Figure 1*].

BP: Yes, Honua'ino I is the other side of the Pā Pōhaku [stone Wall].

KM: So we're in line with where the railroad ran through here.

BP: That's right.

KM: And we've entered into the land that you called "Pā Kula" [the plain lands wall] the area.

BP: Yes.

KM: So we crossed that wall, about what elevation is that wall do you think?

BP: That's about...let's see, the highway is about 1,450, so that is about 1,100 feet elevation.

KM: Okay. And you'd said, right where that wall is basically, it can be raining on the *mauka* side, and *makai* of that wall...

BP: Well that is about the 800 foot elevation [below the Pā Pōhaku], that wall.

KM: Ah-haa, for the Pā kula?

017 BP: Yes. There you have rain on one side, and dry on the other. So on the north of that wall, in Honua'ino I, Tamoda used to raise the most beautiful watermelons. That was about in the period 1928-1929-1930. Thirty, thirty-one, we had a terrible drought, it was awful, we even used to have to drive our cattle ever other day to the ocean, *makai*, to drink brackish water. [pointing to the road in front of us] Watch this bump, you've got to straddle that.

KM: *'Ae* [yes]. Okay. So you'd said, in fact, you'd showed me, there were clearing mounds down here...

BP: Yes.

KM: Because they'd tried planting sugar down here in this area.

BP: That's right, down to the railroad level.

KM: Ahh, but it was just too dry?

BP: Yes, too [dry]...especially below that one wall that we spoke about. The bulk of the sugar lands were up in the Pā Nui [Great Wall in Waihou vicinity], and in another area we called Pā Kō [literally translated as "sugar enclosure"], and then in Kākākā.

KM: Kākākā?

BP: Uh-hmm. Then of course, when you got down to the Greenwell properties in Kalukalu and those areas, they raised sugar there also.

KM: You'd shared, what I think was a very interesting anecdote about your Aunt Carrie Robinson, when she had...In her will, she made sure that there was a provision to care for...

BP: That's right.

KM: The Hawaiian families.

BP: That's right, that lived on land that she owned. And so when the Shipmans decided to sell that property in Lehu'ula-iki, they carried out that provision that they would be taken care of.

KM: They [the native Hawaiian families] had the first opportunity...

BP: To buy the land.

KM: With their homes and things?

BP: That's right.

KM: That was very important, a good way to care for the families that had supported the land owners through that history.

040 BP: Uh-hmm. Honolulu lands were all left in a trust and to this day... She never had children, Aunt Carrie, but her sister's children have benefited greatly, the Shipmans, and Aunt Noenoe Wall's children, and the Paris *'ohana*. They've all come into...there's 116 of us beneficiaries. And we still share in the income for those lands on O'ahu. So she tied up her land in that trust until 1976. Fifteen years after her death, and it was supposed to be divided, but it was physically impossible to divide sugar lands and everything else. So we went to the IRS with the *kōkua* [help] of a trust officer from the First Hawaiian Bank, Campbell Stevenson, Roy Wall and I, and he, and we got the IRS to let us form a limited partnership so that we could orderly liquidate our assets and not be forced to sell.

KM: Yes, that's so important.

BP: But she really, Aunt Carrie, I remember when she was near death, she got me at her bed side and she said, "Wilama..." She knew that some people would *kū'ai ka 'āina* [sell the land], so she tied up the remnant lands in a trust so that they had to be passed on. That's how my cousin Agnes has that piece, that's Uncle Johnny's property, but it went to Uncle David, then to his oldest child which was Agnes...Then she made these trusts, she believed in hanging on to the land. You know, she got onto her...This was about a year before she died, she got me, I went into see Aunt Carrie, and she said to me "*Wilama, a'ale inu pupule, mahape hū ka po'o. 'Auwē lilo ka 'āina o kou kūpuna*" [William, don't drink till you're crazy, by-and-by, the head will overflow. And alas, the land of your ancestors will be lost]. Ahh, you know, that's what she told me. "You drink, your heads gonna bubble and you going loose the land of your ancestors" [chuckles].

KM: Yes. So sad eh, you sell the land and the money is gone.

BP: Yes, I think of the Lunalilo Trust, they had all that property, Roosevelt High School, all Pi'ikoi Street, and those lands in lower Makiki. Ahh—those trustees decided they would sell the land. Well, that was before the depression, they made bad investments, and look what they got out there at old Farmer's Road [Lunalilo Home]. I mean if they would have hung onto the land as Honolulu built up—Ohh! *Hūpō* [foolish]! [chuckles]

073 [tape off, drive further down the trail] and then tape back on]

KM: You were describing, because I'd asked you, if you'd had any benefit of some of the rains that were further north during the last week or so.

BP: Very Little.

KM: Yes, you'd said something about the *'ōpua* clouds.

BP: Yes, those puffy white clouds. They form a *lei* [like a garland] and float over the water on the horizon. And that's what that song is about, "*Kona Kai 'Ōpua*" (Kona of the *'Ōpua* clouds on the horizon), *O Pua hinano kau i mālie*" (Fluffy clouds like the male pandanus blossoms lifted by the gentle breezes in the calm)." When they are there, usually we have adequate moisture for the land. When they disappear, look out, it's dry. *Malo'o.*

KM: You'd said that it was like a *hō'ailona* [omen]?

BP: Yes.

KM: You see the *'ōpua*, you know that maybe the rain is coming.

BP: Yes.

KM: So you'd get up in the morning and look out *makai* [oceanward]?

BP: Yes. My father, every morning of his life, he'd look out for the *'ōpua*, then he'd look up at Hualālai, he knew by the shape of that mountain and everything. Those old people, they could read the weather [chuckles] better than the weatherman let me tell you [laughing]. They didn't have all those instruments, but it was keen observation, learned by memory and knowledge of people who'd gone before them. All gained from the

knowledge of the Hawaiian people in this area, like old man Ho'omanawanui and others.

090 [driving *makai*] You see, this land has a lot of loose rock now.

KM: Yes. So *makai* here, they just left it pretty much.

BP: [pointing to the right side of the jeep trail] That is the edge of an old lava flow.

KM: Oh, so this, it looks almost built up, but it's actually just an old flow.

BP: Yes, uh-hmm.

KM: I guess we've gone through, the first gate since the railroad (track) that we just went *puka* [enter] through.

BP: Yes.

KM: So now, by a map, I can look and see where we are. Interesting though, some of that rock looks like its...

BP: Yes, some has been piled there.

KM: It looks almost like a wall right there, a little pen perhaps.

BP: Yes. The main trail, used to be right there. The *ahupua'a* trail, so the rocks were cleared from there.

KM: Yes. [continuing the drive the road is rough. Uncle was still recovering from surgery, Kepā asks] Are we doing all right?

BP: Sure. [pauses] So you take these old flows, when we were *mauka*, you notice, you couldn't see this up in the area with more rainfall, but as you come down here, they'll start to crop out. And when you get down to the ocean, then the *pāhoehoe* is bare. Of course, a lot of that is because of sea action, *ehu kai* [sea spray] and stuff like that.

KM: Yes, the salt and everything.

BP: Yes.

KM: Yes, you can just see all of the grass and everything just curling up a bit.

BP: Uh-hmm.

112 KM: So you rotate your cattle through these areas...?

BP: Paddocks.

KM: So you don't over graze the grass and just leave everything bare?

BP: Uh-hmm. It is dry. But we still have green feed in the shade. Of course, this was not an indigenous plant, the *kiawe*. So we don't lack for fire wood and fence posts, that's for sure [chuckles].

KM: Okay, another gate [tape off to open gate, and back on, continuing the drive]

BP: Yes, there is no *mauka-makai* fence.

KM: So below this section here?

BP: Yes.

KM: I see. So the land... In fact, you'd said some areas, particularly makai, you loose, you don't have these *pā 'āina*, the walls...?

126 BP: Yes, all you'll have is an *ahu* [cairn] here and there. But we do have the recording of the old surveys.

KM: Sure. Okay I'll be right back [gets out to close a gate; tape off and back on]. So where we're going now, down to the ocean, is that...what area are we heading to?

BP: The beach of Honua'ino.

KM: Honua'ino, which is the proper name for Kāināliu?

BP: Kāināliu, I'll show you where it is.

KM: Okay. So the real location was a place on the ocean?

BP: Yes. [pauses, as we continue driving] Oh, here's the *pipi* [cattle].

KM: Oh yes you're right, all under the shade, the *malu kiawe*.

BP: Yes [chuckles].

KM: They're smart.

BP: Yes, they're not stupid. Ordinarily, I'd be bringing my yearlings down from *mauka*, but when it was a little greener up there, and they come down here, it's a drastic change, the climate and everything. So we hat like heck to move 'em down when it's like this. That's one thing we used to have to watch out at Pu'u Wa'awa'a. When we brought our young cattle off the paddocks, off the slopes of Hualālai, and we were going to send them down to Hōlualoa, we'd try and move them down around the house, hold them for several days. That's still 2,500 feet elevation, to 2,300. Cattle from lower Pu'u Anahulu and those area, not too much *pilikia* [trouble], its warm down there. But, off the mountain.

KM: Oh yes, 'cause they're so *ma'a* [accustomed] to the cool eh.

BP: So we'd try and put them in the upper paddocks, and then slowly let them acclimate. But you'd have to give them the shots to take care of the pastorella and to take care of the shipping fever and other things, The fever they might acquire from the climatic change. There was always a chance of some loss.

KM: Yes, Julian Gouveia had shared with me that as well. They were using those dry *kula* [plains].

BP: Yes.

KM: *Makai*, Puapua'a-Hōlualoa, when they tried to take their cattle mauka, it was just the opposite. They were so used to the dry warm, and when they got into the wet like that, he said, "Oh, they'd often get sick."

BP: Sick. It's a drastic change. That's why, when Pu'u Wa'awa'a was sold to the Dillinghams, they tried to select their herds by grade of animal, so to

speak. But, they experienced that, you putting cattle from *mauka*, *makai*, and *makai* cattle, *mauka*, for a while there, it really was terrible.

KM: *Ma'i* [sick].

162 BP: Yes, they're not used to it. You've got to let them acclimate.

KM: Ahh. It's amazing though, your grass down here is still green.

BP: Yes. Well those cattle from, they'll come down. And plus we'll be bringing more down shortly. I hope we'll get a change in this weather.

KM: How many people are working with you now?

BP: I just have one full-time man and one part-time. And then when we need extra fence work, we'll contract it out. We're not keeping a big labor force on. [pointing to a split in the trail] You can go straight here. Just follow the tracks.

175 The next wall we come to, is where the Pā Kuakini comes through [see *Figure 1*]. It's not as big here as it is over the other side [from Keauhou to the north].

KM: Ah-haa. But your recollection from memory, is that the Pā Kuakini starts on the south side...

BP: Of Keauhou.

KM: ...Keauhou, and does continue all the way...

BP: Yes.

KM: That's quite amazing.

BP: A portion of it goes on till the *'a'ā* flow comes down in the *ahupua'a* of Honalo, but they don't have the wall on the *'a'ā*.

KM: Ahh, no need eh.

BP: Yes. [pause, continue driving] We've had people try to go down that Ka'awaloa trail...well, you can go down with a four-wheel drive car, but there are some awful bad places in that trail. And end up, trying to get through to the [laughs] Kona Surf side. They'll get this far, and come up these roads, or try to and get stuck. So we have to come and pull 'um up. And oh shoot [chuckles].

KM: So this is the extension of the Pā...

BP: Kuakini, right here.

KM: Amazing. What's your understanding of why this wall was...?

196 BP: Well, of course, you had more of the Hawaiians that were down here, living makai of here eh. And they'd have their own little *pā kēkake* [donkey enclosures], so they didn't want the hordes of outside animals coming down. So they'd *mālama* [take care] *pua'a* [pigs] and their own kēkake [donkeys] and stuff like that, in this lower land.

KM: Wow, what work eh.

BP: Uh-hmm.

KM: [inquires if the shaking around is too much] You'd mentioned that grand uncle Eben Low had used prison labor to get that road towards Ke'āmoku like that...

BP: Yes.

KM: Did you hear about how the labor was assigned in Kuakini's time for this?

BP: No [chuckles]. I'm just wondering, that would have been a damn good use for them [laughs].

KM: Yes. I think I've seen little archival notes between the *pō'alima* [fifth day work law], and the *kō'ele* [royal agricultural field] for the chief, you know.

BP: Yes.

KM: And then the *pa'ahao* [prisoners], even back then, I hear it referenced in the time of the Māhele...

BP: Yes.

KM: So you wonder, maybe when Kuakini had this done...He died around 1844 I believe.

BP: Yes.

KM: Like Judd them, Judd and Kinimaka, for the Kaumalumalu trail [now Judd Trail], they used prison labor also.

BP: That's right.

KM: So that was in about 1849, when Kauikeaouli assigned them that task.

BP: That's right. If it wasn't for the 1859 lava flow, maybe we'd have a road... And I'm sure that if that trail had been in good use, going to Hilo, they'd have improved it for ox carts and horse carts, and carriages and then, we might have a road into Kona.

KM: You know it. That's the thing to me, that is kind of interesting, the old name there, Wall's place there, when he made a mistake, and built in Kaumalumalu instead of Keauhou.

BP: Yes.

KM: Kealapū'ali.

BP: Kealapū'ali.

KM: [translated as] "The warrior's path" like.

BP: Yes.

KM: So it makes you wonder, was there a precursor of something previous to the Judd Trail.

226 BP: [pointing to the curve in the trail] Now we're in Honua'ino I again. But we didn't come through...and this is Lehu'ula [pointing to the right side of the trail].

KM: So this *pā* [wall] right here is the *pā 'āina* [boundary wall] for the *ahupua'a*?

BP: Yes. That's the Wall *'ohana*, Wall Ranch Incorporated.

KM: Ahh.

BP: And over here, off to the right, up on the hill...I don't know if we can see it from here. But, that is 'Ūkanipō, that's a large *heiau*.

KM: Ahh, on the hill in Lehu'ula?

BP: Yes. Right at the boundary of Lehu'ula and Kawanui, is 'Ūkanipō.

KM: Yes. So actually, we went through a gate there, at the Pā Kuakini, that was just left open...

BP: Yes. Well [looking up slope], it's hard to see.

KM: Yes, hard to see with all the trees.

BP: *Klawe*. But, when we get down to *makai*, we'll look up and we'll see a portion of it.

KM: Ahh. Did you hear, was there a shark associated with this area, do you recall?

240 BP: Yes, that's built for him.

KM: So 'Ūkanipō was for that shark eh?

BP: Yes. Some people have asked me why. I just think, associated many times, you will have a friendly shark, he'll come and rub the side of your canoe or something[1].

KM: *'Ae*.

BP: ...or something at night, so "*kani pō*" [resonating, or ring at night].

[on *pō Kāne* (no moon) nights, when they've stayed *makai*, Uncle and his wife, Aunty Bertha, have heard the sounds of music and voices coming from the *heiau* (pers. comm. May 9, 1997).]

KM: Oh sure, that makes sense doesn't it. In fact, "Ū" as a name, is shared with several areas as a shark, you know, Kaūnihokāhi and 'Ūkanipō.

BP: Yes.

KM: So maybe this shark... [pauses; pointing at the trail] Do you want to go straight, or do you want to *huli* [turn].

BP: We go straight now, we'll come out the other side. [pauses] There's 'Ū'ukanipō [also pronounced 'Ūkanipō], right there.

KM: Ohh!

BP: That's the *makai* side of the *heiau*. The *mauka* side, you have the walled in area and everything. They say "That's where the *kahuna* [priests] were and everything." But this is the *heiau* proper.

[1] See an account of the shark god *Kaōpulupulu*; (Interview Notes # 1) at the end of this transcript.

KM: Well see, right there [pointing] in Lehu'ula, there is that orange fence, the metal...

BP: Oh, that is...Allen keeps that locked so people won't go up there and *kolohe* [mess around] with their *akomopila* [vehicle] and everything.

KM: So that's Allen Wall?

BP: Wall.

KM: He's keeping that area locked, sort of to protect the 'Ūkanipō *heiau*.

BP: I have the key, but I didn't bring that one today.

KM: Oh no, I mentioned it as a reference point.

BP: That's why, otherwise they start to go up there and *niele* [get nosy] around that place.

KM: Yes. It's not bad if people go and only look, *nānā wale nō*.

BP: Yes.

KM: But *hana 'ino, hana hewa kolohe* [disrespect and damage].

BP: Yes.

KM: [pointing] What is this *pu'u* [hill] over there?

BP: That's Pu'u Ohau.

KM: Oh Pu'u Ohau, which is the boundary between...?

BP: Halekī'i and Hōkūkano.

KM: And is that also the division between Kona Hema [South Kona] and Kona...?

BP: Kona 'Akau [North Kona], uh-hmm.

KM: So this is off to the south of 'Ūkanipō.

BP: Yes. That was a main triangulation station for this part of Kona.

KM: Ahh, all the fishermen like that?

BP: Yes, no, plus survey. You read a lot of the surveys of this area, the reference point was ka Pu'u Ohau.

KM: Oh, I see we have one more *pā pōhaku* [stone wall] down *makai*.

BP: That's our holding paddock, and a watering pen and everything.

KM: I see a little bit of *'uhaloa* [*Waltheria americana*] on the side too.

BP: You know, before we brought in these guinea grasses and other things, when you used to have *pili* grass and the Hawaiian love grass, and those types of things, you had a different type of feed. You had plenty of the Hawaiian herbs.

KM: So do you remember *pili* [native *Heteropogon* grass] still...?

283 BP: Oh yes. But once these other grasses came in, they crowded out...of course, they greatly increased the foraging on the land. But, they greatly changed everything.

KM: Oh, here's your *hale* [house] *makai* here?

BP: Yes.

KM: [pointing to the stone walls and ruins] And this is all...?

BP: That is Ka'ona, the tomb he had built, but he never was buried in there. He built that for himself. He started his religion and when we get over here, you'll see, he started to build a church here.

KM: Ohh. [pointing] Now look, someone set this *pōhaku* [stone] right here on the *pā* [wall] like that.

BP: [chuckles] I don't know why.

KM: But this is your holding pens, watering hole?

BP: Yes, the water trough is over there.

KM: Oh I see, the little shed there.

BP: One of the storms knocked that tree over.

KM: That big *kiawe* there?

BP: Yes, the *makani* [wind].

KM: Wow, the wind must have been ferocious.

BP: It was a pretty *pilau* [bad] wind, because of me of my young coconut trees, twisted the tops right off.

302 KM: Where do you want to *kū ke ka'a* [park the car]?

BP: Just put 'um under the shed, it'll keep cool

KM: [backing up]

BP: Okay, *hiki nō* [this will do].

[tape off, we get out of the truck, and tape back on as we walk around]

...You know, my father said the last time this wall was broken, was in 1917. But the thing when they rebuilt that wall in 1917, they only made it about half as wide as it once was. And no mortar or anything. But strange, and of course out here on this beach, out to those coconut trees, we used to have grass and *ekoa* bushes and everything. So when Bertha and I came down in the 1970s, we started cleaning this place and had decided we'd make the house there eventually. Well, we removed all the *mau'u* [grass] out here and it opened up a path for the water.

KM: I see. Now if we turn back, this is the little *hale* that you made *makai* here.

BP: Yes.

KM: Is this the one you mentioned the DLNR and the difficulty...?

BP: Oh yes! [chuckles]

KM: Now, you see behind your hale, and see the mortar cement?

BP: That is Ka'ona's, when he started to build the church.

KM: So that is the start of his church?

BP: That's right.

KM: Did someone give him permission, you *'ohana*?

BP: No, he just came down and commandeered the land. Well you know, he went through a period... [looking on the ground where we were walking] I can see somebody's been here, they drank beer. Shoot! Anyway, he went through a period of time, he supposedly got a lease on this land up here, just *mauka* side of the railroad, from the Lunalilo Estate, I think that was. And *'auwē*, William Roy came along and said, "That was too cheap," so he offered more and he got the lease. Well, that got the man quite angry.

KM: Ka'ona?

BP: Yes, Ka'ona. So he moved his people to this beach and he took this place over and he started building his Hale Pule [Church] here for his cult. Well, after a period of time, the rightful owner of the property decided that he should be removed from there. And so Sheriff Neville came down to give an eviction notice, and they did not honor it. Finally, later on, he comes back with a posse on mules and horse back, and what have you, about 30 people, to evict him. Well, they defied him and as a result, Sheriff Neville, whether it was a sling, or if somebody threw that *pōhaku* [stone], I don't know, but he was hit on the head, stunned and fell from the horse he was on, and he died. One of his *maka'i* [officers] was hurt too, so they fled. Now Princess Ruth Ke'elikōlani had been left in charge of the island, the *Kuhina Nui* [prime minister] at that time, she dispatched a militia from [thinking] ...they were in Ka'ū at that time. So they force marched to Kona and the Royal Marines were dispatched from Lāhainā and they came here. But, there was not much blood shed, he [Ka'ona] gave up.

354 But, I was reading later on, and I often wondered from the signs in that guinea grass, you can see old house sites and what have you, what had happened here. Why was the evidence of the Hawaiian population that is exhibited here, and out there [pointing south], Honua'ino and Hōkūkano, why were there so few families. 'Cause I only knew about 17 families in this area.

KM: By your time.

BP: By my time.

KM: Now, how many people were with Ka'ona, about?

BP: Two- to three-hundred.

KM: That many.

BP: But, you see, because of western law, they were tried and then they were *hilahila* [shame]. A lot of them were incarcerated on O'ahu, and

imprisoned in Kailua, so they left this area. My great grandfather in his journal says that it caused a mass exodus from this area.

KM: So that perhaps explains it.

BP: Yes.

KM: You'd said inside, behind the paddock area, where you watered the cattle, the *pā pipi* [cattle corral]...

BP: Yes.

KM: Has house sites, still has remnants of small little *kahua hale* [house platforms], like that.

BP: Yes.

KM: Do you think that some of the paddock walls themselves, that stone may have been gathered from some of the earlier sites and built into the walls?

BP: I don't think so, 'cause right near the wall, there's some near, close.

KM: Oh.

BP: I don't think so. Most of them were just a paved area, raised above the ground, maybe they have some *'ili'ili* [water worn pebbles] and stuff.

KM: Ahh—so you know they were residents.

377 BP: Yes, they were residents. In fact, my wife, one day, was over here. Something she was looking at in the *kahua hale*, on the ground, this thing glittering. And she found an old gold coin [chuckles]. And that point out there [pointing to the south, towards Hōkūkano], is Keikiwaha.

KM: So on the south of this bay here.

BP: And Kānāliu or Kāināliu, is right in the inner part of the bay there. Where you come into the point, you get into the calm in the water in there, that's Kānāliu[3].

KM: Ahh—that's Kāināliu. Now its not way in here, its sort of mid-way from the point to the inner...?

BP: No, its inside. And Pā'ao'ao is right around the bay. Its right around the bend [pointing north].

KM: North of here. And so you get into Lehu'ula next?

BP: [gesturing] Lehu'ula is on the other side of the *pā pōhaku* [a stone wall just past the Paris beach house]. Then when Lehu'ula's *pau*, it comes down by...where you come down from 'U'ukanipō, right on the other side of 'U'ukanipō is the Kawanui *ahupua'a*. Then from Kawanui, you go to Kuamo'o, and Kuamo'o to Mā'ihi.

KM: And you were describing, in that Kuamo'o, that its that whole bay really that is in between... ?

[3] See further accounts of the naming of Kāināliu; (Interview Notes # 2) at the end of this transcript.

400 BP: The bay of Kuamo'o transcends the lands of Mā'ihi, Honalo, and portions of Keauhou.

KM: *'Ae* [yes]. Its so beautiful.

BP: But, this is our place. I see the Tongans did a pretty good job over there on my neighbor's wall.

KM: Oh, so they had some Tongans come...

BP: They had some Tongans come do the work. [walking along the older section of the shoreward wall] See, now this is how you set stone.

KM: So the long end is going in rather than face out eh?

BP: Yes.

KM: That's what you were describing.

BP: This wall was done by...I was away, and after the first *tsunami*, this family who was living next door, who had the use of our property, going *mauka-makai*, all along, they came down and talked to Bertha. They cleaned up all the stone in this yard. They said "I'll fix that wall for you." But, you look at the kind of job they did, its all any old way.

KM: The tsunami in 1946, or later?

BP: No, I mean the high seas. Water in that 1982, flattened...this wall was nothing like this. It was just about half, this wide [gesturing]...

KM: Ahh, about three feet maybe?

BP: Yes. And it flattened this, the water went right through under the house, broke through and broke some of the lattice work. It was high seas. My cousin Allen came down, he said he got up on our verandah, he said "These pōhakus were just submerged in the waves.

KM: So was that Hurricane 'Iwa time?

BP: No, just a sea generated, in the west someplace. But *pilau* [slang for dirty or vicious]. And so in the 1980s, we had three times where the walls were [knocked out]. So I said, "Heck no, we're going to fix this wall. Well, here, is part of the old wall. But they built this wall, the Tongans. I told her [my cousin Pudding Lasiter] "Make sure they make it wide enough." So they did a pretty good job.

KM: Yes. It looks nice. Are there *poho* [hollows] for *pa'akai* [salt] out here too.

445 BP: Oh, there's some. Over there too. There's a good little hole to bathe in too, inside of that *wai wili* [a basin-like pond where the water swirls around] place, sometimes, you have kind of a whirl pool.

KM: Ahh—so that's Lehu'ula side already. And this wall on the side of your place is already the division wall?

BP: The division.

KM: Between Honua'ino and Lehu'ula.

BP: So, I had to move this *pā pōhaku* [stone wall], that's why. Because our boundary goes about ten feet the other side. This wall [the *mauka-makai* wall on the north side of the Paris house] is not on the boundary.

KM: I see, so they've actually made too nice of a *puka pā* [gate opening] right here for the wall, because its going to be inside your wall.

BP: That's going to be inside my place. That was kind of a miscue. They should have made the *puka pā* right on the other side.

KM: Who is this?

BP: This is Pudding Lasiter. And where that other tree is starting up over there, where the *'āmana* [a wooden cross post], that is just about the boundary of she and Barbara Nobriga. Barbara Nobriga's is where all those coconut trees are. Then on the other side of Barbara Nobriga is the Hoopers, from Billy Hooper. His son is married to one of the Mitchell girls from Pu'u Anahulu. Yes, they had...the Hooper family, they have cousins in Honolulu. I know one of them used to live out at Kaimuki, Herbert.

KM: [looking at the ground] A *kukui* nut came down.

480 BP: Looks like *kukui*, it didn't come from here, some one carried it. Anyway, we go on the back verandah, maybe we can... Oh no, these trees have grown too big to see 'U'ukanipō. 'Cause before you get up on the verandah, you can see. We get out on the beach, and you can see. Wherever you go at *kahakai* [the shore], you plant *lā'i* [ti leaves] and then when you want to [chuckles] *lāwalu* [broil fish wrapped in ti leaves]...

KM: *'Ae*. That's right. Ahh—we've got all these *pipili* [weed seeds], on our feet now, and on you pant's legs. [walking on to the verandah of the Paris beach house].

BP: *'Auwē*, the clothes line fell down... No, we can't see 'U'ukanipō.

KM: Yes, the trees grew up through there.

BP: Yes.

KM: Oh, there's quite a nice pā wall enclosure] in here. So this is like the old...

BP: And the other width, the *pā pōhaku* is the *mauka* side [of the enclosure]. To make this holding pen, we just put the stone on top, but we kept the base.

KM: Yes, it's of historic value.

BP: No, we didn't *kolohe* [disturb] that.

KM: That's the old kind of cement, they *kālua* [bake] the coral in the *imu* [earthen oven].

510 BP: Yes, the kiln was right out here, by that coconut tree, you get under the sand, you dig, you'll find all the burnt coral.

KM: Oh wow.

BP: Look, the *pikake* is coming out to bloom.

KM: Yes, beautiful, a good place for it. And what, you get wai [water] just from the roof, or you made a little...?

BP: We have water come all the way from the top.

KM: Wow, too good, some pipe eh.

BP: Uh-hmm. Before, we used to pump water, but heck now, we just run the water down by gravity.

KM: Yes, may has well.

BP: [looking shoreward] Ohh—look at the *limu pahe'e* [a native green flat leafed seaweed that's collected and eaten seasonally]. Plenty *limu pahe'e* this year. One rough sea and it will really grow. That's the best thing for *limu pahe'e*. June, pretty soon, when you get a high sea, and then when it gets *mālie* [calm], boooo! It really grows [chuckles].

KM: So is this where your dad them would come down too, and go fish like this?

BP: Yes, of course, they didn't have a house down here, but he would go over there and talk story with... That's Jock Ackerman's house over there [pointing to a house to the south, Hōkūkano side]. And on the other side, in the back, Sam Ho'omanawanui had a house, and Hailama Ho'omanawanui had another one.

That was one thing Aunty Carrie would turn over in her grave, is that those people didn't get their beach lots. The Kele's got theirs thank God. [walking out towards the shore] Frank Thompson has it now, 'cause Kele's granddaughter, Leilani Whitmarsh, was the principle heir.

KM: Oh, so Leilani Whitmarsh was the heir to that, and she sold it?

BP: No, no, Frank married Leilani. So now its he and his children's *kuleana* [land parcel]. The children come down quite a bit. What we're going to do is, we'll wait and cut the fence post off, and bum-bye, to get rid of the wood, we'll have to burn it. But now we're not supposed to burn fire. So down here we'll tell 'um we're building a camp fire [chuckles]. We have to wait till we get the ground wet. Hooo! So this is where we get all coconuts and what have you.

We've got to go through these piles [looking through coconuts on the ground]. When they clean the beach, the leave the ones the wai on top. But pau these already.

KM: Yes, *malo'o* [dry], a long time.

BP: Oh, this one has. Then we go up Lanakila Church, get our production line going and we make about five, ten gallons at a crack [chuckles].

KM: Wow, and *haupia* [coconut pudding] too?

BP: *Kulolo* [coconut and taro pudding]. I love to make *kulolo*. But you cannot beat your *haupia* and your *kulolo* made from your own coconuts. Its rich. That Mendonca stuff is just too watered down.

KM: It is. I think they just grind up the whole coconut and squeeze more water through it.

BP: Yes, our *haupia* we make with our own coconut milk is *'ono* [delicious].

KM: Uh-hmm.

592 BP: One time, this whole thing was covered with sand. The high seas took the sand way past the *kiawe* trees where the break in the wall is. You see, we haven't finished that side yet.

KM: Yes. So the sand has been pushed back.

BP: Yes. But all this *pāhoehoe* here...not that over there [nearer the water line], but this strip was covered with sand.

KM: Yes, you can see the root of the *niu* [coconut] over there and how its all exposed.

BP: Oh yes, terrible. See the trees over there, how much sand ran away.

KM: Yes. [pauses, helicopter flies overhead; tape off and back on]

BP: ...One inch in, with only one inch on top, and the Hooper boys came down, and I think they were feeling no pain...

617 [end of Tape 2, Side A, begin Side B—playing out blank tape]

[Having gotten out towards the shore, we turned a looked up towards 'Ōkanipō]

628 KM: Oh, its really quite built up.

BP: That's a massive structure.

KM: Did you hear anything about the *manō*, the shark at all?

BP: No, but I can see why. This area, we know of, we had a person the called Kāmala and "John Pokoki" [Portuguese John], they called him, he was a Coelho, and they both were hurt in that area where the whirl pool is, that I pointed out to you.

KM: Yes.

BP: They were knocked down, bleeding, and they got washed out in the high water, and both of them were eaten by sharks. So I think that the people here were real scared because of the history of that. And you know, people we've lost from this area, there's been several, and if you don't get them now [right when they're taken out], they've never been found.

KM: And you said Coelho and Kāmala.

BP: Yes. And then Mrs. [thinking]...one of the daughters was married to a Japanese man, with the last name of Okamachi, their *kuleana* was; oh, we passed by it off to the left. Well, during World War II, they took the mother's name, and they all changed the name to Coelho.

KM: Oh, like Punihaole *mā* [them].

BP: Yes, Robert Eto.

KM: Yes, just to take care of the families.

BP: Yes. So that happened during World War II.

KM: [walking along the shore] Some one *poina* [forgot] their bamboo [a pole sticking straight up out of the *pāhoehoe*].

BP: Yes [chuckles, a land mark *nō ho'i* [giving emphasis to the statement]! But like our *ahu* [cairn] is straight out there on the *pāhoehoe*, and at high sea, the water washes over and you have several of the bowls, where the Hawaiians used it for *pa'akai* [salt]. Its right in there. So in the old days, they believed you owned to the *limu* [seaweed] line. But you can see this are is washed by the waves. You look at how clear it is.

654 KM: Oh yes, and you see the *punakea*, the white coral like that.

BP: Yes.

KM: Oh, *mahalo*.

BP: Uh-hmm.

KM: So Keikiwaha is to the south.

BP: Uh-hmm.

KM: Pā'ao'ao is around...

BP: Around the bend [north].

KM: And that point with the coconut trees way out there [pointing further north].

BP: Ka-lae-o-Papa, that's Keauhou. That's the far end of Kuamo'o bay. You don't see Cape Kuamo'o from here, but if we went to Pā'ao'ao, we could see it.

KM: I see, so that marks the northern boundary of Kuamo'o Bay.

BP: Yes.

KM: And look, still see *niu* [coconuts] in your trees. So many *niu* now, its just like they never get fruit.

BP: My cousin Bobby Hind he said, "I don't know why these people do this." He says "It's just like a man that's been castrated" [laughs]. That was his description, you know.

KM: *'Ae* [yes].

BP: He hated to see the coconut trees like that. But, its because of the liability. The damn fool don't have the sense...[laughing]

KM: Yes, to look up first, "If it has coconuts, don't stand under it."

BP: If its *makani* [windy] give it room [laughing].

KM: Oh look, here's a *kūpe'e* [*Nerita polita*], kind of water worn, but nice.

BP: Yes. So this is our...My two daughters, we've divided, the one on the mainland, owns that side, and the one here, owns this side.

KM: Is the goal in the family, to make sure to keep this *'āina* [land], like this, not...?

BP: That's right.

KM: Good, we don't need any more [chuckles].

672 BP: Hooo! I was so mad one day, the soil conservation...Bertha and I had just cleaned this place, and we had a member of the board of supervisors with us. And he's "Boy, what a wonderful place for a County Park." Hooo [chuckles, shaking his head]!

KM: I know, terrible. See those *niu* that are on the side [pointing out towards the cove behind Kāināliu], one is no more *po'o* [head] already?

BP: Yes.

KM: That must have been a little dwelling area or something.

BP: Yes, that's where Dr. Trousseau's house was out there. People used to call that "the honey of the houses," the hale collapsed and went down.

KM: Ahh—so those last few coconuts... Who's house is this again, here?

BP: Ackerman.

KM: This little house is Ackerman's?

BP: Yes.

KM: So then just past there is, you see that coconut there.

BP: We walk out.

KM: Oh nah, nah [thinking of his recovery from the hip operation].

BP: Nah, then you can see where the other places are. I don't mind walking now.

[tape off as we walk some distance along the inner shore]

683 [telling how his father loved]...the *kahakai* [beach], my mother loved *i uka* [upland], and he said "It was too damn cold."

KM: Ahh—so papa loved the ocean.

BP: Yes.

KM: And mama was mountain.

BP: And he loved to fish. Oh, he used to say, "I can come down here and sit on one of these points with my *'ala'ala* [squid liver bait mix], and if I have anything I want to talk to the lord about, I do it here. I feel we're at ease, we're at peace with nature. It's much better than going to the Hale Pule [church] and you have people there who are good for one hour, and then 'auwē! When the go outside, they *nahu ke kua* [bite the back]!" [laughing]

KM: *'Ae* [yes]. So he'd just go cast out his little *'ala'ala* line and sit down and *Aloha ke Akua* [love God].

BP: Yes. And I go to church and everything, but still when I'm befuddled, I have a place *mauka*, in the *ka nahele* [forest] out there. A nice little peaceful place, I go there. When my mother died, that's where I went. I held on, but I went up there and let it out. My father, the same thing.

698 So I can see, the land has a special meaning.

KM: Uh-hmm. Well see, that's one of the things that you hear eh.

BP: Uh-hmm.

KM: As you said, "The land has a special meaning..."

BP: Yes.

KM: ...and a lot of people are trying to regain that sense of value and... [pauses, walking along shore; tape off and back on]

BP: [points out the former residence of Sam Ho'omanawanui] ...Right there.

KM: Oh, right inside there?

BP: Yes.

KM: Oh a part of the house is still standing, a part of it. About when do you think Sam Ho'omanawanui passed away?

BP: Oh, he died around the middle 1960s. [walking a little further] This is the Ackerman house. And then, we'll walk as far as the Greenwell place. And Frank Thompson's is the far end. [tape off, then back on]

[walking towards Jean Greenwell's beach house] ...Frank and I helped Norman build this house, then they in-turn helped me build my house, then we all helped Frank build his house]. Norman Greenwell, and Frank Thompson. Frank and Leilani.

KM: Ahh—and Leilani was the Whitmarsh?

BP: Yes. [walking]

KM: Oh, the windmill is still going.

BP: [chuckles] But that's disconnected.

KM: For show.

BP: Oh what a time we had putting that monkey up [laughs]. This is now Jean Greenwell's house. Then Frank them built. Frank and them have a lovely yard, it goes out, you can see the stone work.

KM: Sure, I see the *pā* [wall].

BP: When we get over there, you can see down into Kailua.

KM: *'Oia* [is that so]!

BP: I spent many a night cutting these [pointing to the decorative molding on the porch]. They gave me the pattern so we'd all make some up at home, when I had some spare time.

KM: It's very nice, the verandah decoration. [pauses] Hey look, here's a *papamū* [a stone Hawaiian checker board] eh.

BP: Yes.

KM: Right here.

BP: Plenty, all along and in front where I told you that place, Waiwili?

KM: Yes.

733 BP: All along the side, you could see they paid, there's plenty there. And of course, the park there, if this Oceanside 1250 goes through, they're going to have that Hōkūkano Village Park, on that side.

KM: Oh, so from Keikiwaha, just on the other side?

BP: Uh-hmm. So that's going to be open for the public. Well, we have mixed reservations because we know that when people go there, they'll look down and see our sand and everything, and they're going to come, but can't stop it. [tape off, and back on]

[speaking of the large stones used in some of the walls] ...Hale-o-Keawe at Hōnaunau.

KM: Yes, those pōhaku [stones] are so big.

BP: 'Cause, by grandfather rebuilt that main wall in 1917, he moved his family down there, they set up a tent city and lived there for three months.

KM: Right at Hale-o-Keawe, so that big wall there?

BP: Yes, *mauka* side. And of course, the 1950 earthquake, and the remnants from, the 1929 earthquake, they damaged that and the county didn't do anything. So when the National Park took it over, they repaired it with masonry.

KM: What's this little alignment here [low lined trail ruins]?

750 BP: That's a part of the old trail that used to go through here.

KM: Oh, so the trail ran sort of...

BP: When Dr. Trousseau used to bring the wool down from Kanāhāhā, they used to go through here, and had a gate through Thompson's and go out to where you saw those coconut trees. And at Kāinālīu, they used to load the ships with wool. The ships wouldn't come in, they'd send the lighter whale boats in. So this was part of that trail.

KM: So it ran all the way from *mauka*, come down and across?

BP: Come down and came right through where Sam Ho'omanwanui's house was, there's an alley way there, and it came out on the beach. Then they had another branch, that had a gate here, and went over. So this is it.

KM: *'Ae, mahalo* [yes thanks]. So Trousseau would bring the sheep wool from *mauka*...

BP: The wool.

KM: ...so he had his place where those coconut trees are...

BP: Yes.

KM: ...And then Kāinālīu was just a little further...?

BP: Yes, the cove there, where the point that sticks out. You still see the chain around the *pōhaku* [stones].

KM: Oh, so they'd hold the little boats there.

BP: Yes. Then later on they moved the landing to Nāwāwā, by Pu'u Ohau. It was a better place. [pauses] I don't know what happened to this place, we used to have *limu 'ele'ele* [a native green stringy seaweed, that grows in places along the shore where freshwater also rises up into the salt water] in the cove here. And then, somebody must of *kolohe* [made trouble] over here. Now, no more.

KM: So had fresbwater or something coming up here.

BP: Yes. We had good brackish water over here. [pauses] This is Franks house. Here's more of that mold work [chuckles].

KM: The lattice like on the side of the verandah.

BP: [chuckles] You get pretty good with the jigsaw when you make enough of those [laughs].

KM: [laughing] Sure. [pauses]

BP: Too bad Leilani passed away, she used to love this place. She used to come down here when she was a *mo'opuna* [grandchild] with here grandfather, and when they had the old house. Now, if you get out here, look all the way back down, to Kaiwi Point [north of Kailua].

KM: *'Ae*, how amazing you can see all the way to Kaiwi and Kailua side.

BP: Yes.

KM: I guess that's Kona Surf there [pointing to the hotel in the distance].

BP: Yes, and beyond that on the other side, you can see either the Lagoon or the Keauhou Beach. These are choice lots. Good *makani* [breeze] here, cool. This is where you used to go out to Trousseau's place.

KM: So the road would go through there, and out to Trousseau, and...I see a little *poho pa'akai* [stone salt bowl].

BP: Yes, well those, they're from around here.

KM: Over the years, its better to take care of it. [pauses while walking, tape off and back on]

795 BP: ...Grandfather and grandmother, Lu'ukia, they used to use these things. They were *akamai* [smart]. The old people knew how to live in these remote areas. [pauses while walking, tape off and back on]

[speaking of Old Ho'omanawanui *mā*] ...The old way.

KM: Hmm, they'd call, "*Mai, mai.*" That's the part of Hawai'i I love.

BP: [looking around] They must have moved the pet *pōhaku* [stone] down there. They used to keep it under the water faucet from the tank.

KM: I see some more *pikake* here.

BP: They really bloom when they come in. Here's another salt bowl. When Frank and Leilani first started working on their lot, they built that [a section of the structure behind the main house] and that's where they camped and everything. And then as time went by, he built the house.

KM: [pointing to a cave] is that a *lua wai* [water hole] back here?

BP: No, it's just a cave.

KM: I and see put a *pū hala* [pandanus tree], did Leilani weave?

BP: Oh, she could weave, her *mo'opuna* [grandchildren] are learning too.

KM: I interviewed an Aunty Lucia Whitmarsh on O'ahu, for a Mōkapu project... [brief discussion of that project and the Whitmarsh tie]

822 BP: Oh the Hawaiians had many uses for that. Well, we better get going... [pauses while walking, tape off and back on]

KM: That's Hiram...

BP: Ho'omanawanui, Hailama.

KM: So we're right behind Jean's house, so this was all...he'd plant *'uala* [sweet potatoes] and every underneath here?

BP: His house was right out here, and Sam was over there.

KM: [pointing to an old stone alignment] So, is this a part of an old *kahua hale* [house site] here?

BP: It looks like.

KM: Yes, the way its built up here, and that's all *kahua* [platform] there.

BP: Yes built up. And the *pā pua'a* [pig enclosure] was in there. [pauses while walking, tape off and back on]

You know Kai Wah Lee?

KM: Oh yes, and Tak Wah them.

BP: Well, Kai Wah's wife Elizabeth, she a Ho'omanawanui, Hiram's daughter. So she was *ma'a* [familiar] to this place here. She's a Deaconess and Hāili Church. Of course, worked were pretty close in bringing Henry Ōpūkaha'ia home.

KM: Yes.

BP: Well, I told them, I felt we brought him home at a kind of wrong time, because you know, we had the bulk of the Hawaiians, had the interest in the sovereignty. So I just felt that maybe he didn't get as much response as he would have if he had been...When Kaina first wanted to bring him home, three years before, we weren't having the big movement, so maybe we could have done a better thing. Our hope was that he would be as an example of a Hawaiian who went up there, learned five languages, started to translate the Bible from Hebrew in to his mother tongue. And then it showed that if you gave your mind to it, his thirst of knowledge, you could do something. He influenced a lot of people. Without him, the missionaries would never have come here.

852 We were hoping that he would inspire our younger Hawaiians, to grasp as much knowledge as possible. [pauses while walking, and going to get the truck; tape off and back on]

KM: So this is Ho'omanawanui's *hale* here.

BP: Trousseau Road is right, if you go a little; you see the gate, that's where the Trousseau Road came down.

KM: So this *pā* [enclosures/walls] where the *niu* [coconuts] are now, you'd said it was a *pā niu, pā mahi'ai* [coconut grove and garden plot]?

BP: *'Ae* [yes].

KM: So for more dryland cultivation down here. You know, with perseverance and hard work, but they *aloha* [love] so much the land eh.

BP: Yes.

KM: They didn't tire of working it. Even this *niu* is nice too, the *hua* [nuts], small, you know.

BP: You know, when you make *palu* [bait chum], we use the oil from the *niu ka'a* [the dried coconut meet that rolls around in the unbroken nuts]. You know, when you get that coconut that goes caaraca, raca, raca [mimicking the sound of the rolling coconut]. You use that one.

KM: And look at this small one like that, nice for make *'ūlili* [a native musical instrument, rattle].

BP: *Makai* of the paddock, *mauka* side here, belongs to Allan Wall, but we use it, and then this is Ackerman. There land is on the other side.

KM: Yes. So Ho'omanawanui's time, and when you were young like that, he was still growing things down here?

BP: Yes.

KM: *'Uala* [sweet potatoes] and ...

BP: Pumpkin.

KM: Ahh—*pala'ai* [pumpkin] like that.

879 BP: See, between those two *pā pōhaku* [stone walls], that is the Trousseau Road.

KM: I see, so is that a small water tank up there?

BP: Yes, that's Ackerman's pressure tank. Yes, this is where the Trousseau Road puka'd [opened] out on the *makai* side. Then later on, they shifted it and it came down in the area where Yamagata is and they went down to Ka Pu'u Ohau. [pauses while driving, tape off and back on]

KM: [Speaking to Uncle about some of the legendary narratives that I had translated for this area in] ...*Ka Hōkū o Hawai'i*. Some nice Hawaiian texts about here. So it's so good to see it in real life, not just in the writings. [pauses while driving]

BP: Did you do any research, in trying to find the name of that *heiau*, in Lehu'ula *i uka* [upland Lehu'ula]? The one that's near Kōheo. That's the name of that area?

KM: No. That's the *heiau* that you'd said Jean and Dorothy Barrere had looked into.

BP: Yes, uh-hmm. It has a name, I'm trying to remember.

900 BP: There was another lady that lived up in the Volcano area, related to [thinking]
...her *'ohana*, they did some research on *heiau* and stuff...

KM: So we've come back around, we're at the *pā 'āina* between Honua'ino and Lehu'ula.

BP: Yes, that's right. [pauses while driving] We're in Honua'ino, and on the other side of the wall is Lehu'ula iki. There's two Lehu'ulas, Lehu'ula iki and Lehu'ula nui.

KM: So Pudding's *'āina* [land] is in Lehu'ula iki?

BP: Yes. I know when I [chuckling], I always fill out these shipping permits, we have to fill out when we send cattle. You have to have a shipping form which has the cattle's brand on it, the sex, and everything else, and where it says "Origin of Shipment," I always say Lehu'ula iki, North Kona [chuckling]. And these markets, they don't know where the hell that is, you know [laughing]. They all think, "You live in Kainaliu." I say "No!" [laughing].

KM: Yes. Now, when you were shipping cattle, how much did you get per head in Honolulu, and what was the cost of shipping about, per head?

935 BP: When I was a kid, I remember in the early 1930s, right after the depression, we were getting about 17 cents a pound. But then in World War II, in that era, they were getting about...under the O.P.A. ceiling price, they were getting about 26 to 29 cents a pound. But in those days, proportionately, your insurance costs were way down and your labor costs were less, and everything else. So we made, when you figure it out proportionately, more money at that price, than we do now.

KM: Oh boy. [having driven past a stone wall] For my clarification again, that was
the Pā...?

BP: Pā Kuakini.

KM: This section here. Okay so we've just driven back through that.

BP: Yes.

KM: And you've got that [gate] open now, but you don't always have it open, the gate there?

BP: No. There's nothing *makai* of that *pā uwea*, the barbed wire fence. Do I hear dogs? Try Stop. I think it was just rubbing tire.

KM: I think I picked up something in the wheel [making a squeaking sound].

BP: I though "'*Auwē, hae ka 'īlio*" [Oh, the dogs are snarling] [chuckles]. I don't have anything with me, but, there are no *pipi* [cattle] down here, so its probably
...There are a few small little dogs that *lalau* [wander, roam] around here, but they go more after mongoose and stuff like that. But when you get the bigger dogs, and they get after *pipi* [cattle], they can really do damage, they can kill 'em.

KM: Yes, they run 'um.

BP: Yes. One year up at Waike'chu Paddock [*mauka* of Hōkūkano], that's when Norman Greenwell had the place, that one year, they killed about 28 head of yearlings. I got five of those dogs and other people got 'um, and finally, we had to put out poison. You warn all the neighbors, and everybody tell 'um, "Look out, keep your dogs tied."

KM: I know, it's hard, but when you see the impact they have on your animals, you've got to make a choice.

BP: Yes. And I see in the legislature they were trying to pass a law to make it legal for ranchers to shoot dogs on their land. We're better off doing it silently [chuckles], if you advertise, you're going to get into trouble. [pauses while driving]. You try and catch one of those *lalau* [roving] dogs, to go and tell the neighbor, or who ever it belongs to, he going to bite you and he's going to take off.

One thing I got to find out, I've got to change that lock up there. I pulled it by chance and it opened, it shows its worn out. [looking in the field] Oh, our pipi still *moe* [laying down]... [tape off and back on]

1002 [speaking about the religion preached by Ka'ona, he] ...to maintain some of Christianity and some of the old religion, a kind of a blend. But he tried to do several things, like they say on O'ahu, once he kept a corpse in the house for three days, trying to resurrect it and stuff like that. So sometimes, he could be way out.

KM: Was he originally from Kona?

BP: All I know is, he went to Lāhainā Luna School, so he was a fairly educated person. My great grandfather said he [Ka'ona] was very intelligent. Too bad. [tape off—open gate—tape back on]

...The old Hawaiians who went, in fact, just to grammar school, they were sound in their English, penmanship, mathematics. Hooo! Gosh, they were very intelligent people.

KM: They were very...there was good English, good Hawaiian and...

BP: Grammatically sound. Well, they had to be intelligent, look at how fast our people like Kamakau and John Papa I'i, and all of them, they mastered the English language, and they were historians and boy! Henry Kawewehi from here in Kona, and others, they were brilliant people. And look at our Ali'i [rulers], Queen Lili'uokalani, and how they could compose and everything, it was wonderful.

KM: *'Ae* [yes]. You now, you mentioned Henry Kawewehi, he and his wife, Julia, are buried down by the old Ka'ili'ilinehe Church.

BP: Hmm.

KM: And there is a move to try and sell that lot and those graves...

BP: I know Sam Kawamoto has come to me about that. We just talked about it at our Council meeting the other day, [recalling the famous saying of the area] "*Keauhou i ka 'ili'ili nehe, me Helani i ka wai o Puka-iki*" [Keauhou of the rustling pebbles on the shore, and Helani of the spring of Puka-iki].

KM: *'Ae* [yes], that's a famed place. So I know that several of the families I've spoken with are very upset about that. It's almost the last Hawaiian presence there, those 'ilina [grave sites]. So they'd like to see it kept and taken care of.

1043 BP: Hmm. 'Cause the old road to go the other side, went right there, *mauka* of where Arnold Richardson and Alice Hoapili them had their place. And it bent and went down from there, then you went down to He'eia Bay and everything else.

KM: 'Ae [yes], Ha'ikaua.

BP: Yes. That's where the old church there was.

KM: Did you ever hear of Kānehoa's tomb being down there?

BP: No, no.

KM: Aunty Lily Kong took me last week to go past Alice Hoapili's to the small little Awa wa'a [Canoe landing] that was there...

BP: Yes.

KM: And there's still, that old kind cement [crypt-like] there.

BP: Yes, that I know, but I forgot the name. 'Cause we used to get the spooks when we went by old Ka'aha'āina's house, I tell you. She was right on the end, *mauka* side [chuckles].

[pause while driving; tape of, then back on]

[speaking of the Ke'enaki-Ke'āmoku area, Pu'u Anahulu] ...a *kipuka* [area of older forest growth], *mauka* there. And up about four miles above there.

KM: So Ke'enaki and *mauka*?

BP: Yes. And we'd go up and *ki hipa* [shoot sheep] *mauka*. And my Uncle always used to say, "Don't drink too much water, just drink enough." And we'd go along, as we'd start up, we'd carry half gallon jugs of water. Then we'd come to an *'ōhi'a* tree, then we'd hang it. And then we'd go further up and bang another one. So when we came down, we could wet our mouths, but he said *'alani* [oranges] were the best. We'd take orange and you eat that, its juicy, it would quench your thirst. So we never drank too much water. But coming down, we'd all... Once, I took a bunch of *malihini* [visitors] hunting up there, hoo! These were athletes, track runners and everything, but they didn't know how to walk on the *pōhaku* [stone]. And when they saw the *hipa* [sheep], they got all excited, in fact, the *hipa* crossed between them, and here this was cross fire. My Uncle David said, "*Wilama pa'i ka lepo*" [William hit the dirt]! So we hit the dirt. All these guys, and I gave them heck. I said "Don't you shoot when you shooting towards each other." But that gave them buck fever, and I had given each one, a *hipa* to carry. And *hiki 'ole* [laughs, they no can].

KM: [opens next gate] So they just kind of wilted eh.

BP: Well, that happened at Pu'u Wa'awa'a too, when we went hunting one day. Don Carlsmith and his father Wendell, and their handyman, Toshi. And had young Dwayne Carlsmith with them...well, he was in the army at the time, so he had some sense about a rifle, and hunting. The sheep did the same, ran between Toshi and Don and the father, and they had their 30-0-6s, and this war was going on with ricochets going off the pōhaku [stones]. Dwayne and I hit the dirt, and he got mad, he said, "Mr. Paris, show me the trail home. I'm not going to stay with these fools!" [laughing]. So I talked to them and I said, "From now on when you go hunting, no more than two rifles at a time." 'Cause when you have a lot of rifles, and everyone wants to shoot, you look out.

KM: It's common sense, but like you said, they get "buck fever." [chuckles]

BP: Yes. So Wendell, after that, he learned a good lesson. He became very strict on hunting. He and his son almost killed each other.

KM: So we're back at the rail road track berm.

BP: Yes. See some of the fill there?

KM: Yes. Now, was this the old West Hawaii Railroad?

BP: KD Company, Kona Development Company. [pauses while driving; tape off, back on]

1135 KM: [speaking of the sugar plantation venture] ...So they really went to a lot of effort, clearing areas like that.

BP: Yes. This here, if we had cheap water, we could raise a lot of stuff here, citrus, melons, and everything. Of course, melons today is such a job.

KM: And this is the pile of rocks you said, that stone was taken to make Henry Ōpūkaha'ia's memorial?

BP: Yes. We took all the flat stones from there.

KM: Uh-hmm, and that's one of the old sugar field clearing mounds?

BP: Yes. Have you seen that new grave site?

KM: No.

BP: Well, you go down to Kahikolu Church, its right *makai* side of the parking lot. It's really something. All together, to get him home and to build that burial site, of course it is an elaborate burial site and everything. The cost was about, with all the expense plus the *pā'ina* [banquet] we had after the reinterment, to get him back from the United States, it cost about $27,000.00. It was big money. We had to pay all those kind of permits and stuff up in New England

KM: [as we drive up to another cross *ahupua'a* wall] Is this the Pā kula?

1169 BP: The Pā kula begins one more stone wall up above, but this is the line I said, that divides the rain fall.

KM: I see.

BP: By this *kumu manakō* [mango tree].

KM: Yes, nice one too, nice healthy little *manakō* [mango]. [tape off, back on]

BP: [speaking again about Ka'ili'ilinehe at Keauhou] ...*'ili'ili nehe*, it really kanis [resonates]

KM: *'Ae* [yes], that's why its sad, because they put the wall on the water there, and cut it off, so you loose that place [*wahi pana*].

[pointing to the feature] So is this just sort of a small gathering, or holding pen?

BP: Yes, we work and load our cattle there. We have a squeeze shoot there. When we have to treat animals or anything, we use that area. *Wāwahi pipi* [separate cattle], or anything. Some people say *ho'oka'awale* [to separate], others say *wāwahi*.

KM: *'Ae* [yes], for separate, break 'um apart. There's some under the tree there.

BP: They're smart, the heat of the day, they go *moe* [sleep] under the trees, and when it comes evening time, they go out and graze in the cool. In dry weather, sometimes its better to leave your cattle alone, they know how to *mālama* [take care themselves]. When you start pushing them around, they get hot, and look out. [tape off, and back on]

...The higher slopes of Hualālai, from about 3,800 feet *mauka*, those cattle up there, never had a drop of water, they all lived off the dew, because your cloud shroud in the evenings, dampened the grass. But you'd see

them in the day time, they were all under the *kumu koa* [acacia koa trees]. But, if you started pushing them around, you were asking for trouble. They knew how to take care of themselves.

KM: So the dew was *lawa* [enough]?

BP: Yes, 'nough. [tape off, and back on]

1207 ...From the railroad down, we used to have plenty *pā-nini* [cactus], and in dry weather, you'd go and cut *pā-nini* for you *pipi* [cattle], and they'd get the moisture from the leaf. There's a lot of moisture in cactus.

KM: And this lantana, you'd said before "just covered everything."

BP: Covered the place. Every once in a while we'd have to come...you can see it kind of set back now, we have a parasite that comes in and defoliates it.

KM: So you folks, in your dad's time still did some burning occasionally to clear out large sections of this?

BP: Yes, that's right.

KM: Even in this area here?

BP: Well, its more from that wall, the dry wall *makai*.

KM: Boy, and I guess that lantana, nothing can go through it eh.

BP: No. [pauses]

KM: [looking to the Lehu'ula side] I see these guys are growing...

BP: Avocado, citrus, it's Sasaki.

KM: So this upper section of that wall, went down after the earthquake?

BP: Yes, in 1929. He never put it back. Well at that time, he used to have milk cows and everything else... [1248 end of Tape 2, Side B]

[Tape 3, Side A]
Counter #
and Speaker

001 KM: [discussion in progress, regarding the importance of collecting oral history interviews] ...Its so important, you know. Its good to understand how people were living. Particularly the old families, what you're describing about Ho'omanawanui *mā* [them], and how they would *kanu* [plant] their *'uala* [sweet potatoes], and get the *pā niu* [wall enclosed coconut groves], and the *mahina 'ai* or *mālā 'ai* [cultivated plots].

BP: Uh-hmm. *Mauka* here, they would *mahia 'ai* [cultivate] the *kalo* [taro], and they also had *'uala* up here. And [in historic times] they'd raise a certain amount of vegetables too, beans and stuff like that. Carrots and *akaakai* [onions] too. [pauses] That is the Coelho's house site, where the coconut tree is.

KM: Ahh—so its just a little below the main road eh.

BP: And they used to have another place down there, past the Trousseau place. [pointing to a house on the Hōkūkano side of the trail] That's my sister's son's home there.

KM: How many brothers and sisters did you have?

BP: I just have one sister. Most of our Paris' didn't have many children. The other had two, my Uncle David had four, my Uncle Bob had one, and my Uncle Alec had one. Aunt Ethel didn't have children, and Aunt Mae had the most, she had five. But being married, the surname changed to Smith...

KM: [pauses while driving] Oh, you get this nice breeze again.

BP: Yes, the *makani* [breeze], when you get up on the knoll... Big difference in temperature, *mauka* and *makai*, I tell you. Anywhere from 5 to 10 degrees difference. That's why I get so mad when they list Kona, and they list probably one of the hottest places in Kona, the airport, as the temperature. When we're up here [chuckles].

KM: Yes. And there's two reasons why its so hot...

030 BP: The pavement.

KM: That's right, that's the primary issue right there.

BP: Look at that airport in Honolulu where they take the temperature, how hot it is. *'Auwē* [032 tape off].

[Having arrived at the gate on the highway, we took a break, and then proceeded *mauka*, driving up Barbara Nobriga's driveway (the old Trousseau Road), passing her house, and on towards Waibou]

KM: [This road] bed here, is this part of the old road coming off of the mountain?

BP: No, they did this, not too long ago. They used to *pakika* [slip] on that hill a lot. But you can see all the old clearing walls eh.

KM: Yes, yes, these mounds. Now, there was sugar here right?

BP: Yes.

KM: And you said we're in the *'āina* [land] of Kawanui?

BP: Yes. But Kawanui, *make* [ends, ends] right up at the next *pā pōhaku* [stone wall] where all that vegetation is. This part, and then the other Kawanui, there's a couple of them, one goes further up. Kawanui dies right at this *pā pōhaku*, as does one of the Honua'ino also. Here's another of the citron trees. Yes, this is the Lehu'ula nui *pā pōhaku* here.

KM: Yes, right on the side here. [pauses while driving] And I see underneath the trees, on the north there, is that another division wall?

BP: That's still in Kawanui.

KM: Oh, there's all macadamia trees.

BP: See you get some macadamias.

KM: Now, it was sugar right?

BP: Uh-hmm.

KM: So these clearing mounds like this, were probably from the plantation days.

BP: Yes... *'Auwē*, the *pipi* [cattle] got in with these young trees. [tape off, back on]

KM: Oh, it looks like they made a little exclosure eh.

BP: That's an old...there's a stream that runs in real wet weather, out of the little bogs up here, and they used to catch water there, and they had a small tank *makai* with a filter in it to clean the water. [pointing to the wall] You see, there's one of the *puka pua'a* [pig gates] over there.

KM: Oh yes. Now, is this the wall that cuts off...

061 BP: Now *mauka*, is Lehu'ula.

KM: I see, and that's like a little *puka pā* [gate] for the *pua'a* [pigs].

BP: For the *pua'a*. And this was old Pila Keali'i's pig trap here. He used to work for Allen, and he used to trap those wild buggers in that trap. [pauses, tape off, and back on]

The wall is the lower end of the Pā Nui [Great Wall or Enclosure—of Kamehameha I, built in c. 1814]. But, a lot of this stone was taken away during the plantation time, to line roads and what have you.

KM: Ohh—so we've entered into that 450 acre...?

BP: 600-plus acres [enclosed by the Pā Nui]. And when we get up over here ...Ahh—I should of showed you where the North end of the Pā Nui is. But, we can when we come back down. Yes, they removed a lot of the stones in the plantation time. They took about half of that wall off. So this was in sugar and now its all in jungle.

KM: Oh look, there's a *hāpu'u*...

BP: Yes.

KM: So still has a few native plants.

BP: Yes, the *'ōhi'a*...wow, plenty of the strawberry guava.

KM: Hmm. Did you hear a story about how all this was built, this Pā Nui?

BP: It was built for his *pipi* [cattle], that's all I know[1].

079 KM: Did you hear, that it may have been...well, Kamehameha ordered it built, but that it was like real fast, or did it take some time?

BP: I think it was done relatively quickly. You know, those days, he had the power, when you're told "*hāpai pōhaku*" [carry stones], you don't [laughs]...

KM: Yes, they carry stones.

BP: No back talk. Today, you tell 'um "*hāpai pōhaku*," they tell you , "What you think me, Tarzan?" [laughing] *'Auwē*!

KM: Yes.

BP: When we get up here, you go where that iron gate is. That's where we'll go to Waihou. This is where we go *mauka* to our place, on the other branch.

KM: Ahh.

BP: Bum-bye, in the future someday you come, we'll *holoholo i uka* [travel to the uplands], look at the ranch lands and everything.

KM: *'Ae* [yes].

BP: We have a small interest we keep in this for right of way purposes, this is undivided property in this area.

KM: Ahh. Its nice to still see some *'ōhi'a* here.

BP: Yes, quite a lot coming in here. [pauses] Okay, now I've got to give you a key.

KM: Okay [tape off, and back on]

BP: [speaking of a parcel of the property that had been sold by the Shipmans]

KM: Is that Cendric Woodhouse's?

BP: He bought that from the Shipmans. He cleared all this *'āina* [land], then *'auwē* [alas], they didn't follow up and all the *mau'u pilau* [bad grass] came back. And this pilau broom sedge came in when they built the soil conservation district. Evidently some...you know, equipment is one of the worst spreaders of...especially tractors. That's what brought that pluchia in, that was *mauka* side by Allen's gate. [pointing along side the trail] This stuff, this is *pilau*.

KM: It is, yes.

BP: This was brought in during World War II to camouflage those bunkers and hangers they had for the air craft at Hilo airport, Lyman Field. This is what they brought in from the South Pacific. Now its spread all over the islands. [tape off, and back on]

The remainder of the transcript includes excerpts on discussions of native and historic uses of the land, and certain family customs (breaks in discussion are indicated with ellipses "...").

119 ...He [Cendric Woodhouse] cleared a big flat over here, he was thinking of making a polo field over here. Then he went up below Waihou at Hāli'imaile and built another flat area, but he finally ended up putting everything at Hāmanamana, on the other side, in the land of Honalo.

[looking around] Boy, this broom sedge has really spread out. [pauses, continue driving]

But, you give it time, the *'ōhi'a* is going to poke its nose out all over the place.

KM: Yes. [pause] Oh, this Christmas berry is sure thick too in areas eh.

BP: Yes, but, you know, I have mixed feeling. I feel up in this wet belt, this is up in preserve, kind of a water shed like, and if you were to subdivide lands like this, you would have the worse dam flood problems, because this is in a high rainfall area. Usually, if we were not going through a dry period like now, this place would be muddy and everything else. But a lot of people just have the idea that...we tried farming right above our house for vegetable crops and what have you. Every time we'd get a cloud burst, especially just after you plowed and everything, the soil that would was, no matter what you did. You get caught in that area where you've plowed the field, and there's nothing on it, you look out.

That's why, you have to farm in strips, you always have to leave something in vegetation, you can't just bald-head the whole side of the hill.

KM: Yes, but that's what a lot of people do.

BP: Yes. Oh boy! Like when he [Woodhouse] first started clearing up here, he kind of changed the water course a little bit. Oh! One day the road comes down, going to where my daughter's house is, where Bertha and I live, a pile of water came roaring down, and we'd never had water like that before. Because it cut off the ditch up here, that takes the water over the side, and it just followed this road down. Hoo! So we came up later, and put run-offs in.

KM: Oh, here some more of that citrus (citron), *'alani* like. So was some of that spread through this area?

BP: Well, most of it was planted here, like Waihou. That makes good lemonade. The best lemon pie, I tell you. See, look at that stand of *'ōhi'a* coming up.

KM: Yes, nice.

BP: And across over the other side, is Uku'ula. And then on the other side of that, a cousin of mine's husband, has planted quite a lot of coffee up there.

KM: Is Uku'ula a small *'ili* [land parcel] name, or...?

BP: Its just a place name. Up here, this place is fairly well open, *mauka* side of the *pā uwea* [barbed wire fence].

KM: And we're still within the enclosure of the Pā Nui?

171 BP: That's right. Pā Nui, the wall goes down...ahh—we can't see the stone wall, when we get up by Waihou, I'll show you.

KM: Wow, amazing. [approaching a closed gate] Is this one *pa'a* [locked] too?

BP: Oh, I see a *laka 'ia* [lock]; where did I put that key now? [tape of and back on]

Now the Nobrigas, I think they only come up this way when they're on horse back, but when they go up by car, they go up the road that comes up through the coffee farm over there. I haven't been here for a long, long time.

KM: Oh, someone did some big clearing eh.

BP: Uh-hmm. Yes, they broke down the old brush piles, and they've done some clearing here. I wonder if he was going to make a reservoir or something. Its a good site.

KM: Oh, a *kōlea* [golden plover].

BP: A plover, yes.

KM: It has its traveling colors, the black breast and white stripes.

BP: Yes, they leave us [thinking]...they should be going home soon. The first full moon in the month of April or the first full moon in the month of May, they'll leave like clock work, every year. That's the time. Funny how they've got that built in time. You wait, the next full moon, they'll be going home. A built in compass, they go all the way to Alaska.

KM: Amazing. Oh, look at this nice *kukui*.

BP: Yes, oh, and some small ones down there. [pointing in front of us] There's Waihou, the big eucalyptus trees. Well actually, the *punawai* [spring] is this side.

210 I know, my dad and I used to come up, we had a siphon pump to take the water out of that hole. We'd start the water flowing with the siphon pump. Now we've got to go over the ford, this is the soil conservation district. We, our Kona Water and Soil Conservation District put this in. This goes over to a lava tube and we have a concrete chute over there, and we put the water into a lava tube, and the water just goes down there, where it goes. I always used to say, "I hope it doesn't come up in somebody's *hale li'ili'i* [out house, or restroom]" [chuckles]. It looks like they've been using this ditch quite a lot. [pauses, driving along]

KM: Ahh—I see the wall over there [on the left side of the trail].

BP: That's the Pā Nui, the stone wall goes this way. That's the top of the Pā Nui here, it's *pau*.

KM: I see, so where we entered, *makai*, now this is the top.

BP: And the other wall goes down by the eucalyptus trees over there.

KM: Wow, its a big wall.

BP: [chuckles] Yes...

KM: [driving towards the Waihou homestead] Look, there's a little triangular wall enclosure.

BP: Well, they always used to *mahi 'ai* [garden] in there. There was always something planted, mint parsley, something...

254 This place, they used to have coffee trees and everything.

KM: Did anyone live up here?

BP: Yes, William Roy spent his last days of his life up here. He loved this place. Here's the old house.

[At] Makepā, used to be an *Inia* tree, Pride of India, over here. It used to be right over there by that Christmas berry, is where you have a little stone wall, and puka down, and underneath is the water. So we used to use the pump to get the water. That's Waihou.

KM: So by that clump of Christmas berry over there [on the north side of the homestead]

BP: Yes, there used to be an Inia tree right by the side, but its *make* [dead] already. So this was the old *pā kuni* [branding corral] in here, it was a big *pā loa* [long corral] they had.

KM: So this is *mauka* of the Pā Nui.

BP: Yes, its in the Pā kō [the sugar lot], right *mauka* side. [pauses] See, there's one of the old coffee trees. And this coffee up here...Ohh! Your high elevation coffee is real *'ono*, it has a terrific taste.

[stopping the car, we get out and walk around the old homestead]

293 KM: Its so *'olu'olu* [comfortable] up here.

BP: We used to look forward to this place. We'd go *mauka*, and you'd be coming with *pipi* [cattle], and we'd *ho'omaha* [rest] in here. *Ho'omaha* the *pipi* and old man Nagata used to be the care taker up here, he and his wife. And they'd have...you could smell the coffee on the old wood stove, you know. And then they'd know about what time, and they would have hot cakes, and even us kids, we'd drink the coffee with condensed milk. You'd be cold, ohh—rainy day, you feet all shriveled. Most of us would ride barefooted. I have wonderful memories of Waihou.

KM: *'Ae* [yes]. Now who built this old house here. It was built by William Roy.

KM: I see. Now is William...?

BP: He married Eliza Davis-Johnson. She was married to William Johnson first, and then she married him after.

KM: And that was Mauna Roy's...?

BP: Grandfather, right.

KM: Oh beautiful, this stone walkway. Look how nice even the steps were set, all dry set stone.

BP: Yes. The old saddle house used to be over here. We used to have camellias, fuchsia, lilies, and up here is the old cottage. This is where my mother and father spent part of their honeymoon [chuckles].

KM: Its a beautiful place.

BP: Boy, look at the peaches. Here's the old house. They put a fire place on there, and the kitchen was here. It looks like they're not maintaining the upper lawn too much any more. The old *hale ho'opau pilikia* [out house] used to be there, and they'd have all the old magazines, order books [chuckles], you'd go through them. Oh, the begonias are beautiful.

KM: And the peaches, look coming ripe almost.

BP: Almost.

KM: So how old about do you think this house is?

BP: Oh boy, I'd say, its probably built around...Let's see, Uncle William Roy ...Grandpa Johnson died in 1867, so some where after that. Its well over 100 years old.

KM: So *'olu'olu* [comfortable], who has this *'āina* [land] now?

BP: Its Barbara Nobriga and Pudding Lasiter, and now they're trying to divide it out. They've had the surveyor up and everything. I've got a hunch, that's why one side is not being kept too well... I see the *neneleau* [a native sumac] grove behind...

KM: So this house is situated just outside of the big Pā Nui then?

371 BP: That's right. *Mauka* here, was the Pā kō, that's for the sugar that was raised up here.

KM: And they enclosed it to keep the *pipi* [cattle] out?

BP: Yes... [looking at the stone paved path] This is all *pāhoehoe* flagstone, Hawaiian stone. They prided themselves in workmanship in those days, I tell you.

KM: Yes.

BP: That's the old servants quarters down there. The old man used to live there... I haven't been here for a long, long time, about eight years ago, when one of the girls got married.

KM: Are there any family burials up here?

BP: Uncle Allen and Aunt Noenoe were there, but they moved 'um *makai*.

KM: Okay.

430 BP: They were right in the little triangle there *mauka* of the house...

Up where our house is at *Kūlia i ka nu'u*, that's what Mary Kawena Puku'i named the house, up there, at night, it goes down, when we have the *kea* [white mantle] on Mauna Loa 38-36°, our mauka house.

KM: About what elevation is that?

BP: Three-thousand-four-hundred feet, in the *'āina* of Lehu'ula... [pause—walking around looking at the homestead] The road to *mauka* goes over there where you see the *'ōhi'a* trees. That's what we call the "Lae 'ā." We go up over there to go *mauka*, that's on an old *'a'ā* flow. So now-a-days when we bring *pipi* [cattle] *makai*, we bring them in the trailers and we

don't drive them down like we used to. We have less men now and everything, its safer, they can't run away in the guava and the Christmas Berry, and everything else...

[return to the truck and begin driving *makai*]

[describes how they caught the wild cattle up here] ... They'd established quite a little herd up here. So I put this stuff [pens] in to trap 'um out. And we got 'um all with these pens.

KM: So you came back from Pu'u Wa'awa'a in...?

516 BP: I came back in 1959, so in 1960, 61' we started trapping these cattle.

KM: So were they kind of *'ahiu* [wild]?

BP: *'Ahiu*! Big son-of-gunz too.

KM: So we're on the southeastern corner of the Pā Nui?

BP: That's right, the Pā Nui.

KM: And you think its about 600 acres?

BP: About 647 acres... [photo taken of Uncle Billy at the southeastern corner of the Pā Nui] [tape off and back on]

...We're in Honua'ino here, and Honua'ino goes up to a stone wall about a mile above here. And over there, is Lehu'ula.

KM: So the wall [Pā Nui] is predominately Honua'ino?

BP: No, it goes into Lehu'ula, I'd say more of it is in Lehu'ula. Lehu'ula is bigger.

[driving along the wall]

KM: Beautiful, the rock work is still good inside here.

BP: Yes. [pause] Right here is where the *pā loa* [long wall] ends. I don't know, Woodhouse didn't believe in repairing stone walls. Even our boundary fence with him, we repaired the stone wall, and he still put the *pā uwea* [wire fence] along side. And you know, a wire fence is constant maintenance. The stone wall, you fix it one time, its *pau* [chuckles], until the next earthquake. That's the only trouble with *pā pōhaku* [stone walls], when you get an earthquake, you usually get a lot of work all at once.

KM: So who put the wire fence along this side here?

BP: Woodhouse. And actually, a wall like this is not much to repair.

KM: It's so thick, its not like you've got to start from the bottom up.

BP: Yes. [noticing a break in the fence line] Oh boy, they better fix this quick or they're going to have *pipi* [cattle] out in the guava.

607 Now the *heiau* that I speak about, is about 200 feet that way, and *makai* of the Great Wall.

KM: I see, we're still on the *mauka* elevation of the Great Wall, on the *makai* side of the wall, about 200 feet from this fence line.

BP: And then maybe about 150 feet *makai*, is the *heiau*.

KM: Is it in fairly good repair?

BP: Yes. Of course, I haven't seen it for quite a number of years, but it was in good repair. We used to have some grape plants there, and I always used to go and pick 'um...

[Kōheo is the name of the land in the vicinity of the upland *heiau*. There is a spring below Kōheo that is called Paipai, because there was a pump that was set up on the spring. The pumping motion was likened to the rocking of a the *noho paipai* (rocking chair).

Another spring in upland Lehu'ula-nui, near the 3400 foot elevation, is called Wai-ka-manō (water of the shark). I always used to ask my father about that name, if it was supposed to be "*manu*" or birds because it's in the uplands, but he explained that it was "*manō*" for the shark. Though I never heard story about why, there is the account of the shark and *heiau* in coastal Lehu'ula, so there is probably some connection (pers. comm. June 4, 1996 and May 9, 1997).]

[630 — end of Side A; start Side B]

...Barbara Nobriga lets her horses out into this Pā Nui, so that's why you see the grass chewed up along the fence on the outside. [continuing drive along trail]

643 KM: There's mounds of stone scattered inside here.

BP: Yes, that's from the plantation.

KM: So there was sugar up in here.

BP: Yes. People have looked at this and said, "Oh, what a wonderful place for a golf course." That's usually it eh, the first *mana'o* [thought] of the new people. Here's remnants of a stone pile.

KM: I would say "so funny," but really, its not funny to talk about the golf course. Oh here's some *uluhe* fern.

BP: That stuff can burn when it burns. That's where the blooming hippies were raising...before the helicopter, they'd go into a big clump of *uluhe* and clear out in the middle and then they'd plant their *pakalōlō* [marijuana] in the middle of the opening...

Oh, this part of the fence went right through a stone pile... [continuing the drive]

KM: You know, the *heiau* that you'd mentioned was up here, is there any thought about what type of *heiau* it might have been?

BP: That I don't know...

[tape off, open a gate]

[speaking of Aunt Carrie Robinson] ...The people who would work for the family. I remember once a month she sent their pensions to my mother, and my mother would go and deliver these stipends to all of the pensioners. She took care of all the Hawaiians and Chinese, and everyone the worked for the family. It was really something. And at Christmas time, the *Humu'ula*...she would tell my father to arrange a shipment out of Keaubou at that time, because she had cattle up here too, and dad used to *mālama* [care] for her *pipi* [cattle]. So when we'd ship at that time of year, the *Humu'ula* or *Hawai'i* would come in with barrels of salt salmon and cases of apples and oranges and that was all given to the Hawaiian families.

KM: About when did Carrie Robinson pass away?

BP: 1938. She really *mālama* [cared for] her people. My Grandma Paris did the same thing with the people who worked for our family. So when you get people like that, she'd have *pipi* [cattle] killed at every holiday season so they'd all have some fresh meat, and that is the way it was. We still do that ourselves, we butcher, and we give meat away to friends, employee, and things like that at every Christmas and New Years... [Having arrived at the lower elevation of the Pā Nui, Uncle Billy observed]:

753 BP: This is the lower end of the Great Wall, but part of this was removed.

KM: Ahh—this is the section that you said was sugar fields like that, and where they were harvesting rock for other uses.

BP: Yes... [in the fields *mauka* of the Paris home] We had this all in truck crops at one time. Hoo! But the erosion was terrible.

KM: And you'd laid pipes for irrigation?

BP: Some... [tape off at 787; end of recorded interview]

While conducting oral history interviews with Aunty Kapua Heuer (Uncle Billy's older cousin) on May 9, 1996, and with Uncle Billy on May 15,, 1996, additional information regarding shark gods of the region was recorded. The following narratives are excerpted from those previously released interviews:

Interview Notes # 1
The Shark God, Keōpulupulu

As a child, Kapua often heard stories about a shark god of Kona who was named Keōpulupulu. Keōpulupulu was reportedly a very large shark who traveled the waters north towards Kawaihae, and south to at least Ho'okena. Kapua notes that though she never personally saw Keōpulupulu while she was out with her father, the Kalawas, Ho'omanawanuis, or other families, she heard many stories about the shark. She recalls that the shark figured as an important part of the traditions and practices of area fishermen through the 1930s. After that, he was not seen again. It was generally believed by Kapua's elders that the disappearance of Keōpulupulu coincided with the rise of commercial fishing in Kona—non native fishermen are thought to have killed or driven Keōpulupulu away.

Kapua's Uncles John Johnson and William Johnson Paris told her of many experiences they had with Keōpulupulu. The shark's back was covered with barnacles, *'ōpihi*, and *limu*. While they were out in their canoes, fishing, Keōpulupulu would rise up next to the canoe. The fishermen would scrape his back and clean him, and then whatever fish they had caught prior to Keōpulupulu's visit, would be fed to the great shark. After eating, Keōpulupulu would depart, and in a short while he would drive schools of *'ahi, aku,* or *'ōpelu* back to the fishermen, and they always went home with plenty of fish to share with the family.

While discussing the various forms and the nature of sharks, Kapua recalled that at Lehu'ula *makai* is the *heiau* that 'Ūkanipō, dedicated to a shark god. On the shore below the *heiau* is an ancient canoe landing, within a somewhat protected cove. It has been a popular swimming area for the families. Kapua recalls, though, that one of the Ho'omanawanuis was killed by a shark there, and to this day, she will not swim at the landing. She prefers the protected *Kaneka* (tidal pools). Kapua's *mo'opuna* (grandchildren) will call out to her "Nana, come swim with us." She responds "You're not going to get me in there, the kahekas are fine!" (laughing) (pers. comm. May 9, 1996).

Following the interview with Aunty Kapua, Kepā spoke with Uncle Billy, who recalled hearing about the shark from his father and Sam and Hailama Ho'omanawanui *mā*. His recollections were like those recorded in the notes from Aunty Kapua, though he was very pleased to learn the name of Keōpulupulu. Uncle also recalled that his family was familiar with another shark, which lived in the waters between Kaunā and Kaulanamauna. The stories of this shark are much like those of Keōpulupulu (pers. comm. May 15, 1996).

Interview Notes # 2
Kāināliu

The following narrative, recording the variations of pronunciation and meaning of Kānaliu-Kāināliu, is excerpted from the interview between Uncle Billy and Kepā, on March 7, 1996 (Tape 2-Side A):

BP: 083 ...Kāināliu is a spot at the ocean. Where's our area [looking at the 1924 Quad]? He'eia Bay, we come over here...

KM: Let's see, we may not, oh, here's Kanāueue.

BP: Yeah.

KM: Here's Pā'ao'ao, yeah.

BP: Pā'ao'ao, Well Kāināliu is right here.

KM: Oh, right in Honua'ino, right in the little cove there, yeah.

BP: Yeah. Yeah, that's where they used to come in, and some people say the proper name is Kānāliu. That's where they used to come in and bail the bilges.

KM: Oh, I see.

BP: Yeah, of the double canoes. They would come around Keikiwaha Point. And usually, if it was rough, they'd come into the lee, here, bail the canoes out before they proceeded, or vice a versa if they were coming from the north. Before they'd go out of this area, they'd bail the canoe bilges out. So Kānāliu, or Kāināliu is here. The village was...Honua'ino Village is the proper name. Honua'ino is the name of the land, Lehu'ula, then Honua'ino...

During follow up conversations on June 4, 1996 and May 9, 1997, Uncle Billy added the following comments on pertaining to practices and place names:

Lānai-o-Kauhi (sheltered porch of Kauhi). Kauhi was a chief who resided in the coastal village of Hōkūkano, he enjoyed watching the fishing canoes returning to shore with their catch of *aku, akule,* and other fish. On the rocky point that is known by the name Lānai-o-Kauhi, an open air shelter was erected so the chief could watch the canoes return to the shore.

Monohā and Palena'āina (*mauka* Lehu'ula-Keauhou, below Pūlehua) were among the last sources of good canoe logs in this area. In the early 1930s, there was a revival of canoe racing. Old Charlie Hua and Charlie Moku'ōhai went to Monohā and Palena'āina to cut logs for the canoes. I went with them when I was just a kid, and I remember that they would choose the trees, and cut them down. They'd clean off the foliage, and then leave the trees to cure for about one year. After the year was up, the *kālai wa'a* (canoe makers) went back up and roughed out the canoes, leaving the *maku'u*, knobs at the two ends of the hull. When it was time to move the canoes, ropes were tied to the *maku'u* so they could be hauled off of the mountain. In the areas where they crossed *'a'ā*, they laid out *'ōhi'a* bark, greens and ferns to cushion the hull. Another youngster and I rode on our horses at the back of the canoe, with a rope from the *maku'u* to our saddles, and each time they needed to make a turn on the trail, it was our job to pull the hull in the right direction. We hauled the canoes down the Trousseau Trail, right down here

to the village, where the finishing work was done. The canoes Ka'imiloa, Kākina, and Leilani were built in this period.

Back then, there were several "mountain men," guys who lived on the mountain and harvested *koa* to ship to Honolulu. The *mauka* camps were at places like Monohā Palena'āina, Nāhuina, and Pūlehua. There was a Medeiros who married one of the Kekā's, that lived up at Monohā. Nishihara and Susaki were among the last *koa* haulers, CQ Hop purchased most of the *koa* in Honolulu. (chuckling) Those guys would live alone up on the mountain, and when they were ready to ship to Honolulu, they'd get their money and go to Honolulu for a couple of weeks, have a great time, and come home broke. They'd go back up the mountain, and start all over again. There were a number of times when my dad would have to advance them the money just to get home.]

Ka'awaloa. It has been said that Ka'awaloa means something like "*'Awa* gotten from far away," and this was because the people of Kona had to go all the way to Puna to get their *'awa*. This isn't true. Kona always had plenty of *'awa*. Old Charley Aina always said that Ka'awaloa described the "Long, or distant canoe landing" of the area. (pers. comm. June 4, 1996)

Personal Release of Oral History Interview Transcript and Map Records from:
William Johnson Hawawakaleoonamanuonakanahele Paris
Interviewed by Kepā Maly at Lehu'ula-nui and Honua'ino,
April 24, 1996 (with interview excerpts from March 7, May 15, and June 4, 1996)

I, William Johnson Hawawakaleoonamanuonakanahele Paris, participated in an oral history interview April 24th, 1996, with Kepā Maly, who was conducting an oral history study to record my family recollections of land use and site histories in the *ahupua'a* of Honua'ino and Lehu'ula, and neighboring lands of North and South Kona, Hawai'i. I have reviewed the typed transcript and discussion notes from March 7th, May 15th, and June 4th, 1996, and agree that said documentation is complete and accurate, including changes made while reviewing the original transcript on May 9th, 1997 (corrections made to the file document during the discussion).

As discussed between Kepā Maly, Helen Wong Smith, and myself on May 9, 1997, I agree that pertinent excerpts of the interview may be included in a study being prepared by historical research consultant, Helen Wong Smith in conjunction with the proposed development of the Māmalahoa Highway By-pass—a complete copy of the final study, including my interview, will be forwarded to me upon completion of the review process. I further agree that the interview information may be used, including *releasing such information in a report to be made public*, subject to my specific objections to release as set forth below under the heading "SPECIFIC OBJECTIONS TO RELEASE OF INTERVIEW MATERIALS — RESTRICTIONS SET BY INTERVIEWEE."

Aside from curation within my family collection, the interview transcript, summary of discussion notes, the interview map, and accompanying photograph(s) may be curated for reference and historical use by: the Kona Historical Society; Kepā Maly (*Kumu Pono Associates*); and Helen Wong Smith, Historical research Consultant.

CONFIDENTIALITY—SPECIFIC OBJECTIONS TO RELEASE OF INTERVIEW MATERIALS — RESTRICTIONS SET BY INTERVIEWEE:

Corrections and/or modifications to transcript made by typing on May 9, 1997, supersede the recorded narratives.

Interview Background and Release:
Recorded Interview made on Date: April 24, 1996.
Interview Notes Made on Date(s): March 7, May 15, June 4, 1996, and May 9, 1997.
Type-Written Text Transcriptions of
Interview Received in the Week of: April 14, 1997.
Interview Tapes Received on: May 9, 1997.

William J. Paris Jr. — Interviewee
Kepā Maly — Interviewer-Witness
Helen Wong — Interviewer-Witness

Address: PO Box 249
Kealakekua, Hi 96750
Phone: (808) 3223113
Signed: May 16, 1997

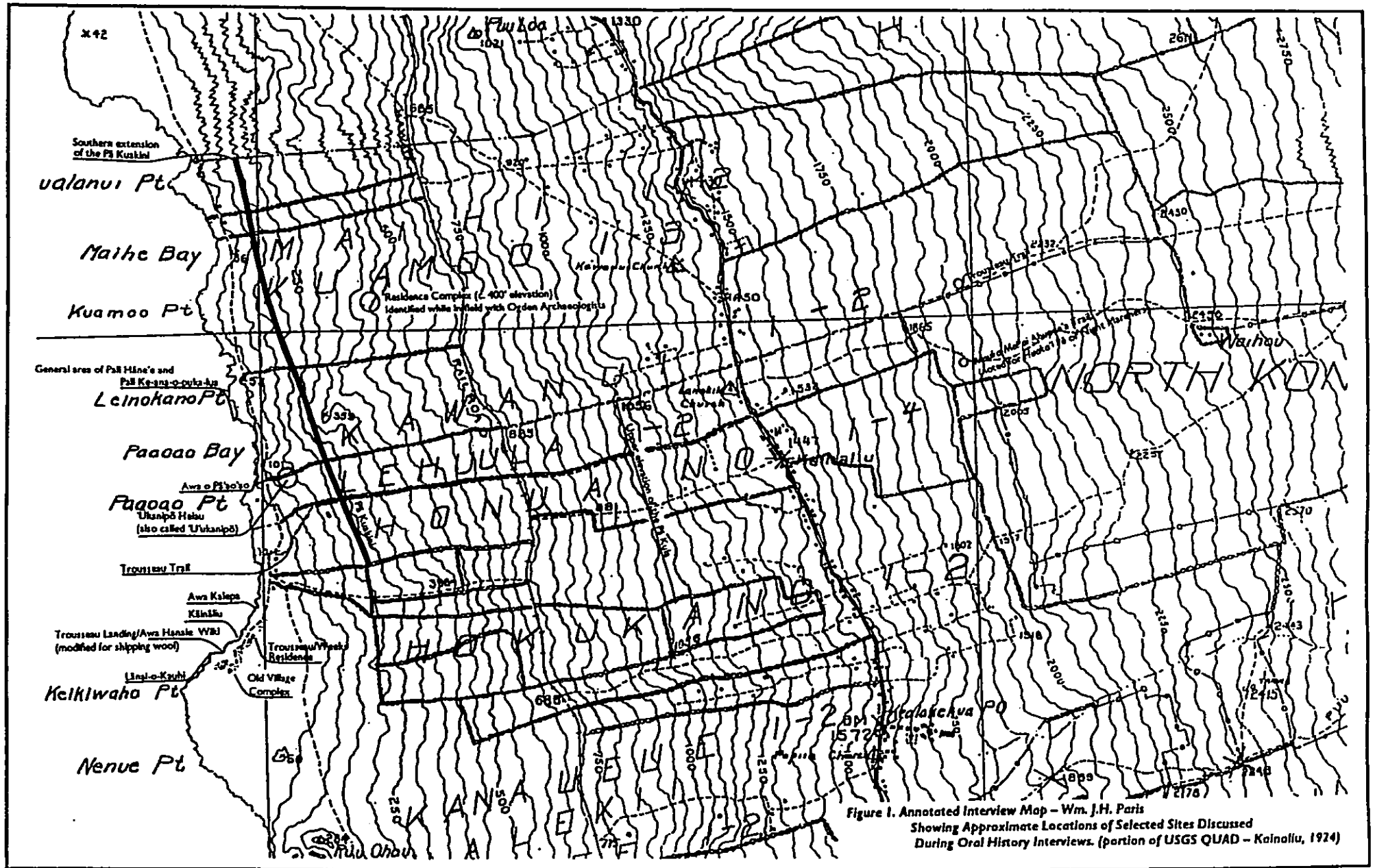

Figure 1. Annotated Interview Map – Wm. J.H. Paris
Showing Approximate Locations of Selected Sites Discussed
During Oral History Interviews. (portion of USGS QUAD – Kainaliu, 1924)

Appendix I
Socio-Economic Report
(Hallstorm Group)

Economic Impact Analysis of the

MAMALAHOA HIGHWAY BYPASS

Kona, Hawaii

THE HALLSTROM GROUP INC.

May 1, 1998

Mr. Richard T. Frye
Project Manager
Oceanside 1250
74-5620 A Palani Road, Suite 200
Kailua-Kona, Hawaii 96740-1625

Economic Impact Analysis of the Proposed Mamalahoa Highway Bypass Keauhou to Napoopoo, Kona, Hawaii

Dear Mr. Frye:

At your request, we have completed a defined-scope analysis assessing the general economic, regional market and public cost/benefit impacts likely associated with the proposed Mamalahoa Highway Bypass (Bypass) scheduled for near-term construction within a five-mile right-of-way extending from Keauhou Resort to Napoopoo Road, Kona, Hawaii. The roadway will provide access to the planned Villages at Hokukano project and serve as a needed "reliever" north-south route for the over burdened existing highway.

Modern traffic arterials are vital components of a community's infrastructure system, potentially having significant near- and long-term consequences on a local economy. When completed, the long-envisioned bypass will provide a thoroughfare across some 2,500 acres of currently inaccessible and undeveloped makai-oriented lands, inherently affecting traffic, taxation, land use and consumption patterns in the area to some degree.

Our assignment has been to identify, analyze, and quantify the substantive outcomes which will likely result from the development and operation of the subject roadway over the next two decades, focusing on four primary issues:

1. The effects on existing and future businesses in the Honalo to Captain Cook area due to change in traffic flow patterns.

2. The level of employment and wage creation and relocation associated with the construction and use of the bypass.

3. The change in value and land use potentials for holdings within the bypass corridor and the affected Kona region.

4. The impacts on governmental (state and county) operating costs and tax revenues base within the right-of-way study area over the next 20 years arising from the emplacement of the roadway.

Essentially, our task has been to determine how the subject corridor will economically change with the addition of the bypass relative to its continuing condition without the roadway.

The research program for this assignment included inspection of the study area and its environs; compilation of database of the area businesses and land uses; analysis of pertinent available public agency statistics regarding the Big Island and Keauhou-Napoopoo region; interviews with local residents, corridor consumers and proprietors; review of materials prepared for the proposed Villages at Hokukano development; and assembling of information from various public and private libraries, on-line sources and our files.

All conclusions expressed herein are subject to the standard limiting conditions, assumptions and certifications of The Hallstrom Group, Inc., in addition to any others set forth in the narrative or tables. All work has been completed in conformance with the Code of Professional Ethics and Standards of Professional Appraisal Practice of the Appraisal Institute, and the Uniform Standards of Professional Appraisal Practice (USPAP).

Our narrative opens with an **Assignment and Methodology Overview** section, briefly describing our study goals, research program and analytical techniques employed. The subsequent chapters of the document identify the pertinent insights, data and conclusions. An Addenda, containing tabular data and supporting materials, concludes the report. The investigation and analysis for this assignment were completed in March and April of this year, with the effective date of study being May 1, 1998.

Based on our study, we have concluded:

- The proposed roadway will have a nominal impact on the existing business activity along Mamalahoa Highway, attracting (from a consumer perspective) resident passers-by who do not have strong purchasing demographics, and a small number of tourists who would forego the highway to use the new road exclusively. A decline in total gross sales of less than one percent in the Honalo-Kealakekua commercial corridor is forecast. Lost traffic volumes and associated sales will be more than offset by population growth and market expansion over the mid to long-term.

- Mamalahoa Highway, fronting businesses in the study area, are predominately oriented towards meeting the neighborhood shopping and service needs of community residences, which will remain largely unaffected by the bypass. Most business activity that could be re-directed elsewhere has already done so with the opening of several "superstores" in Kailua-Kona. Tourism spending will remain strong, only passers-by business will decline.

- Ninety-eight percent of local residents surveyed did not expect the bypass to meaningfully change their regional shopping habits, and only seven percent of tourists questioned would forego the area entirely if an alternate route were available.

- An estimated 201 worker-years of employment, and some $7,305,000 in wages, will be created during the construction of the bypass, with its operation requiring .5 permanent positions with $18,000 in total annual wages. Users of the roadway will cumulatively save one-half million hours in travel time each year by avoiding the congestion of the existing highway.

- State and county coffers will register a net aggregate gain of an estimated $26,074,583 in capital assets and enhanced tax revenues from the project during construction and the first two decades of operation.

- Although land values (and real property taxes) in the bypass corridor will increase due to their new-found accessibility and long-term development potentials, there is a lack of utility systems, entitlements, investment capital and market demand to support any wide-ranging development in the near to mid-term, particularly as the most desirable residential lands in the region are above the 1,200-foot elevation near the existing highway. At best, there would appear sufficient market support for a gas station/mini-mart during the first decade-plus of roadway operation; however, the developers of the proposed Villages at Hokukano have no plans to undertake or support such a venture.

We appreciate the opportunity to be of service in regards to the proposed Mamalahoa Highway Bypass project. Please contact us if further discussion, detail or data is required.

Respectfully submitted,

THE HALLSTROM GROUP, INC.

James E. Hallstrom, Jr., MAI, SRA

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THE HALLSTROM GROUP INC.
REAL ESTATE CONSULTANTS & APPRAISERS

Economic Impact Analysis of the

MAMALAHOA HIGHWAY BYPASS

to be located at

Keauhou to Napoopoo
Kona, Hawaii

Prepared for

Mr. Richard T. Frye
Project Manager
Oceanside 1250

[redacted]

May 1998

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ASSIGNMENT AND METHODOLOGY OVERVIEW

Our assignment has been to assess the probable economic and land use impacts to the south-central Kona communities fronting Mamalahoa Highway (from Pualoa to Kealakekua) which will result from the construction of the proposed Mamalahoa Highway Bypass (Bypass). Focal considerations of the study have included:

- Analyzing the effects and the changes in traffic flow will have upon existing businesses in the subject area;
- Quantifying the creation/relocation of employment and wages associated with the construction and operation of the roadway;
- Projecting land use demand trends and how they would be changed by the new thoroughfare; and
- Estimating the public sector (state and county) cost/benefits resulting from the roadway development.

In order to complete these tasks, a multi-step research and analysis program was developed, moving from acquisition of general community information to demographic projections for specific businesses and financial forecasts. Statistical sources included federal, state and county data banks; private-sector information services; leading Hawaii financial institutions; interviews; and on-site fieldwork, in addition to our file materials.

Our results are presented in the following report; the format reflects the general-to-specific course of study as contained in seven brief chapters. The first two provide an overview of the study area and constituent demographic groups within the region. The third concisely describes the proposed roadway development, and the final four specifically assess the probable impacts associated with the bypass project.

1. Subject Environs
2. Regional Demographics and Income/Expenditures

3. The Proposed Bypass
4. Analysis of Business Impacts
5. Analysis of Real Property Impacts
6. Projection of Employment and Wages
7. Analysis of Government Costs and Benefits

Our conclusions are based on a variety of standardized methodologies and applications. In analyzing the business impacts, we have used demographic, traffic, consumer survey, and tenant-orientation approaches. For insight into the new roadway's affect on real property issues, we have reviewed demand trends using historic Kona data and case studies elsewhere on the neighbor islands. Employment and wage projections were made via models based on forecast development and operational costs, and governmental costs/benefits were estimated by comparing probable expenses with tax revenues and capital investment.

Primary data sources are as cited on the tables, in the narrative, or within the addenda section of the report. The effective date of our analysis is May 1, 1998.

LIMITING CONDITIONS AND ASSUMPTIONS

The research, analysis, conclusions, and certification performed by The Hallstrom Group, Inc. are subject to and influenced by the following:

- The report expresses the opinion of the signers as of the date stated in the letter of transmittal, and in no way has been contingent upon the reporting of specified values or findings.
- Any sketches, maps, plot plans, and photographs included in the report are intended only to show spatial relationships and/or assist the reader in visualizing the property. They are not measured surveys or maps and we are not responsible for their accuracy or interpretive quality.

- It is assumed that the subject property is free and clear of any and all encumbrances other than those referred to herein, and no responsibility is assumed for matters of a legal nature. The report is not to be construed as rendering any opinion of title, which is assumed to be good and marketable. No title information or data regarding easements which might adversely affect the use, access, or development of the property, other than that referenced in the report, was found or provided. The property is analyzed as though under responsible ownership and competent management.
- Preparation for, attendance, or testimony at any court or administrative hearing in connection with this report shall not be required unless prior arrangements have been made therefor.
- If the report contains a valuation relating to a geographical portion or tract of real estate, the value reported for such geographical portion relates to such portion only and should not be construed as applying with equal validity to other portions of the larger parcel or tract; and the value reported for such geographical portion plus the value of all other geographical portions may or may not equal the value of the entire parcel or tract considered as an entity.
- It is assumed that there are no hidden or inapparent conditions of the property, subsoil, or structures which would render it more or less valuable; we assume no responsibility for such conditions or for engineering which might be required to discover such factors.
- Information, estimates, and opinions provided by third parties and contained in this report were obtained from sources considered reliable and believed to be true and correct. However, no responsibility is assumed for possible misinformation.
- Possession of the report, or a copy thereof, does not carry with it the right of publication, and the report may not be used by any person or organization except the client without the previous written consent of the appraiser, and then only in its entirety. If the client releases or disseminates the reports to others without the consent of the appraiser, the client hereby

agrees to hold the appraiser harmless, and to indemnify the analysts from any liability, damages, or losses which the analysts might suffer, for any reason whatsoever, by reason of dissemination of the report by the client. Further, if legal action is brought against the analyst by a party other than the client concerning the report or the opinions stated therein, the client agrees, in addition to indemnifying the analysts for any damages or losses, to defend said analysts in said action at client's expense. However, nothing herein shall prohibit the client or analysts from disclosing said report or opinions contained therein as may be required by applicable law.

- Disclosure of the contents of this report is governed by the By-Laws and Regulations of the Appraisal Institute. Neither all nor any part of the contents of this report (especially any conclusions as to value, the identity of the appraisers or the firm which they are connected, or any reference to the Appraisal Institute or to the MAI designation) shall be disseminated to the public through advertising media, public relations media, news media, sales media, or any public means of communication without the prior consent and approval of the appraisers.

- Unless otherwise stated in this report, the existence of hazardous material, which may or may not be present on the property, was not observed by the appraiser. The appraiser has no knowledge of the existence of such materials on or in the property. The appraiser, however, is not qualified to detect such substances. The presence of substances such as asbestos, urea-formaldehyde foam insulation, or other potentially hazardous materials may affect the value of the property. The value estimate is predicated on the assumption that there is no such material on or in the property that would cause a loss in value. No responsibility is assumed for any such conditions, or for any expertise or engineering knowledge required to discover them. The client is urged to retain an expert in this field, if desired.

- The Americans with Disabilities Act (ADA) became effective January 26, 1992. We have not made a specific compliance survey and analysis of this property to determine whether or not it is in conformity with the various detailed requirements of

the ADA. It is possible that a compliance survey together with a detailed analysis of the requirements of the ADA could reveal that the property is not in compliance with one or more of the requirements of the act. If so, this fact could have a negative effect upon the value of the property. We did not consider possible noncompliance with the requirements of ADA in estimating the value of the property.

SUBJECT ENVIRONS

The study area encompasses approximately 20 square miles on the westerly flank of Mauna Loa, from the shoreline to the 2,500-foot elevation level, between Keauhou Resort and the northerly edge of Captain Cook village, a corridor some five miles in length. The proposed Mamalahoa Highway Bypass right-of-way will bisect the lower elevations of the region, stretching from the current southerly terminus of Alii Drive/Highway (about 50 feet above sea level) diagonally upslope to Napoopoo Road, just makai of its intersection with Mamalahoa Highway (at the 1,300-foot elevation).[1]

Development in the subject region is concentrated in a relatively narrow band along Mamalahoa Highway, centered around three villages--Honalo, Kainaliu and Kealakekua (north to south), within the 1,200- to 2,000-foot elevation range. The highway is the focal infrastructure component in the area. It is the only transportation link to other areas of the island, and is the primary high-volume arterial for local traffic; it provides critical business and public-use frontage; and it runs at a temperate elevation considered desirable for living and farming.

Land uses in these historically rural communities include a mixed use of commercial, warehouse, public and some residential improvements along the road frontage, with residential subdivisions and agricultural holdings in outlying areas and between villages. Further mauka (above 2,000 feet in elevation) are less intense and feral agricultural lands and forest/conservation tracts. Makai of the highway corridor

[1] Keauhou Resort and the areas of Captain Cook, south of Napoopoo Road, are not included in the primary study region, but are considered part of the general economic area which runs from Keahole Point to Hookena.

(below the 1,200-foot level) is mostly pasture, open space and shoreline conservation lands, with a few scattered houses.

Residences range from aged coffee shacks to modern upscale estate homes, with most units being 10 to 30-plus years old and of moderate quality. The majority of commercial space is within older buildings (20-plus years) and dedicated to "neighborhood" retail and service businesses, with less emphasis on tourist-oriented, public and warehouse uses.

The cultural orientation and economic perspective of the area has been agrarian since westernization, dominated by ranching and coffee, with small farms producing a variety of specialty floral and food crops in recent years. However, as with many neighbor island districts, there has been tremendous transitional land use pressures over the past two decades, although to a lesser degree than seen in central Kona and elsewhere in the state.

The quality of lifestyle, relative affordability of housing, traditionally large family sizes in south-central Kona (coupled with the availability of service and trade jobs elsewhere in West Hawaii) have created a demand for many new housing units. Demand for supporting neighborhood uses has also commensurately increased.

Intensification of land uses in the study corridor will continue over the long-term, the result of natural outward pressures from the economic growth and urbanization in the adjoining Keahole-Keauhou region. Future development in the area will be predominately low- to moderate-density housing, with new/redeveloped commercial, public and denser residential uses fronting Mamalahoa Highway.

The primary constraints to this expansion will be community support, cyclical economic effects, and lack of sufficient supporting infrastructure. Existing systems are limited and strained, and Mamalahoa Highway is now regularly congested with increased commuter, commercial, local and passers-by traffic.

REGIONAL DEMOGRAPHICS AND INCOME/EXPENDITURES

At year-end 1997, there were an estimated 6,700 residents in the specific study area.[2] This represents an increase of 847 persons, or 14.47 percent, in the region since 1990. Over the past 27 years (1970-1997), the compounded annual growth rate in the south-central Kona population has been at 1.08 percent. Relative to statewide proportions, the area has a greater number of Hawaiian and mixed-Hawaiian persons, and the influx of Caucasians has occurred more recently.

These "local residents" represent the primary demographic group which would be potentially affected by the proposed roadway, through expansion of traveling, consumption, and housing location options, and associated economic adaptations.

The present regional populace represents 18.51 percent of the total resident population of 36,200 in Kona (North and South). For generations, about half the total number of Kona residents lived in the study area; but with the coming of urbanization since the mid-1970s and the growth spike in greater Kailua-Kona over the past 12 years, the prominence of the study region has declined. Despite the increased demand for housing and development in the subject area since the early 1980s, it is anticipated the region will decrease in proportionate population relative to the rest of West Hawaii, given the amount of potentially developable land between Keahole and Keauhou.

In addition, there are some 14,340 visitors daily in West Hawaii which add to the de facto population of the general region. A majority of these tourists visit the study area drawn by the coffee and macadamia nut "factories" or in transit to the volcano or a circle-island drive.

Tourists (specifically) and other Kona residents (who visit, pass-through or otherwise trade in the study area) comprise the secondary demographic groups.

(2) Population and demographic data taken from U.S. Census Tracts 214, 215.97 and 215.98, the boundaries of which closely correspond to the defined study area. These tracts stretch from Kamehameha III Road to the northerly neighborhoods of Captain Cook.

TABLE 1

HISTORIC AND PROJECTED PRIMARY DEMOGRAPHIC GROUP POPULATIONS
IN SOUTH-CENTRAL KONA 1970 to 2020
Economic Impact Analysis of the Proposed Mamalahoa Highway Bypass
Kona, Hawaii

	Historic			Year-End	Projected		
	1970	1980	1990	1997	2000	2010	2020
Study Area Residents (1)	4,384	4,943	5,853	6,700	7,110	9,100	11,936
Compounded Annual Pct. Growth	—	1.21%	1.65%	1.95%	2.00%	2.50%	2.75%
Percent of Total Population	41.09%	20.30%	13.30%	13.26%	12.92%	11.70%	10.65%
Other Kona Residents (2)	4,452	13,412	24,089	29,500	32,235	45,470	64,100
Compounded Annual Pct. Growth	—	11.66%	6.03%	2.94%	3.00%	3.50%	3.50%
Percent of Total Population	41.73%	55.08%	54.74%	58.37%	58.59%	58.47%	57.20%
Daily West Hawaii Visitor Census (3)	1,832	5,997	14,063	14,340	15,670	23,195	36,021
Compounded Annual Pct. Growth	—	12.59%	8.90%	0.28%	3.00%	4.00%	4.50%
Percent of Total Population	17.17%	24.63%	31.96%	28.37%	28.48%	29.83%	32.15%
Total Potential Demographic Population	10,668	24,352	44,005	50,540	55,015	77,765	112,057
Compounded Annual Pct. Growth	—	8.60%	6.10%	2.00%	2.87%	3.52%	3.72%

(1) Living in U.S. Census Tracts 214, 215.97 and 215.98. Generally, between Kamehameha III Road and northern Captain Cook.
(2) Residents of North Kona and South Kona Districts outside of study area.
(3) Average Daily visitor count during year.

Sources: State of Hawaii Data Book, U.S. Census, Hawaii Visitors and Convention Bureau, and The Hallstrom Group, Inc.

Our analysis indicates the resident households in south-central Kona can be generally divided between the following categories according to principal employment type/status:

Employment Status	Est. Pct. of Total
Retail/Service/Financial	21%
Tourism	19%
Trades (construction/maintenance)	16%
Agricultural	9%
Entrepreneur/Self-Employed	5%
Retired	13%
Other	17%
	100%

Coupling these employment factors with state Department of Labor wage statistics, results in average family incomes marginally below the estimates made by the U.S. Department of Housing and Urban Development for median household income on the Big Island. However, housing costs on an average are also slightly lower in the study area than countywide, resulting in comparable levels of available household discretionary income.

Growth in household incomes lagged behind other West Hawaii economic regions from the mid-1960s and into the 1980s, which were fueled by the initial periods of tourism development and urbanization. An increase in commuter employment opportunities, residential development, and neighborhood businesses over the past 15 years have moved study area incomes into the general Big Island trendline.

On a macro basis, the potentially "available dollars" for expenditures in the Honalo-Captain Cook corridor, among the primary (local residents) and secondary (tourists and other residents in West Hawaii) demographic groups, have generally climbed over the past two decades; the most significant decline occurring during the early years of the decade at the depth of the recent recession.

A summary of historic and projected demographic group populations for the study area are shown on Table 1.

THE PROPOSED BYPASS

The proposed Mamalahoa Highway Bypass will be a five-mile restricted access thoroughfare stretching from the existing southerly terminus of Alii Highway (within Keauhou Resort) to the Napoopoo Road/Mamalahoa Highway intersection on the northerly edge of Captain Cook. The roadway will be initially built with two lanes, but will have sufficient right-of-way to allow eventual expansion to four lanes.

Although propelled forward by development efforts associated with the Villages of Hokukano project, the need for additional arterials to provide traffic relief to Mamalahoa Highway has been recognized for years, with numerous alignments and alternatives forwarded by various interests since the late 1970s.

The selected alignment, reached through negotiations with right-of-way landowners and community input, passes through undeveloped agricultural-designated rocky pasture and open space holdings. Apart from the Hokukano proposal, there are no other developments in the corridor announced at this time. Given the difficulties in achieving land use approvals, the lack of utility systems, shortage of investment capital sources, and other factors, it is considered highly unlikely there will be a push towards further urbanization along the roadway over the near to mid-term.

It has been estimated[3] that by the year 2015 the bypass will carry a peak A.M. load of 1,325 cars per hour, and a peak P.M. load of 1,415 cars hourly.

The roadway will begin to relieve some of the over-capacity service load presently borne by Mamalahoa Highway of about 17,000 cars per day. Volumes along the existing highway are anticipated to decrease by several percent in the first years of the bypass operation; however, general growth in the region will recover lost traffic volumes during the projection period.

The chart below summarizes the estimates on daily traffic volume along Mamalahoa Highway and the proposed Bypass to the year 2020.

(3) By M&E Pacific (Hilo), June 1997.

ESTIMATED TRAFFIC VOLUMES DURING PEAK HOURS EXPRESSED IN NUMBER OF VEHICLES *

	Current	2005	2010	2015	2020
Mamalahoa Highway	2,970	2,300	2,565	2,930	3,223
% Change	--	(22.56)	11.52	14.23	10.00
Bypass	--	1,700	2,155	2,740	3,288
% Change	--		26.76	27.15	20.00
Total Arterial Volume	2,970	4,000	4,720	5,670	6,511
% Change	--	34.68	18.00	20.13	14.83

* Total of A.M. and P.M. peak hour traffic count projections at Halekii Street crossings.

Source: M&E Pacific and The Hallstrom Group, Inc.

The projections depict traffic volumes more than doubling during the two decade forecast period of this study, with vehicle counts achieving stabilization between the two roadways by 2020.

The socio-economic impacts arising from these changes in traffic patterns through south-central Kona as a result of the proposed bypass are the subject of the remainder of our study.

ANALYSIS OF BUSINESS IMPACTS

Overview

The business communities of Honalo, Kainaliu, Kealakekua and Captain Cook have historically been focused to meeting the needs of area residents, serving as the commercial center for more than 20 miles along Mauna Loa's western flank.[4] Apart from some specialized agricultural-oriented suppliers which attracted purchasers from throughout West Hawaii, the businesses were similar to that found in

(4) Our analysis centers on the defined bypass corridor, which stretches from Pualoa to the northerly portions of Captain Cook. Keauhou and portions of Captain Cook, north of Napoopoo Road, were not considered included in the primary study area.

any rural, small town, with "mom and pop" grocery stores, local restaurants, small dry goods outlets, medical practitioners, small service providers, and branches of financial institutions.

Regional public uses also contributed to the absorption of some commercial lands or finished space, including the West Hawaii Hospital, University of Hawaii West Hawaii Campus, and various state and county agencies.

For many years, the scale and mix of businesses remained relatively static. This began to change in the early 1980s as the resident population of the study area (and throughout West Hawaii) began to grow and the number of visitor days increased. In response, new enterprises emerged, existing businesses adapted, and other companies moved into the area.

Within the specific study corridor, each of the three business communities experienced differing levels of change during this period.

Honalo, with land scarce and major traffic flow concerns, was altered the least of the villages, a franchise gas station/mini-mart being the only major project of the past decade. The opening of the relatively proximate Keauhou Shopping Center in 1984 (five miles north) provided "Class A" retail opportunities that otherwise may have been attracted to this community.

The retail orientation of **Kainaliu Village** was most affected by the 1980s market expansion. The fresh popularity of Kona Coffee (abundance of local fruits and floral products, and its emergence as a "new age" center for West Hawaii) stimulated refurbishment of many buildings on the central commercial strip. For the first time, businesses emerged that were intended to primarily draw from the non-local resident population. Coffee outlets and gift boutiques opened for tourists, and natural food and alternative culture businesses, attracted a broad range of West Hawaii residents. Several established stores also adjusted their product lines. The 18,000-square-foot Mango Court was a major addition, extending the commercial district southward, with the majority of tenants geared towards local resident consumers.

Kealakekua experienced the greatest commercial growth, and appeared on the verge of recovering its prominence among West Hawaii towns and again becoming a primary, independent urban

enclave. There was development for major outside businesses (McDonalds, Foodland, KFC), several tourist-oriented projects, significant refurbishment of many buildings, and renewed public institutions (West Hawaii Hospital and U.H. West Hawaii); all contributing to the market inertia.

By the end of the "bubble economy" of the late-1980s, the region (particularly Kealakekua) seemed poised for evolution into a freestanding, self-contained market zone, where a sufficient selection of name-retailers and quality services would lessen the historic need for residents to trek to Kailua-Kona on a regular basis for shopping. However, the supply of businesses was pressing against the level of potential demand, and any instability among consumer demographics would take a meaningful toll.

During the early-1990s, three events transpired that negatively impacted most study area businesses:

1. "Big Box Retailers" came to Kona, with Costco, Wal-Mart, K-Mart and Borders Books, providing a level of selection and low pricing unprecedented in West Hawaii. As experienced in countless regions across the United States, these "superstore category killers" enormously and immediately altered resident shopping habits away from smaller neighborhood stores for many household goods. Given the high cost of Kona living, the tradition of outlying residents traveling to Kailua-Kona to shop, and the easy acceptance of warehouse-retail ambiance, the Kona outlets became inordinately successful. The competition contributed to the closing of several major retailers in the study area, and markedly diminished the sales of numerous others.

2. West Hawaii, as throughout the state, entered into a prolonged recessionary period. The stagnation of wages, loss of employment positions, increase in business failures, and reticent investment attitude, contributed to the decline in aggregate household income in south-central Kona. This loss of disposable dollars, coupled with resident concerns over economic security, depressed sales levels in many study area businesses. The decline in construction jobs had a direct (if minor) impact, as many outlying trades people commuted to job sites in central Kona through the subject villages, and these

"passers-by" contributed to the sales at gas stations, food outlets and markets.

3. The worldwide economic downturn earlier in this decade caused a decline in tourism to the Big Island. Fewer arrivals and visitor days translated into lower expenditures directed towards tourist-oriented businesses, with declines or stagnation occurring from 1991 through 1994. The drop in traffic had minor effects on study area retailers appealing to visitors.

As a result of these factors, the south-central Kona commercial market has retreated from its rising status at the start of the decade, becoming more akin to its past standing as offering neighborhood goods and services to a local community which still travels to Kailua-Kona for many daily and specialty products.

The greatest potential for sales growth over the long term in the three villages is in the tourism-oriented sector, which has generally recovered from early decade declines and should enjoy relative strength as a "destination" area for most visitors. This perception could be improved over the long term (particularly in Kainaliu) with more unique gift/craft stores, boutiques and lifestyle businesses creating an ambiance similar to Makawao, Maui.

Today, there are some 136 commercial businesses[5] in the Honalo-Kealakekua corridor, comprising an estimated 303,000 square feet of floor space. Local residents comprise the primary customers for the significant majority of outlets. Table 2 summarizes the existing businesses in the study area.

It is upon this inventory and associated market sector that the proposed highway Bypass will have the greatest potential for impact, as assessed in the following section.

However, in comparison with the negative influences of recent years, the affect of the roadway must be viewed as relatively insignificant. It is the recovery of the Hawaii economy, creation of more regional employment, and continuing expansion of the visitor industry, which will have a far greater impact on the

[5] Retail, restaurant, and financial.

TABLE 2

SUMMARY OF EXISTING COMMERCIAL BUILDINGS AND TENANTS
HONALO TO NAPOOPOO ROAD
Economic Impact Analysis of the Proposed Mamalahoa Highway Bypass
Kona, Hawaii

Third Division Tax Map Key	Building Name	Tenants	Use	Building Type	Building Quality (1)	Estimated Site (sq. ft.)	Customer Demographics Primary	Customer Demographics Secondary	Probable Impact (2)
Honalo									
7-5-3-29	Teshima Restaurant	Same	Japanese Restaurant	Wood Frame	5	9,700	Local Res.	—	1
7-5-3-53	Texaco Station	Same	Gas Station/Mini-Mart	Pre-Fab Concrete	9	3,300	Local Res.	Tourist/PB	2
7-5-4-7	Unnamed	Barber (previously)	Vacant	Wood Frame	2	800			
7-5-14-20	Hale O Honalulani			Masonry	3	1,700			
						200	Tourists	Local Res.	4
		U1 Design	Clothing & Swim Wear			500	Local Res.	—	1
		WS Honolo	Barber Shop			1,000	Local Res.	Tourist/PB	2
		Sharon's Place	Snack Bar			800			
7-5-14-13 to 15	Honalo Business Plaza			Masonry	6	5,000			
		Hawaii AIE Props. Pc. Assn.	Real Estate Broker			1,000	Local Res.	—	—
		Dr. Arrington	Medical			1,000	Local Res.	—	—
		Dr. Sin	Medical			1,000	Local Res.	—	—
		Tax Planners	Tax/Bookkeeping			1,000	Local Res.	—	—
		Servco Appraisal	R/E Appraisal			650	Local Res.	—	—
		Baird Appraisals	R/E & Farm Appraisals			650	Local Res.	—	—
		3 Empty Bays	Vacant			650 each	Local Res.	—	—
7-5-4-24	Ushijima Store	Same	Grocery	Wood Frame	4	2,000	Local Res.	Tourist/PB	3
Kainaliu									
7-5-7-6	Aloha Theater	Dancers Academy	Dance Studio	Wood Frame	6	10,000			
		Aloha Store	Crafts/Health Food			400	Local Res.	—	—
		Aloha Cafe	Restaurant			1,600	Local Res.	Other Res/T	2
		Aloha Performing Arts Ctr.	Dance Studio			1,600	Local Res.	Tourist/PB	4
		Fleischer Publishing	Print Shop			400	Local Res.	—	1
		Aloha Theater	Playhouse/Theater			2,200	Local Res.	Other Res.	1
						3,300	Local Res.	Other Res.	1

TABLE 2 (continued)

SUMMARY OF EXISTING COMMERCIAL BUILDINGS AND TENANTS
HONALO TO NAPOOPOO ROAD
Economic Impact Analysis of the Proposed Mamalahoa Highway Bypass
Kona, Hawaii

Third Division Tax Map Key	Building Name	Tenants	Use	Building Type	Building Quality (1)	Estimated Size (sq. ft.)	Customer Demographics Primary	Customer Demographics Secondary	Probable Impact (2)
7-9-7-19	Unnamed			Masonry	5	3,400			
		Paradise Found	Clothing Boutique			1,800	Tourist	Res.	4
		Davelyns of Hawaii	Clothing/Crafts			1,600	Tourist	Res.	5
7-9-7-18	Kimura Store	Same	Fabrics/Grocery/Gifts	Masonry	5	2,800	Tourist	Res. & PB	4
7-9-7-17	Beachcombers	Same	Aloha/Beachwear	Mixed (Wood/Masonry)	4	2,000	Tourist	---	6
7-9-7-3	Yamada Furniture	Same	Furniture	Wood Frame	8	4,000	Local Res.	Other Res.	2
7-9-7-36	Kainalia Center			Wood Frame	6	7,500			
		Kainalia Video	Video Rentals				Local Res.	---	2
		Rehab @ Kona	Clinic				Local Res.	---	1
		Orchid Isle Respiratory	Clinic				Local Res.	---	1
		Island Books	New/Used Books				Local Res.	---	1
		Advanced Dentures Lab	Dental lab				Local Res.	---	1
		West Hawaii Lab	Medical Lab				Local Res.	---	1
		HI Health Service Ctr.	Public Service Referral				Local Res.	---	1
		Arlington Clinical	Clinic				Local Res.	---	1
7-9-7-45	Sandy's Drive Inn			Masonry	8	1,300			
		Sandy's Drive Inn	Fast Food				Local Res.	Tourist & PB	2
		Bob's Shear Magic	Cutting Utensils				Local Res.	---	1
		Pacific Watertank	Water Storage Tanks				Local Res.	---	1
7-9-7-46	Norge Village	Same	Laundromat	Wood Frame	4	3,500	Local Res.	---	1

TABLE 2 (continued)

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Kona, Hawaii

Third Division Tax Map Key	Building Name	Tenants	Use	Building Type	Building Quality (1)	Estimated Size (sq. ft.)	Customer Demographics Primary	Customer Demographics Secondary	Probable Impact (2)
7-9-9-22	Phillips Service Station	MAG Home & Energy	Propane Sales	Wood Frame	3	1,600	Local Res.	---	1
7-9-9-37	Union 76 Service Station	Same	Gas Station	Wood Frame	3	800	Local Res.	Tourist/PB	3
7-9-9-9	Blue Ginger Gallery	Same	Arts/Crafts	Wood Frame	7	1,300	Tourist	Residents	5
7-9-9-21	Kainalia Bowl			Wood Frame	3	7,000			
		Wally's Watch	Jewelry/Watch Repair			1,200	Local Res.	---	1
		MDs Office	Medical			1,200	Local Res.	---	1
		Chiropractic Clinic	Medical			1,200	Local Res.	---	1
		2nd Floor Offices	Various			3,400	Local Res.	---	1
7-9-7-37	Unnamed	Lori's Styling	Beautician	Wood Frame	5	1,500	Local Res.	---	1
		Real Estate Concepts HI	Real Estate Broker			1,500	Local Res.	---	1
7-9-7-21 & 40	Oshima Store	Same	Grocery/Pharmacy	Masonry	6	6,000	Local Res.	Tourist/PB	2
			Crafts/Souvenirs			2,000	Tourist	---	6
7-9-9-19	Joy's Upcountry Cafe	Same	Restaurant/Bar	Wood Frame	4	1,000	Local Res.	Tourist/PB	3
7-9-9-34 & 35	Ben Franklin	None	Vacant/Available	Masonry	6	8,500			
7-9-9-20	Basque Building			Wood Frame	5	2,400			
		Once Again Travel	Travel Agency			800	Local Res.	---	1
		Metaphysical Books	Bookstore			800	Local Res.	Tourist	2
		Rainbows	Health Food Cafe			800	Tourist	Res. & PB	5
7-9-7-20	Unnamed			Wood Frame	4	1,200			
		Victor's	Produce/Floral			400	Local Res.	Tourist	4
		AAA Monogramming	Trophies/Engraving			400	Local Res.	---	1
		The Shoe Box	Athletic Shoes/Gear			400	Local Res.	Tourist	2
7-9-9-6	Red Ass Coffee Co.	Same & Garden Cafe	Coffee and Cafe	Wood Frame	4	1,200	Tourist	Res. & PB	5
7-9-9-6	Healing Arts Ctr.	Same	Clinic	Wood Frame	4	800	Local Res.	Other Res.	1
7-9-9-5	Captain Cook Coffee Co.	Same	Coffee Factory	Wood Frame	6	5,500	Tourist	Res. & PB	5

success of businesses in the study area than any diversion of Mamalahoa Highway traffic.

Impact Assessment Methodology

We have analyzed the probable effects of the proposed Bypass highway using four methods. The first two are general (or macro) techniques, the latter two are specific market-based applications.

Traffic Analysis -- For some retail and service businesses, success is a function of access, exposure and traffic flow; hence, the use of arterial frontage for most commercial operations, as in the study area. To some degree, the more persons which pass-by a property, the more potential customers. For those businesses dependent on sheer volume of exposure to attract patrons, a decline in the traffic flow can potentially affect gross sales levels.

Mamaluhoa Highway has many characteristics which make it a desirable commercial frontage. It is the only through route in south-central Kona (giving it a 100 percent traffic capture rate); access is virtually unrestricted; speeds are slow; and there is some on-street parking. However, the congestion and rural nature of the roadway creates safety, transit speed and vehicle-mix problems that negatively affect the quality of highway frontage.

Currently, the benefits and detriments of having such a high volume of traffic on a roadway of this type are in balance from a commercial perspective, particularly given the economic downturn in recent years. But an increase in vehicular movement in and through the region is inevitable; and without some form of relief, damage to local trade will result.

While area residents would have no choice but to co-exist with the situation, and would not likely alter consumption habits, further congestion would be expected to depress secondary demographic groups. Other West Hawaii residents would fully avoid the already infamous travel difficulties through south-central Kona, and the increased driving stress will dampen the impulse of tourists, commuters and passers-by to patronize local businesses.

Visitors returning to Kailua-Kona accommodations from a drive to the volcano represent a meaningful consumer group that our surveys

TABLE 2 (continued)

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HONALO TO NAPOOPOO ROAD
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Kona, Hawaii

Third Division Tax Map Key	Building Name	Tenants	Use	Building Type	Building Quality (1)	Estimated Size (sq. ft.)	Customer Demographics Primary	Customer Demographics Secondary	Probable Impact (2)
8-1-16:8	Skidmore Electric	Same	Appliances & Service	Masonry/Wood Frame	3 & 4	3,200	Local Res.	---	1
8-1-4:44	Chevron Gas	Same	Gas Station	Wood Frame	3	500	Local Res.	Tourist/TB	3

(1) Relative quality on a scale of 1 (poor/undesirable) to 10 (excellent/most desirable).
(2) Relative impact on a scale of 1 (no probable impact) to 10 (significant as to threaten business).

Source: The Hallstrom Group, Inc.

indicate often adopt an "on the way back" mentality towards shopping for coffee, mac nuts, crafts and produce items. By increasing the traveling time and fatigue, congestion on Mamalahoa Highway will reduce consumer stops.

Based on the traffic volume forecasts, there will be net long-term growth of Mamalahoa Highway traffic flow despite the development of the proposed roadway. The drop in volume will be moderate in the first years after opening, with the majority of loss recovered during the first six to ten years thereafter.

More importantly, the potential customer base will increase as a proportion of total volume as the "pure commuters," who are unlikely to stop in any case, and transit shipping will have been removed from the highway. This adjusted vehicle mix should prove more amenable and efficient from a commercial perspective relative to the existing traffic blend.

Thus while the traffic count may dip for several years, the prospective customer count should remain static to marginally increased.

This "lost" short-term flow would mainly affect the tourist and passer-by demographic groups, not the foundational local resident consumers in the study area market. And volcano-bound tourists with a propensity to stop would likely use the Bypass only in one direction, and still be expected to patronize south-central Kona businesses either "going to" or "coming from" the national park.

Based on traffic volume analysis, those businesses dependent upon passers-bys would lose upwards of 50 percent of customer volume in the initial years of operation, with levels recovering gradually. Tourism-oriented businesses will also experience a briefer and less intense decline in highway traffic, with recovery from a 5 to 10 percent decline within five years.

Demographic Analysis -- Businesses are supported by consumer populations comprised of demographic groups. To the extent the effective size of these groups increases over time, the demographics are favorable. If numbers decline, commercial demand will lag.

The enterprises in south-central Kona are supported primarily by local resident consumption. Generally, secondary customers include tourists

and other Kona residents (destination and passers-by). Several area businesses are strongly oriented towards visitor traffic.

Although each of these demographic groups was stunned during the recent recession following years of sustained expansion, tourism has experienced moderate recovery since late 1994 and West Hawaii appears to have moved past the nadir of the economic cycle. Though significantly slowed from the 1980s growth rate, major population expansion is still expected throughout Kona (including the study area) during the coming decades.

This historic and projected demographic group populations were presented on Table 1. Each of the component groups is forecast to increase over the next 20 years, more than doubling in gross size during the projection period, moving from a current level of 50,540 individuals in the potential demographic pool to 112,057.

The local resident total is forecast to escalate by more than 5,000 persons by 2020, a compounded increase of 2.54 percent per year. Tourism counts in West Hawaii are projected to grow by 4.09 percent compounded annually, reaching 36,021, up from the current level of 14,340 on average per day. The rest of Kona is also expected to more than double in size, increasing by 34,600 persons.

Based on the macro measurements provided through gross demographic analysis, the outlook for businesses in the study region are favorable, and will outpace any customer flow loss associated with the proposed Bypass after the first several years.

Tenant Analysis -- The probable impact of the planned roadway on south-central Kona can also be determined through identification and individual assessment of the businesses that comprise the commercial community. This is a practical on-site approach providing specific insights about the study area.

To the extent there are large numbers of businesses in the Honalo-Kealakekua corridor that depend upon mass traffic flow (specifically tourists and passers-by), there is the potential for meaningful commercial disruption. The fewer such enterprises, the less the impact.

TABLE 2 (continued)

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HONALO TO NAPOOPOO ROAD
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Third Division Tax Map Key	Building Name	Tenants	Use	Building Type	Building Quality (1)	Estimated Size (sq. ft.)	Customer Demographics Primary	Customer Demographics Secondary	Probable Impact (2)
		US Post Office	Kealakekua Branch			6,000	Local Res.	—	1
		West Hawaii Dental	Dentistry Clinic			4,000	Local Res.	—	1
		Various MD	Offices			2,000	Local Res.	—	1
8-1-3-49	Central Kona Center II			Wood Frame	6	9,000			1
		The Korner Pocket	Bar & Grill			3,400	Local Res.	Other Res.	1
		UHH West Hawaii	College Campus			4,000	Local Res.	Other Res.	1
		Bookkeeping & Tax Service	Pro. Services			800	Local Res.	—	1
		KCFMI	Pro. Services			800	Local Res.	—	1
	Building #3	UHH West Hawaii	College Campus	Stucco/Glass	8	2,400	Local Res.	Other Res.	1
	Building #4	UHH West Hawaii	College Campus	Concrete/Glass	8	3,000	Local Res.	Other Res.	1
	Building #5	Hawaii Emp. CU	Credit Union/MD Office	Concrete/Glass	8	2,200	Local Res.	—	1
	Kealakekua Bus. Plaza	(Old Foodland Store)		Concrete/Glass	7	28,000			
		UHH					Local Res.	Other Res.	1
		State Dept of Health					Local Res.	Other Res.	1
		MDs					Local Res.	Other Res.	1
		Midwife					Local Res.	—	1
		Space Available							
8-1-3-65	KSC Corp. Building			Stucco	8	5,600			
		Internal Medicine Group	Clinic/Offices			2,800	Local Res.	—	1
		Kona Sonic Realty	Realty Office			2,800	Local Res.	—	1
8-1-3-40	Macadamia Nut Factory	Same	Nut Display & Sales	Steel	8	8,000	Tourist	—	6
8-1-12-1	Ashikawa Building	Kealakekua Furniture Co.	Furniture Sales	Masonry	7	3,200	Local Res.	Other Res.	1

TABLE 2 (continued)

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Third Division Tax Map Key	Building Name	Tenants	Use	Building Type	Building Quality (1)	Estimated Size (sq. ft.)	Customer Demographics Primary	Customer Demographics Secondary	Probable Impact (2)
7-9-7-29	Mango Court			Wood Frame	7	13,000			
		Kona Psychic Center	Clinic			2,400	Local Res.	—	1
		Dr. Fujita	Psychologist			800	Local Res.	—	1
		Hawaii Comm. FCU	Comm. Services			4,800	Local Res.	—	1
		Zen Center of Hawaii	Resource Center			1,600	Local Res.	—	1
		JA Harbet & Assoc.	Pro. Services			1,600	Local Res.	—	1
		Kealakekua Pharmacy	Pharmacy			2,400	Local Res.	—	1
		Subway	Sandwiches			1,100	Local Res.	Tourist & PB	3
		The Pet Shop	Pet Supplies			1,100	Local Res.	—	1
		Eve's Natural Food	Health Food			1,100	Local Res.	Tourist & PB	2
		Vacant				1,100			
7-9-10-83	Kainalu Square			Wood Frame	5	2,400			
		Kona Electronics	Retail Electronics			1,500	Local Res.	—	2
		Kona Bay Kayaks	Recreational Boats			400	Local Res.	Tourist	3
		Emma's Flower Shop	Florist			500	Local Res.	Tourist	3
7-9-10-10	Unnamed	Two M.D. Offices	Surgery Clinic	Stucco	7	3,500	Local Res.	—	1
7-9-10-64	Manta Health Care	Same	Clinic	WF & Masonry	6	3,600	Local Res.	—	1
7-9-11-18	PACE Studio	Same	Cultural Exchange Studio	Wood Frame	5	3,000	Local Res.	—	1
7-9-11-13 & 42	2 Unnamed Bldgs.	Multi-Tenant	Warehouse/Ind.	WF & Masonry	3	20,000	Local Res.	—	1
7-9-11-23	Unnamed	Dr. Blum MD	Doctor's Office	Wood Frame	4	2,400	Local Res.	—	1
Kealakekua									
7-9-11-5	Kahanahou	Same	Hawaiian Art Gallery	Wood Frame	1	1,100	Tourist	Local Res.	4
7-9-11-4	Unnamed	Dr. Nakamura	Dentist Office	Wood Frame	6	3,000	Local Res.	—	1
7-9-13-12	Dodo Mortuary	Same	Mortuary	Wood Frame	5	4,500	Local Res.	—	1
7-9-11-14	Vacant			Wood Frame	4	2,200			
8-1-3-39	BHP Gas	Same	Gas Station	Masonry	9	2,000	Local Res.	Tourist	3
8-1-3-57	Kona Adult Day Care	Same	Senior/Comm. Center	Masonry	8	5,000	Local Res.	—	1
8-1-3-37	McDonalds	Same	Fast Food	Wood Frame	8	3,000	Local Res.	Tourist	3
8-1-3-38	Central Kona Center I			Masonry	6	12,000			

TABLE 2 (continued)

SUMMARY OF EXISTING COMMERCIAL BUILDINGS AND TENANTS
HONALO TO NAPOOPOO ROAD
Economic Impact Analysis of the Proposed Mamalahoa Highway Bypass
Kona, Hawaii

Third Division Tax Map Key	Building Name	Tenants	Use	Building Type	Building Quality (1)	Estimated Size (sq. ft.)	Customer Demographics Primary	Customer Demographics Secondary	Probable Impact (2)
8-1-3-2	Pualani Terrace			Stucco/Wood	5 & 6	6,500			
		Peacock House	Chinese Rest.			3,000	Local Res.	Tourist/PB	2
		Osteopath	Natural Med. Clinic			1,300	Local Res.	—	1
		Medical Offices	Various/Some Vacant			2,200	Local Res.	—	1
8-1-3-76	Unnamed			Wood Frame	4	2,000			
		Carpet Care Center	Carpet Cleaning Products			600	Local Res.	—	1
		Pua Nani Florist	Floral Products			400	Local Res.	Tourist/PB	2
		Dayne's Beauty Salon	Beautician			1,000	Local Res.	—	1
8-1-4-52	Kona Specialty Meats	Same	Meat Packing/Sales Plant	Stucco	3	4,000	Local Res.	Tourist/PB	2
8-1-4-43	Little Grass Shack	Same	Souvenirs/Gifts	Wood	2	800	Tourist	—	7
8-1-19-22	Kona Trail Rides	Same	Rides/Souvenirs	2 Wood Bldgs.	3 & 4	1,800	Tourist	—	5
Captain Cook									
8-1-16-39	Dayton Tires	Same	Retail Tire Sales	Stucco	6	4,500	Local Res.	—	1
		Vacant	Car Lot and Sales Office			2,500			
8-1-16-20	Keopuka Square			2 Wood Bldgs.	5 & 6	7,100			
		Wayne's Printing	Print Shop			1,800	Local Res.	—	1
		Billy Bob's	BBQ Rest.			1,800	Local Res.	Tourist/PB	2
		Capt. Cook Stop & Shop	Convenience Store			3,500	Local Res.	Tourist/PB	3
8-1-15-24 & 25	The Old Coffee Mill	Same	Retail Coffee Sales	2 Wood Bldgs	4 & 6	2,300	Tourist	Res. & PB	5
8-1-15-47	Auto Value	Same	Retail Auto Parts	Metal Shed	5	2,800	Local Res.	—	1
8-1-16-19	Goodyear Tire	Same	Retail Tire Sales	Wood Frame	2	1,200	Local Res.	—	1

TABLE 2 (continued)

SUMMARY OF EXISTING COMMERCIAL BUILDINGS AND TENANTS
HONALO TO NAPOOPOO ROAD
Economic Impact Analysis of the Proposed Mamalahoa Highway Bypass
Kona, Hawaii

Third Division Tax Map Key	Building Name	Tenants	Use	Building Type	Building Quality (1)	Estimated Size (sq. ft.)	Customer Demographics Primary	Customer Demographics Secondary	Probable Impact (2)
8-1-12-2	Unnamed			Masonry	5	2,800			
		Copy Cat	Copy Services			400	Local Res.	—	1
		Josie's Cut & Style	Hair Stylist			400	Local Res.	—	1
		Attorney	Office			1,200	Local Res.	—	1
		H&R Block	Tax Services			400	Local Res.	—	1
		The Perfect Gift	Gift/Craft/Party			400	Local Res.	Tourist	2
8-1-12-4	Ooaoa Bldg.	Canoes Deli	Deli/Snacks	Masonry	5	1,000	Local Res.	Tourist & PB	3
8-1-2-47	American Savings	Same	Bank Branch	Wood Frame	9	1,200	Local Res.	—	1
8-1-2-46	Bank of Hawaii	Same	Bank Branch	Stucco	10	3,000	Local Res.	—	1
8-1-2-32	First Hawaiian Bank	Same	Bank Branch	Stucco	8	3,000	Local Res.	—	1
8-1-12-8	Finance Factors	Same	Financial Services	Wood Frame	5	2,300	Local Res.	—	1
8-1-12-7	Hawaii CCU Bldg.	HI Comm. Credit Union	CU Branch & Offices	Masonry	9	4,800	Local Res.	—	1
8-1-12-55	Selwyn Plaza			Masonry	10	4,000			
		Selwyn Realty	Real Estate Brokerage				Local Res.	—	1
		MD Office	Urologist				Local Res.	—	1
		Ctr. for Ind. Living	Senior Support Group				Local Res.	—	1
		Vacant							
8-1-2-31	Kamigaki Store	Same	Grocery Store	Metal Clad	6	10,500	Local Res.	PB	2
8-1-2-44	Hatasumura Business Bldgs.			Wood Frame	4	3,600			
		Chris' Bakery	Bakery Store			1,200	Local Res.	PB	2
		DDS Office	Dentistry Clinic			1,000	Local Res.	—	1
		Borthwick Mortuary	Funeral Home			1,000	Local Res.	—	1
		Vacant				400			
8-1-3-3	Antiques, Arts and ?	Same	Arts/Crafts	Wood Frame	4	1,200	Tourist	Local Res.	5

We completed a building-by-building survey and streetfront inspection of the commercial frontage of Mamalahoa Highway throughout the defined study area in order to determine the number of businesses, their characteristics, and associated consumer demographics. Supporting real property data was taken from TMK On-Line Services. The study area includes seven buildings in the northerly portion of Captain Cook, north of Napoopoo Road junction.

A roster of the various building tenants and related information, by tax map key, is contained on Table 2. The information listed includes the name of the building, name of the tenants, use (business type), building quality, estimated square footages, and demographic mix. There are a total of 136 commercial tenants in the Honalo to North Captain Cook highway frontage corridor housed in an estimated 303,000 square feet of finished floor space ranging in quality from nearly dilapidated to modern, competitive standards.

The study area commercial market is dominated by businesses and services primarily attending to local resident demand, which comprise 88.24 percent of the total enterprises (120 of 136) and an estimated 266,600 square feet, or 88.12 percent of the total available building area. There are few large tenants, and the focus is on conveniently meeting basic community commercial needs.

These neighborhood businesses, by definition, are highly proximate to, and dependent on the consumers they serve, and should not experience meaningful effects due to a highway which circumvents the region. Residents are not going to travel many miles out of the area for gas, video rentals, banking, beer, hair salons and fast food. Others, particularly medical providers and tenants associated/supporting the U.H. West Hawaii campus, attract "destination" users specifically to their location, and are not susceptible to alterations in the traffic flow unless the core facilities are moved.

There would also be no anticipated affect on the local professional service business tenants in the region. For these doctors, accountants, attorneys, realtors, travel and insurance agents, their clientele would remain unchanged.

Only neighborhood businesses having direct competition with companies outside of the region (where south-central Kona residents could chose to patronize elsewhere for price, selection or service

reasons) would be impacted by a roadway which provides quicker access to the competitor. However, most such outlets have already been permanently damaged by the superstore retailers in Kailua-Kona, and there is little further effect that could be done in this regard.

A bypass opportunity could affect the flow of residents living south of Captain Cook into the study area commercial properties. But the neighborhood shopping demands of this group are already intercepted by Captain Cook stores and services. Members of this population, who currently shop in the Honalo-Kealakekua corridor, are currently there by choice and are likely to continue regardless of a new roadway opening.

By relieving congestion on Mamalahoa Highway, some of the traffic destined for Captain Cook businesses may elect to continue on to Kealakekua. Overall the sales volume lost from this group would be nominal.

There are 16 businesses in the study area, comprising an estimated 36,400 square feet (or 12 percent of the regional total), that are primarily oriented towards serving the tourist and passers-by trade. These businesses are most prone to be negatively impacted by a decrease in traffic volume resulting from the proposed Bypass.

A quarter of these tenants market coffee, mac nut, floral or fruit products that are part of the rich agricultural heritage that defines the region. Many tourists visit the area specifically to find these goods. Similarly, the seven craft and gift stores have always been dependent upon attracting individuals with shopping propensities. These tourists are unlikely to use the new roadway exclusively as they are particularly seeking the type of retail opportunities found on the existing highway.

The handful of stores selling clothing and goods available at other West Hawaii locations will be most affected.

There is no doubt there will be a loss of other West Hawaii passers-by traffic through the region, as that is the focal purpose of the bypass undertaking. Gas stations, fast food, and convenience stores are the most likely to suffer some setbacks. However, our inspections revealed no specific businesses in the region is solely or even

substantially dependent upon this demographic group; they are merely just contributors to the overall traffic flow.

Based on our tenant analysis, we concluded that less than four percent of the Honalo-Kealakekua business community, comprising 2.57 percent of the total regional commercial space, would experience measurable negative operating effects due to the construction of the proposed Bypass. And in most cases this is anticipated to be short-lived until traffic volume returns to current levels.

Consumer Survey Analysis -- The most direct method for eliciting the specific probable impact of the proposed roadway on the customers forming the subject market is to interview a sampling of current patrons. Therefore, we conducted a polling series of the constituent demographic groups in south-central Kona asking whether the existence of the Bypass would affect their consumption activities in regional businesses.

The majority of responses were gathered through on-street interviews in late April 1998 at selected locations in the Honalo-Kealakekua corridor, including the Texaco and Ushijima Store in Honalo; Aloha Theater, Bad Ass Coffee Company, Norge Laundromat, and Mango Court in Kainaliu; and BHP Gas, McDonalds, Central Kona Center, and Kamigaki Store in Kealakekua. Interviews were also conducted at Keopuka Square, one of the properties at the northern edge of Captain Cook that is within the study area.

Selected local residents, in a corridor stretching from Keauhou Mauka to Hookena, were surveyed by phone. Secondary studies were undertaken at Keauhou Shopping Center, Wal-Mart and Kona Inn.

A total of 108 persons, comprised of 57 (or 53 percent) Kona residents and 51 (or 47 percent) tourists, provided responses to some or all of the queries/posed to each group.

The primary questions answered and pertinent results from the process are summarized on Table 3. The survey was not intended to be a scientifically identified sampling, but to provide a typical "snapshot" of the attitudes of the consumer demographic groups as of a timely date.

The primary indications include:

TABLE 3

SUMMARY OF CONSUMER SURVEY RESPONSES (1)
Economic Impact Analysis of the Proposed Mamalahoa Highway Bypass
Kona, Hawaii

Question	Local Residents		Tourists		Other Kona Residents	
	Yes	No	Yes	No	Yes	No
Are you aware of the proposed bypass project?	38 88%	5 12%	2 4%	49 96%	8 57%	6 43%
Would you have used bypass on this trip at least one way?	4 13%	28 88%	47 92%	4 8%	5 38%	8 62%
Would you be conducting the business you're doing if a bypass were available?	31 91%	3 9%	46 90%	5 10%	9 75%	3 25%
Would a bypass meaningfully change your buying habits locally?	1 2%	42 98%			2 18%	9 82%
Has the opening of the Kailua-Kona "superstores" changed buying habits?	40 95%	2 5%			13 93%	1 7%
Would you drive into "town" for what you are now purchasing (no $ benefit)?	6 14%	36 86%				
Would you be more inclined to shop in the area if less traffic?	16 38%	35 60%				
First trip through area?						
Are you on a round-trip excursion?						
Would you by-pass the area entirely if possible?						
Do you enjoy the existing road experience?						
What are your primary purposes for conducting business in the area? (2)	Convenience Allegiance Local Support Habit Can Get Credit	98% 58% 44% 15% 8%	Passing-Through Specific Purchase Visiting in Area Allegiance	88% 81% 46% 22%	Buy Local Goods Sightsee Eat/Drink Rest/Walk	42% 32% 18% 22%

(1) Not all those interviewed answered every question. Only "Yes" and "No" answers counted.
(2) Respondents were allowed to give more than one answer.

Source: The Hallstrom Group, Inc.

- 89 percent of those doing business in the study area would have been doing so even were a bypass roadway available. Among the demographic groups, 91 percent of local residents, 90 percent of tourists, and 75 percent of other Kona residents still would have made their purchases in Mamalahoa Highway businesses on their particular trip.

- 98 percent of the local residents did not anticipate any meaningful change in regional consumption due to a bypass. 95 percent had previously altered their buying habits as a result of Kailua-Kona superstores. Convenience (98 percent) and patronage allegiance (58 percent) were the most common cited factors in using local businesses.

- 92 percent of the tourists would still have elected to travel to/through the Honalo-Kealakekua commercial district on their particular trip even if there were a bypass alternative; however, most of those on a future round-trip route (92 percent) would only use Mamalahoa Highway in one direction.

In addition to the tabulated responses, the more in-depth interviews provided additional insights, such as:

Local residents "already shop at Costco" and some only buy groceries and household products at neighborhood retailers "if we have no time or gas money." Apart from the extreme influence of the bulk outlets, the pattern for purchase of products and services is typical for communities of this type. The most anticipated change in buying habits due to the proposed Bypass was in the purchase location for in-transit or "on the way home" items, most commonly beverages, gas, fast food and convenience goods.

Tourists are typically interested in several products, primarily coffee and mac nuts, and will seek these out in future visits. They are amenable to other "local flavor" purchase opportunities (crafts, floral and fruit, and clothing), but most would not travel to the region specifically for these items. A significant minority had no prior plans to shop in the area before arrival. Almost all felt signage, points of interest/rest stop facilities, and street frontage upgrades ("it could be more quaint") would enhance the desirability of the area.

Other West Hawaii residents, whether passing through the area or visiting a local business, endorsed the bypass plan. However, many were skeptical of it ever being constructed. A surprising minority said they would use Mamalahoa Highway anyway, contending it would be less distance even if slower, or they like the feel of traveling through the mountainside villages.

Based on the consumer survey analysis, there is no indication the proposed Bypass will have a significant impact on individual patron's habits in either of the critical local resident or tourist groups. In fact, by relieving congestion and adjusting the vehicle mix, the easier access for local residents and enhanced transit and shopping desirability for tourists should result in solidifying or increasing the volume of these customers. Nominal signage and rest stop improvements could certainly benefit the visitor experience.

Passers-by customers will likely decline by upwards of 25 percent. Some of this loss will be off-set by increased accessibility to the corridor for other West Hawaii residents.

Conclusions

The businesses along Mamalahoa Highway between Honalo and Captain Cook have lost significant market share in recent years due to the opening of predatory "superstore" retailers in Kailua-Kona (Costco, Wal-Mart, K-Mart), and have suffered due to the loss of purchasing dollars in the community during the prolonged recessionary period. However, the surviving businesses are neighborhood and tourist oriented, servicing a now stabilized local populace and an increasing flow of visitors to the Kona coffee-growing region.

The results from our analyses regarding degree of impact and length of recovery period are summarized in the following chart.

SUMMARY OF ANALYSIS INDICATORS FOR BYPASS COMMERCIAL IMPACTS			
Business Orientation	Local Residents	Tourist	Other Kona Residents/ Passers-By
Existing Market Share	88%	12%	12%
Traffic Volume Analysis	No Impact, Continued Growth	Off 5 to 10%, Recovery in 5 yrs.	Off 50%, Extended Recovery Period
Demographic Analysis	No Impact, Continued Growth	No Impact, Continued Growth	No Impact, Continued Growth (Kona Residents)
Tenant Analysis	No Impact, Growth Over Mid to Long-Term	Minor Impact to Handful of Businesses, Recovery in Near Term	Nominal Impact Due to Limited Importance in Market
Consumer Survey	Off 2%, Recovery in Near Term	Off 3%, Recovery in Near Term	Off 25%, Extended Recovery Period

On a correlated basis, the composite effect on the study area business community will be off by less than three percent, at most, with full recovery for most sectors within five years. The passers-by market will be the most affected and an extended decline is likely, until traffic volumes regain current totals circa 2010.

ANALYSIS OF REAL PROPERTY IMPACTS

Current Market Status

After a period of unprecedented activity and appreciation through the late 1980s, virtually every sector of the statewide real estate market entered a prolonged downcycle. While several areas in the islands have experienced a stabilization or nominal recovery since mid-decade, many linger in an unstable or stagnant state.

The West Hawaii real estate market mirrored these general trends over the past 15 years, with significant expansion of the residential, commercial, resort, and industrial sectors prior to the downturn of the early 1990s.

From 1984 through 1990, sales and development activity was strong, and appreciation rates were in the double-digits each year, with some properties increasing in value more than three-fold during the up-cycle. Beginning in 1991, prices moved downward, with most sub-markets registering declines of 30 to 60-plus percent. The number of sales and construction levels fell by 70 to 90 percent in some areas, and investment capital virtually dried-up.

It appears the region is headed towards better times, as indicated by the retail and residential projects under construction in greater Kailua-Kona and the increase in home building over the past year; however, market conditions remain subdued.

South-central Kona experienced a similar cycle during the past decade. Although it took until the late-1980s for the surging market demand to fully wash over the study area, and was generally limited to residential and raw land holdings. This high demand/appreciation period was followed by a marked downturn that continued into the mid-1990s.

Interest in bulk acreage properties and associated investment dollars remains limited.

Within the specific bypass right-of-way corridor, the real estate market, with the exception of the Villages at Hokukano, has been generally dormant in this decade. During the up-cycle of the 1980s, there was substantial interest in bulk acreage investment/development opportunities, as throughout West Hawaii, with several residential/resort projects having a makai or golf course orientation discussed.

After reaching a price peak in the late 1980s, raw land in the Keauhou to Napoopoo region, below the 1,000-foot elevation (non-oceanfront), has declined in price by upwards of 30 percent, having current values in the range of $8,000 to $15,000 per acre for bulk properties (more than 50 acres).

Given the framework of restrained market activity, the lack of infrastructure systems, the availability of "zoned" lands elsewhere in West Hawaii, and diminished investment resources, the demand for expansive agricultural and open space acreage in the area is very limited. It is not anticipated this status will change in the near to mid-term.

Along Mamalahoa Highway, the growth of last decade was manifest in numerous new commercial projects, the refurbishment of several older buildings, and residential construction in the adjoining neighborhoods. During the mid- to late-1980s, several retail properties in the corridor were purchased for development (notably gas and fast food) at prices reaching up to $12 to $15 per square foot. There was also significant refurbishment capital invested in Kainaliu and Kealakekua.

As previously discussed, the economic decline of the early 1990s affected all of the major demographic groups frequenting the study area and depressed the capital markets. When coupled with the competition provided by the Kailua-Kona superstores, the demand for new commercial floor space in south-central Kona stagnated. Several major tenants closed outlets (Foodland and Ben Franklin), with portions or all of their space remaining vacant for several years.

By mid-decade, the market had absorbed the deflation and made the necessary adjustments to reach a form of stabilization. By 1995, the tourist sector was moving back into an expansion trend and began presenting renewed opportunities for retail uses. Only in recent months have the local and other Kona consumer groups shown signs that recovery from the prolonged recession is occurring.

There will have to be further strengthening and growth in the core demographic groups, absorption of the currently vacant space, and resurgent entrepreneurial and investment vigor before significant new commercial development is successfully undertaken in the Honalo-Captain Cook region.

On a general basis, we have forecast the following trends for the real property sectors in the study area:

- In the bypass right-of-way corridor:

  Without the proposed highway, the lands will remain substantially undevelopable into the foreseeable future, a non-performing economic asset in the community land and real property tax base. Barring another cycle of speculative bulk land transactions, the sale activity and values of the land should not change meaningfully.

  With the proposed highway, the Villages at Hokukano will be constructed, but there is no market-based indication there will be a demand for additional inventory of any use type in the corridor over the near to mid-term. In the long term, as available land in greater Kailua-Kona is absorbed and study area housing pressures increase, some market support for further development may arise. However, the mere existence of the highway, and the vital access it will provide, changes the outlook for use of the properties from "not likely" to "possible over an extended period." This subtle difference will theoretically increase the investment/speculative value of the holdings and their associated real property tax assessments.

- Along Mamalahoa Highway:

  Without the proposed highway, the Honalo-Captain Cook corridor will remain the neighborhood commercial center(s) for south-central Kona. Until the economy exhibits pronounced recovery, demand for additional space will be limited to modernization of existing buildings and tourist-oriented businesses, with major new projects unlikely. Renewed construction and continued redevelopment of the retail areas will occur over the mid to long-term as the economics of the core demographic groups strengthens and their populations grow. The benefits of a sustained monopoly on all regional traffic will be somewhat offset by traffic congestion issues. The value of commercial land in the study area is currently stable and should show modest appreciation as the demand for

finished uses would increase over time while the quality sites are scarce.

With the proposed highway, there will be no meaningful changes in the Mamalahoa Highway commercial sector. The nominal decline anticipated for a very few businesses for a relatively short period should not be sufficient to destabilize even those concerns, and certainly not enough to affect space lease rental rates or underlying land values throughout the community.

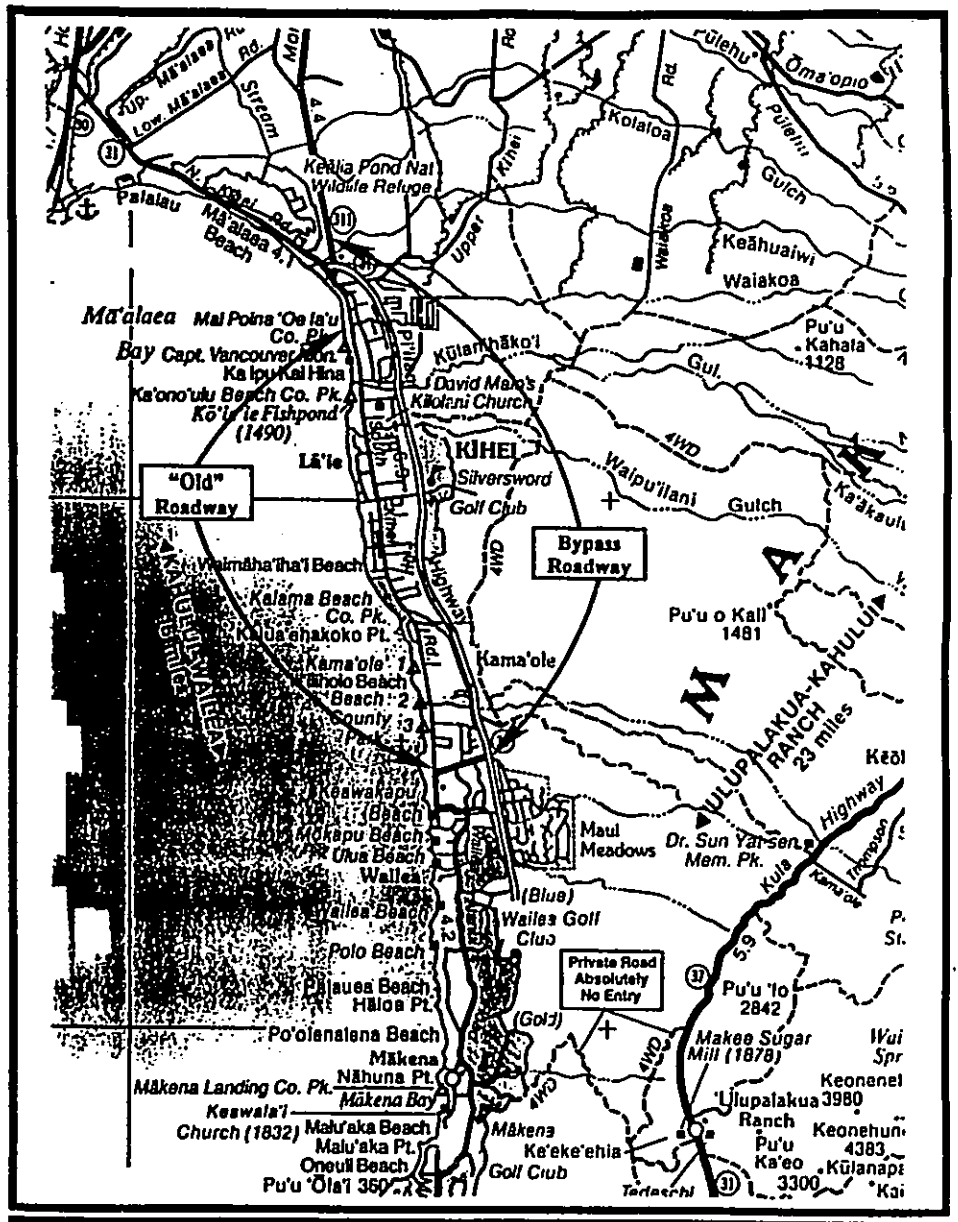
Hawaii Case Study Review

Examples of the real property impacts resulting from construction of a bypass highway near an established commercial corridor can be drawn from several roadways completed since 1980. In comparing the characteristics of these projects with the proposed subject Bypass, critical factors must be considered:

- The length (or scale) of the bypass project;
- The directness/convenience of the resulting traffic patterns;
- The probable impact on consumer demographic groups;
- Availability of utility systems;
- Accessibility to the new roadway; and
- Land use policies regarding frontage development.

Our analyses of selected bypass projects and their effects on proximate real estate are summarized in the following paragraphs, focusing on three Maui and one Oahu development.

Piilani Highway (Hawaii State Route 31) provided a mauka bypass behind Kihei, Maui, a rapidly expanding urbanized residential and resort community plagued by congestion along Kihei Beach Road, the only thoroughfare in the region. It was a major-sized project, stretching 6.4 miles, running parallel to the Beach Road only one-half to three-quarters of a mile



MAP OF PIILANI HIGHWAY (KIHEI BYPASS ROAD)
Proposed Alii Highway Extension aka the Mamalahoa Highway Bypass
South Maui

inland. A potential urban pod of 1,650 acres between the two right-of-ways.

The bypass was direct and convenient to the major arterials leading into the area. Utilities, though having limited capacity, were available nearby in neighborhoods, and access from the old to new roadway was promoted by numerous connecting streets. The ease of access into the "back" of Kihei subdivisions and ability to avoid the Beach Road transit problems resulted in major traffic changes among all area travelers. However, there was no discernible effect on the consumption habits of the local resident or South Maui tourist populations, the primary demographic groups. Changes in the passers-by groups (other Maui residents and tourists) were minor as there are few proximate alternatives, and did not significantly affect retail or restaurant business levels.

For years it was established by county policy that there would be no development mauka of the bypass, but that makai lands (between the highway and Beach Road) would be available for urban in-fill, which rapidly occurred over the next decade. Barriers to mauka frontage uses began to fall with the construction of the Maui Technology Park and Silversword Golf Course, and community expansion pressures and other bulk acreage uses have been considered for the area.

The "Old" Kihei Beach Road commercial corridor has expanded significantly since the construction of Piilani Highway, and there is no indication that it was negatively impacted in regards to business levels or real estate values by the construction of the bypass. The roadway may have accelerated land use in Kihei by providing both access to, and governmental acknowledgment of, the ultimate urbanization pod. However, much of the development would have likely transpired regardless, and the bypass right-of-way served as a barrier against further mauka intrusion for more than a decade.

Land values makai of the highway were enhanced by the new roadway (aided by perceived increased support for urban entitlements), accelerating until absorbed by the market. Mauka of the right-of-way, bulk land values were largely

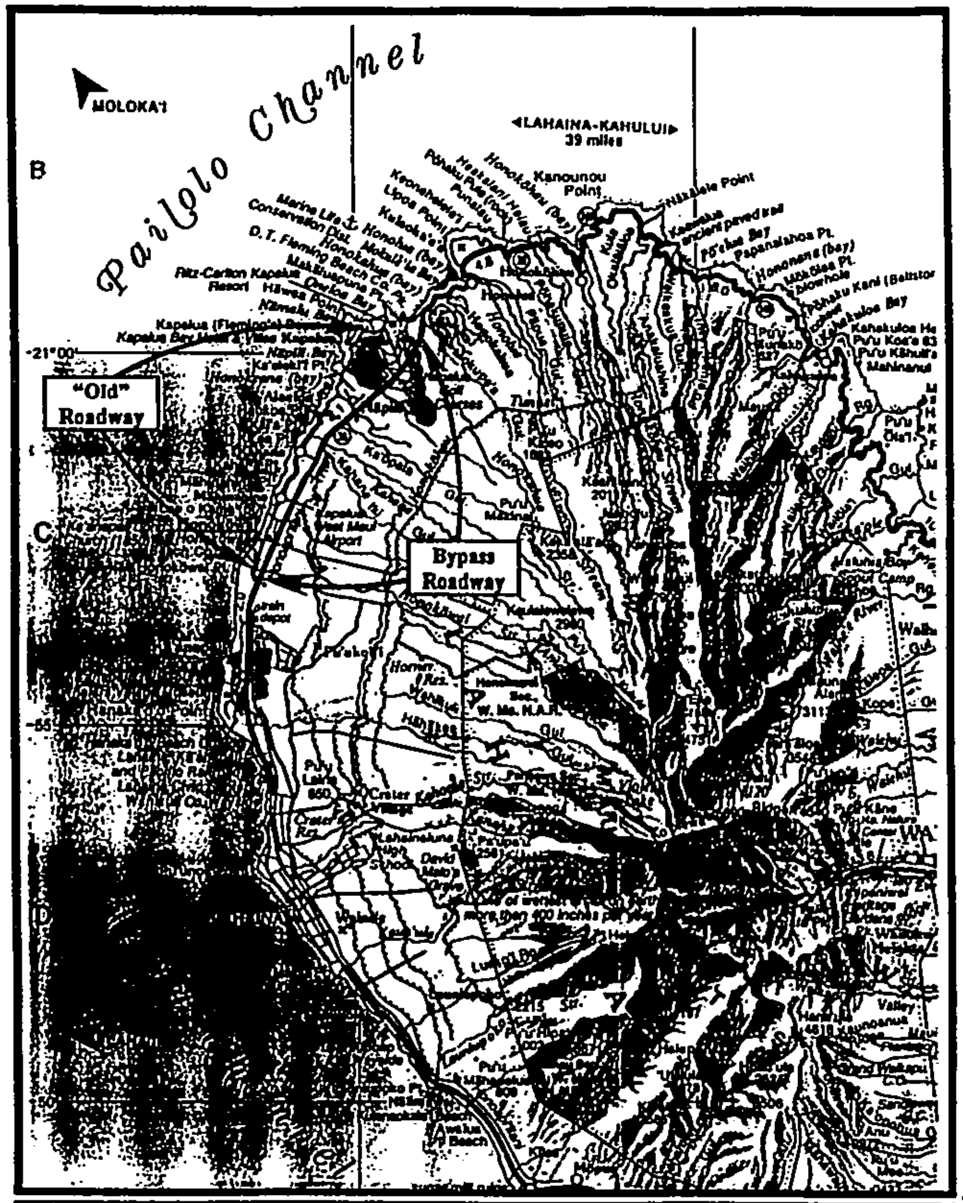
unaffected until it increased with the up-cycle of the late 1980s and the willingness to allow development of the holdings.

Honoapiilani Highway (Hawaii State Route 30) in West Maui was extended in the mid-1980s to provide a high-speed connector between Kaanapali and Kapalua Resorts, by-passing "Lower" Honoapiilani Road, a congested makai arterial serving the resort/residential neighborhoods of Honokowai, Mahinahina, Kahana and Napili. This was a moderate-sized project (2.3 miles), removed from the existing road by less than a quarter of a mile, and creating an area of some 368 acres between the two right-of-ways, portions of which were undevelopable gulches.

From a traffic perspective, this "bypass" has become an extension of the main arterial leading out of Kaanapali, moreso than an alternative route. In order to reach the old roadway, one must turn off the bypass right-of-way, making it the "most direct" path. The vast majority of through-traffic in the region uses the highway, which has limited access points and four connectors with Lower Honoapiilani Road. Utility services are available in the area.

Commercial uses along the lower roadway have always been limited to scattered convenience/superette stores and a few restaurants, generally intended to meet the immediate minor shopping and snack/beverage needs of the predominately tourist population in the region. Most grocery and other items, and all services, were purchased in Lahaina or central Maui. As a growing community with large numbers of moderate- to upper-income tourists, there was a latent demand for a competitive neighborhood commercial development. The quality frontage and access to available lands provided by the new highway stimulated construction.

Several major projects built within five years of the highway completion (Kahana Gateway and Napili Trade Center) which significantly altered the buying habits of the primary demographic groups, attracting business that previously was directed outside of the roadway corridor. However, it was because of increased goods and services being offered locally, not due to predation on the few existing area tenants.



MAP OF HONOAPIILANI HIGHWAY (KAHANA BYPASS ROAD)
Proposed Alii Highway Extension aka the Mamalahoa Highway Bypass
West Maui

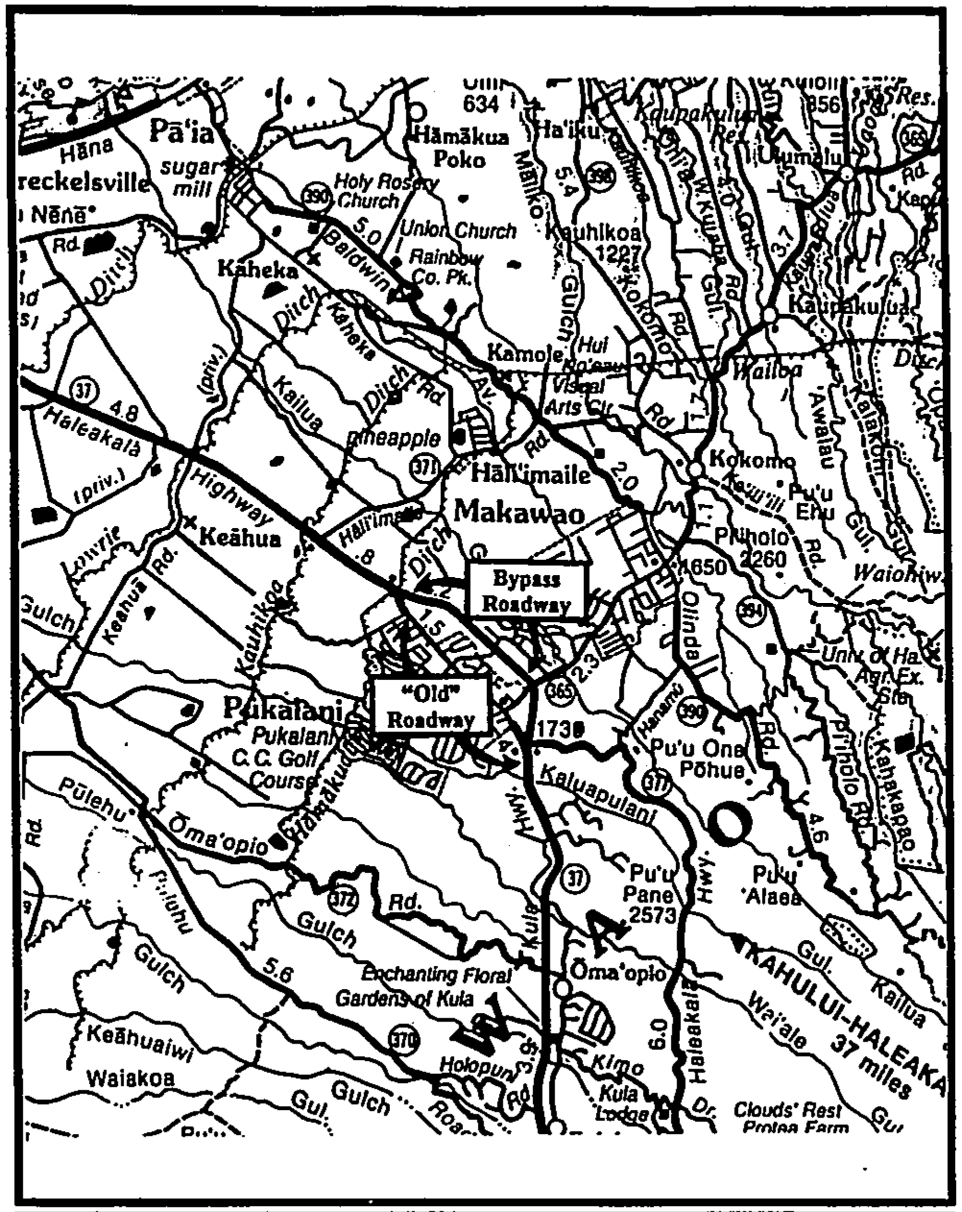
Businesses along Lower Honoapiilani Road continue to provide similar products and achieve comparable sales as before the bypass was completed, focusing on tourists and residents in the immediate vicinity (less than one-quarter mile). Passers-by sales have declined markedly, as there is no attraction/reason for outsiders to travel to the area, but no outlets have been permanently vacated as a result of the decline in traffic.

As with Piilani Highway, governmental agencies generally opposed development of the mauka fronting lands, but conceded the in-fill of the relatively few developable holdings in the pod makai of the right-of-way. The Kahana Hillside subdivision is the first significant project on the inland properties.

This highway project provided valuable neighborhood and passers-by-oriented commercial frontage in an area with an undersupply of available inventory, thereby increasing values for such usable sites. However, it did not otherwise have a significant impact on land use or prices along the roadway corridor.

The Haleakala Highway (Hawaii State Route 37) bypass of Pukalani is a recent moderate-sized roadway project (2.2 miles in length) which offers a high-speed connector between the Kula Highway/Haleakala Highway junction and the expanded lower elevation arterial. The new roadway circumvents Pukalani Town, circa one-half mile east of the "old" road, creating a potential urban pod of some 563 intervening acres, much of which is developed with village neighborhoods, although significant portions remain in agriculture.

This bypass is effectively the extension of Haleakala Highway, and is now the direct route favored by the majority of traffic, leading straight down the mountainside from the confluence of Pukalani, Kula and Makawao. Access onto the road is extremely limited, and there are few connectors between the bypass and Pukalani Highway. Utility systems have limited capacity, but are available in the area.



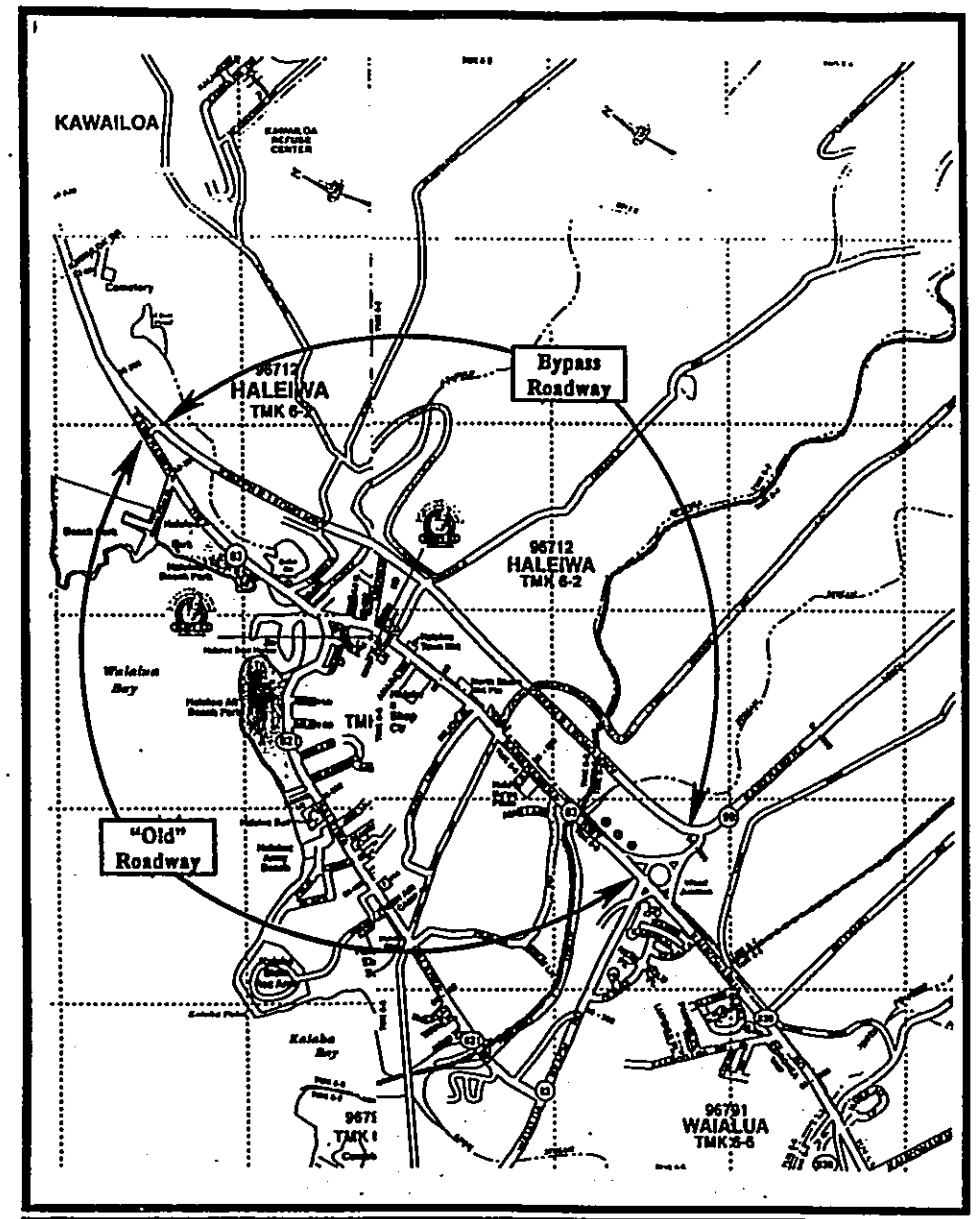
MAP OF HALEAKALA HIGHWAY (PUKALANI BYPASS ROAD)
Proposed Alii Highway Extension aka the Mamalahoa Highway Bypass
Upcountry Maui

The commercial district of Pukalani has experienced a steep decline in traffic, and a lesser significant drop in sales. Local resident neighborhood shopping habits have not been altered notably, although the emergence of superstores in Kahului in the early 1990s eroded the consumer base for many products as it has in Kona. The secondary demographic consumer groups, tourists, and passers-by have been substantially impacted, as the roadway has obviated the need to pass through Pukalani and there is no attraction to draw them into community shops. The Makawao commercial district has continued to show strength and is now a primary tourist destination in the region along with meeting neighborhood shopping and service needs.

There are no firm land use guidelines regarding bypass frontage development; however, the general perception is that urbanization and infill will be allowed in the area between the "old" and "new" roadways, on the Pukalani (west) side of the right-of-way. Intensive land uses on the Makawao (east) side holding are being discouraged. In general, the area lacks sufficient modern, competitive retail space, and two major strip mall developments have been proposed along the bypass. Because of the large size and integrated ownership of the bulk holdings fronting the roadway, there is no activity which would show that values along the right-of-way have increased since its opening, but there is no doubt that the long-term development prospects for the land have been improved, as indicated in the condemnation trials for the corridor.

The Joseph P. Leong Highway (an extension of State Route 99) is a recently opened moderate-sized (3.2-mile) project on Oahu that shunts the main focus of traffic off Kamehameha Highway and around central Haleiwa onto the North Shore. The roadway is effectively the direct continuation of the highway leading to Haleiwa and Central Oahu. Inbound travelers must make a left turn off the main road in order to pass through the town's main commercial district.

The bypass is generally one-quarter to less than one-half mile removed from the "old" road, and has limited access and few connectors. The pod between the two roadways contains some 600 acres, with some utilities available.



MAP OF JOSEPH P. LEONG HIGHWAY (HALEIWA BYPASS ROAD)
Proposed Alii Highway Extension aka the Mamalahoa Highway Bypass
North Shore, Oahu

Because the primary consumer demographic groups for many businesses in the bypass portion of old Haleiwa town were tourist and local passers-by, the new direct roadway has had a meaningful impact. Large numbers of the three-plus million visitors on the circle-island tour, and other Oahu residents traveling to the North Shore, now drive right by the heart of town. Those businesses serving the neighborhood needs of local residents have been much less affected. Promotional efforts enhancing the recognition/attraction of Haleiwa and its base of the North Shore surfing culture have helped entice traffic into the town center; however, the intense shopping opportunities in Waikiki and the large number of visitor destinations and points-of-interest in Central Oahu and along the North Shore limits the demand for tourist diversions in the region.

Development along the bypass has been limited more by poor economic conditions rather than government policy. The demise of sugar on Oahu will likely lead to greater use of the fronting lands over the mid to long-term. The bypass has likely exacerbated the decline in land values for central Haleiwa properties, specifically due to the loss of a huge level of traffic volume, which is unlikely to be recaptured through regional growth in the near to mid-term.

Insights on probable subject corridor impacts can also be drawn from the experience of **Queen Kaahumanu Highway** between Kailua-Kona and Kawaihae. After nearly a quarter century of use, the frontage of this major connector continues to be largely undeveloped outside of town despite massive land use reclassification efforts and regional investment during the last 15 years. Apart from a service station and Kaloko Industrial Park, the private holdings from Kealakehe to Anaehoomalu are vacant. This roadway demonstrates that the mere existence of an alternative route, even one direct and high speed, does not necessarily affect consumer habits. Only because Costco is reached via this arterial can it be said to have altered regional commercial businesses.

The proposed Mamalahoa Highway Bypass is a project of major scale, traversing five miles of undeveloped land. The new roadway will create a pod between itself and the Mamalahoa Highway of nearly 4,000 acres. With the exception of the terminus junctions, there is

anticipated to be no other major linkage with the existing road systems except at Halekii Street.

The subject bypass will not be particularly direct, beginning in the Keauhou community several miles downslope from Mamalahoa Highway and ending at a hillside intersection at the highway's Napoopoo Road junction. The net time saved in traveling from Kealakekua to central Kailua-Kona by the Bypass will be eight to 15 minutes on average, but should become more significant when Alii Highway is extended northward into town. The primary near-term benefit to the community will be in adding to the sheer volume that the regional roadway system can safely carry.

The proposed roadway will not meaningfully affect the neighborhood consumption habits of the south-central Kona resident, who form the primary demographic group in the area. Tourists will still visit the region, one of the few upland "destinations" in West Hawaii; and their spending habits are not anticipated to change, although many will use the bypass at some point in time (particularly those staying in the Keauhou area). "Other West Hawaii residents," who are a lesser consumer group, will be the focal users of the road.

There are no state or county land use policies specifically established for the subject right-of-way corridor and no significant projects proposed (other than the preliminarily approved Villages at Hokukano) which would call for clarification of the guidelines. It is generally assumed there would be opposition to urban re-zoning in the area. There are no utility services currently available, and overburdened regional systems have limited capacity for additional development.

Our analysis of Hawaii bypass case studies indicates that:

1. Direct bypass thoroughfares, in close proximity to urban development, with ease of access to the community and limited linkage to the "old road," can impact land values and established consumer demographics.

2. Tourists, passers-by and non-area residents are the most likely to alter their traffic and purchasing habits. Local residents do not meaningfully change their spending and consumption solely because of bypass construction.

3. Commercial land values along the "old" road can be negatively affected, but generally are not; and land values along the bypass right-of-ways typically increase upon opening (due to access benefits) and then over the long term as development opportunities arise.

4. Bypass roadways by themselves do not lead to intense urbanization in a vacuum. More typically, existing communities expand to them, filling in the space between the congested "old" road and bypass corridor. The bypass speeds this process by providing alternative routes into developing areas.

5. In communities lacking sufficient existing neighborhood commercial uses, there can be pressure to build retail centers on frontage properties shortly after completion. However, near- to mid-term commercial construction is typically absent or limited to service stations and convenience stores. Development usually does not occur until the mid to long-term when urbanization absorbs the infill area between the "new" and "old" arterials and additional expansion lands are needed.

6. County policy on allowed land use intensities within a bypass corridor can be a determining factor in limiting development in the face of rising market demand, particularly if guidelines are announced/established prior to roadway construction.

The subject Bypass does not possess the physical characteristics that have been demonstrated as leading to notable impacts on land use and existing businesses. It will not be a direct route, frontage access will be limited connectors with Mamalahoa Highway will be limited (if at all); and there are no utility systems available to service development.

It is not anticipated there will be sufficient development pressure in the region to force development into the corridor from the existing villages for an extended period. The size of the pod created by the two roadways is too large to be considered for urbanization during the study projection period. Further, there has been no governmental representation that such large-scale growth would be allowed throughout the makai lands.

Recent bypass projects in Hawaii do not indicate that the proposed Bypass must have a negative affect on existing commercial businesses, regional demographic consumer habits, or lead to unbridled urbanization. For the most part, the subject roadway impact on land use and property values, according to case study analysis, would be constrained.

Forecast of Real Property Effects

We anticipate that the holdings within the bypass corridor will be affected in the following manner:

Regardless of economic conditions or land use restrictions, completion of the proposed Bypass will inherently benefit the fronting and proximate properties, giving them superior access traits relative to other holdings in the region lacking quality road service. Although development may still be several decades away for most of the subject corridor parcels, the roadway is the first piece of the infrastructure and entitlement process.

Current bulk acreage land values should increase by at least ten percent during the construction and initial operation phases due to the increased accessibility. Barring an unanticipated near-term market up-cycle or the county aggressively promoting development, the value of the "access enhanced" sites would only grow gradually faster (five percent annually) than general appreciation levels, pushed upward the additional amount by the increasingly closer inevitable development.

During this period, although the long-term use potential of the frontage lands has been upgraded from "not in foreseeable future" to "possible over the long-term," the realization of urban uses is still too far removed to have an extreme present value impact. Other than the Villages at Hokukano project, we do not anticipate that any development in the corridor beyond (perhaps) a gas station/convenience store could be supported or would likely be pursued.

While investor/speculative activity would be expected to occur, the escalation pressure on land values should not be significant. Should an appreciation "spike" occur (which would affect all Kona real estate), the speculative characteristics of corridor lands will be more favorable

than most central and south Kona holdings, and more rapid appreciation could result.

After a decade or so, assuming West Hawaii experiences reasonable economic growth levels, the land use opportunities will have moved closer, diminishing the effect of the discounting process. Thereafter, land values should start to rise over time as development potentials become more apparent (even though it may still be 10 to 20 years removed), reaching peak levels when market demand, community acceptance of development and strong capital markets coalesce.

Significant market pressure for bulk acreage urban development in the bypass corridor is not anticipated during the 20-year projection period of this study. The demand for specialty/unique projects, such as Villages at Hokukano, is limited, and the natural population growth in south-central Kona will require only a fraction of the land in the area accessed by the roadways for residential and neighborhood uses.

Absorption of any major development in the Keauhou-Napoopoo corridor will require attracting large numbers of non-local resident purchasers beyond existing market parameters.

PROJECTION OF EMPLOYMENT AND WAGES

Roadway Construction and Operation

The construction and operation of the proposed Mamalahoa Bypass will favorably impact the West Hawaii economy, providing direct and indirect benefits to the community. In addition to enhancing traffic flow through the region, the multi-million dollar capital asset will generate employment during its development and use.

Furthermore, significant profit opportunities will arise for the contracting companies constructing the roadway and for local businesses who would supply a substantial portion of the materials needed in the building effort.

These wages, profits and expenditures will move through the regional economy, creating a "ripple" or multiplier effect, increasing the impact of the construction dollars on West Hawaii. Construction workers will

spend the majority of their income on living and entertainment expenses, while supporting and patronizing regional concerns. Much of this spending will in turn flow to other island businesses and industries which supply local outlets.

The total cost of the proposed bypass project is estimated at a maximum of $24,000,000, based on "hard" costs of $21,000,000 and indirect expenses of $3,000,000 (including design, supervision, overhead, financing and other "soft" items). A substantial portion of the contracts would be extended to Big Island businesses for materials, labor, equipment and support items.

Completion of the construction process is projected to require from three to a maximum of five years.

Based on comparisons with moderate and major roadway projects in the state, we estimate the bypass construction will create on-site (roadway construction crews) and direct (hauling of materials) employment equivalent to 182 total "worker-years" during development. Estimates on construction workers are based on a full-time worker-year of 2,000 labor hours, which may be comprised of many employees involved in specialized tasks of a much shorter duration.

The total wages paid to these individuals is estimated to be $6,370,000, based on an average hourly pay of $17.50 per hour, which is comprised of a range of positions from "laborer" ($10.50 per hour), carpenters and truck drivers ($14.50 to $19.75 per hour), to specialized heavy equipment operators (up to $26 per hour).

Project office staff and administration will generate eight (8) worker-years having a total wage of $275,000 during the construction period. Consultant, design, legal and other professional fees will equate to an additional 11 worker-years of wages ($660,000 total).

Total employment for the construction of the roadway will be 201 worker-years, with and estimated aggregate payroll of $7,305,000.

Employee support costs (health insurance, disability, FICA and other items) are estimated to comprise another $2,922,000.

Off-site and indirect employment positions will also result from the bypass project. These include truck dispatchers; quarry employees; vehicle maintenance workers; and a myriad of other office workers, tradesmen, suppliers and specialty services which will contribute in less evident ways. For these individuals, the construction effort would not be the primary focus of the business, but a supplement to the existing operation.

Further, as the workers spend their wages in the local community, numerous employment positions are supported, building a "ripple effect" as the money moves through the community.

DBED and Bank of Hawaii econometric data suggest a multiplier of 1.6 to 2.8 off-site jobs are created in the construction industry for every employment position on-site. We have utilized a multiplier of 1.8, at the low end of the range, but reasonably given due to the type of construction project proposed. The total enhancements to indirect positions as a result of the project on the Big Island will be equivalent to 361.8 worker-years, or a total "flow-through" wage benefit of some $8,321,000.

Barring unforeseen calamities, the "operation" of the Bypass will not create meaningful employment opportunities during the first several decades of use. Cyclical maintenance, litter/debris clean up, and signage/striping upkeep will be required, but major repair and repaving which would generate significant employment would be beyond the length of our projection period.

The sum of the various minor tasks incurred during operation of the new road should, on average, be approximately one-half worker-year annually (about 1,000 hours of work). The associated wages would total about $15,000 per year at current pay scales ($15 per hour average), plus benefits. Realistically, the five miles of subject roadway will represent less than 0.04 percent of the 13,800 miles of paved streets and highways on the Big Island, and will not necessitate substantial operating considerations.

Some policing and emergency response efforts will be required to deal with accidents and safety issues. However, these needs will be created solely as a function of traffic flow, which would otherwise be directed (along with the problems) back to an increasingly congested

Mamalahoa Highway. The enhanced "employment base" for these workers resulting from the opening of the new road is inconsequential.

As previously opined, we do not foresee significant frontage development on the Bypass for at least the first 15 to 20-plus years after opening. There is no evident existing unmet or foreseeable near to mid-term market demand for new urbanized lands in south-central Kona for uses which may generate employment (specifically industrial, retail or other commercial uses).

The rural setting of the roadway corridor further limits the desirability of the location from a potential business operating perspective.

The only reasonable opportunity along the Bypass would be a service station/mini-mart tapping into the passers-by using the road.[6] This represents the demand for gas and convenience items which are being shifted away from Mamalahoa Highway along with the commuter traffic. As the market share for any operation will be denuded by intercepting stations in Keauhou and Captain Cook, at either end of the highway, it will require strong traffic volumes to achieve profitability. We believe it would be six to ten years, after the initial phases of the Villages at Hokukano are absorbed and the regional economy has returned to a more stable footing, before there will be measurable support for a gas station in the study area.

Typically, a 24-hour self-serve gas station and mini-mart creates employment for seven to ten individuals who annually combine for a total of some five or six worker-years. At current levels, the total wages paid by such an operation would reach $105,000 per year, assuming 4.5 worker-years for counter positions (at $9 per hour), and one management position ($12 per hour). Should repair, safety inspection, propane sales or other services be offered, the station employment would be increased.

Service station/mini-marts generate significant supply and support business, and associated employment, relative to their overall size. A new client is available for vendor and product delivery routes and additional business for regional service providers. The benefit to indirect and off-site employment arising from the business and wages flowing through the West Hawaii economy should be toward the

[6] The developers of Villages of Hokukona have no plans to undertake or support a gas station/mini mart project.

upper-end of the multiplier range, or about 2.5 indirect jobs per direct position. A bypass gas station would, therefore, annually enhance the Big Island employment base by a combined 13.75 worker-years, which is equivalent to wages of $302,500, assuming an average pay of $11 per hour.

Impact on Regional Employment and Wages (Outside Roadway Corridor)

The most significant impact the proposed Bypass will have on regional employment trends is through increasing the potential number of working hours available to commuters using the road to avoid time-consuming congestion on Mamalahoa Highway. If, say, one half the traffic volume are commuters going to or from work, and each "saves" ten minutes in both directions by using the subject roadway, the total additional time made available to Kona residents will be some 80,000 minutes daily based on projected traffic patterns.[7]

Over the course of a working-year, the total regional time savings would be circa 487,000 hours. If all this time was put to productive job use, an unlikely occurrence, the total potential wage benefit to the community would be $5,357,000, assuming an average wage of $11 per hour.

In most respects, the overall employment characteristics of the region will be unchanged by the subject road well into the long term, particularly so if land use reclassifications are resisted by public agencies.

The redirection of large numbers of passers-by and some tourists from Mamalahoa Highway to the Bypass will move some of the associated consumption (gas, convenience and fast food) to other locations. Yet, the impact on existing employment levels overall should be nominal as the majority of businesses in the Honalo-Kealakekua corridor serve local resident needs.

Even among the few operations oriented towards the lesser regional demographic groups, it is highly doubtful that any will face imminent closure solely because of the subject roadway opening, although some

[7] M&E Pacific traffic studies indicate a potential time savings of up to 17.2 minutes for those using the proposed road over Mamalahoa Highway.

businesses experiencing lingering instability due to competition with the Kailua-Kona superstores or recessionary debt may falter.

Using a closed system perspective, it could be argued that the creation or enhancement of jobs at a service station along the new roadway or in Keauhou or Captain Cook must inherently come at the expense of an existing job in the Mamalahoa Highway corridor. Thus, as many as ten to 15 employment positions would move away from the highway operations.

This analysis inherently overstates impacts, as the typical response is a modification of workload (more or less) on existing employees, and not the number of workers. Further, the actual effect, if any, would be in relocation of the position from within the Honalo-Kealakekua area to a site relatively proximate that would likely utilize the same neighborhood workforce. The net result is no regional job loss.

On a macro statistical basis, if employment can be directly tied to the traffic volume and expenditures of selected demographic groups, the net loss in employment for the Mamalahoa Highway study area would be about one percent of the employment base in the near term, the equivalence of eight full-time positions based on an estimated regional employment of 800 persons in the frontage commercial businesses. As traffic volumes recover due to economic, population and tourism growth over time, any lost positions would be recovered.

If aggressive signage and marketing of south-central Kona as a "must see" tourist destination is undertaken, or further commercial redevelopment completed, the gain in tourist-oriented retail jobs will more than offset any near-term declines.

The change in commuter patterns may cause some businesses to alter operating hours and resulting personnel structures, but such adjustments are unquantifiable on a regional scale. Conversely, the availability of a higher speed, less congested access route will attract some new residents to south-central Kona and other south points, whom otherwise may not have relocated to the area. These individuals represent additional neighborhood consumers for local businesses.

ANALYSIS OF GOVERNMENT COSTS AND BENEFITS

The purpose of this section is delineate the areas in which the proposed subject roadway will potentially impact the sphere of public agency resources, and quantify (where possible) the *costs of providing expanded services* to the project, versus the economic *benefits that accrue to the community* through increase in taxes or fee payments.

Because it is effectively just a rural highway which will be dedicated to a government agency in a pristine condition, the associated public costs of construction and operation will be minor during the 20-year projection period, limited to:

- Planning and Construction Oversight
- Repair and Maintenance
- Emergency Services

Additionally, the government will bear fiduciary liability as the "owner" of the right-of-way.

The benefits to the state and county coffers will flow primarily from four major sources:

- Capital Asset Development
- Real Property Tax Receipts
- State Income Taxes
- Gross Excise Tax Receipts

Our analysis does not include any "hook up" or permit fees that public agencies may charge during the approval and construction process.

We have incorporated these primary cost and benefit items into a cash flow model depicting the construction and the first 20 years of bypass

operation. Table 4 displays a moderate case scenario, with all amounts expressed in current, constant dollars.

The undiscounted, aggregate net cash benefits flowing to governmental hands, as a direct result of the development of the subject roadway, is $26,062,433 during the study period; of which $24,000,000, or 92.09 percent, is the capital cost of constructing the asset.

This represents a creation of community wealth that would not otherwise exist without the bypass project.

The total does not include secondary and indirect public benefits (specifically through increased excise and income taxes) which will be created throughout West Hawaii due to the economic stimulus of the roadway development.

Public Costs

For analysis purposes, we have not differentiated between state and county costs associated with the subject project; although, we acknowledge there will be a division between the state and county in regards to tasks performed at construction and during operation.

For the planning, pre-development and construction period, we have included an allowance of $168,000 to reflect increased personnel and administration costs to the state and county oversight agencies. Government employees or contractors will be required to review and approve plans, inspect and sign-off on permit items, insure compliance measures are met, and process clerical work.

The estimate for these costs, which will be incurred over two years prior to and during the construction period, is based on 1,500 hours of design review, 1,500 hours of inspection and oversight, and 3,000 hours of administrative and support efforts. The current average in-place cost for a public employee is estimated at $28 per hour (average wage of $18.60 per hour plus 50 percent benefits and overhead).

We have conservatively included the entirety of this amount. To the extent that fees or assessments are paid during the project, the actual net cost to the public agencies will decline. Typically, it is assumed the review/administration costs are off-set by fees incurred, and that planning and building review departments are intended to provide for and be supported by the entire community.

TABLE 4

SUMMARY OF ESTIMATED DIRECT PUBLIC CAPITAL COSTS AND BENEFITS
Economic Impact Analysis of the Proposed Mamalahoa Highway Bypass
Kona, Hawaii

Year	Construction Period	Operating Year 1	2	3	4	5	6	7 (1)	8	9	10	Years 11 to 20	Years 16 to 20	Totals
Public Benefits														
Capital Asset Development	$24,000,000													$24,000,000
Increase in Real Property Taxes	$0	$2,331	$2,447	$2,569	$2,698	$2,833	$2,974	$3,123	$110,339	$110,731	$111,239	$57,855	$60,748	$169,157
State Income Taxes (2)	$1,077,200	$400	$400	$400	$400	$400	$400	$400	$11,056	$11,056	$11,056	$54,443	$54,443	$1,222,993
Gross Excise Receipts														
Total Direct Public Benefits	$25,077,200	$2,731	$2,847	$2,969	$3,098	$3,233	$3,374	$3,523	$121,395	$121,787	$122,295	$112,297	$115,191	$25,392,150
Public Costs														
Planning/Oversight Costs	$168,000													$168,000
Repair and Maintenance		$43,000	$43,000	$43,000	$43,000	$43,000	$43,000	$43,000	$43,000	$43,000	$43,000	$225,375	$225,375	
Emergency and Safety		$40,000	$40,000	$40,000	$40,000	$40,000	$40,000	$40,000	$40,000	$40,000	$40,000	$201,000	$201,000	$370,710
Total Direct Public Costs	$168,000	$83,000	$83,000	$83,000	$83,000	$83,000	$83,000	$83,000	$83,000	$83,000	$83,000	$426,375	$426,375	$538,710
Annual Net Public (Cost) or Benefit	$24,909,200	($80,269)	($77,153)	($79,031)	($79,902)	($79,767)	($79,626)	($79,477)	$38,395	$38,787	$39,295	($313,978)	($311,184)	$24,853,440

(1) One additional year as 2-work site.
(2) Includes only direct roadway maintenance workers income among government employees. Omits planners, emergency and safety, and oversight personnel wages.

Source: Valleau, and The Hallstrom Group, Inc.

Repair and maintenance should be relatively light during the study period. In addition to the estimated annual maximum of one-half worker-year, or $28,000 to fully service the roadway, there are associated equipment and materials for which we have made an allocation of $15,000. The total stabilized operating cost for the highway is estimated at $43,000 per year for the first ten years, increasing by three percent in years 11 through 20.

Emergency and safety services for the proposed Bypass will be a direct function of traffic volume, speeds and conditions leading to mishaps, or resulting from break-downs or unsafe practices ultimately requiring assistance. While it is difficult to quantify the frequency of accidents, according to The State Data Book in 1993 (the most current statistical year available), vehicles traveled 1,092,000,000 miles on the Big Island and were involved in 2,932 "major" traffic accidents causing more than $1,000 in damage. This is equivalent to a rate of one major accident for every 372,442 miles driven. During the same year, there were 2,196 traffic injuries, or one for every 497,267 miles traveled.

Traffic volumes on the new roadway are forecast to grow to 6,000 vehicle trips per peak work day, or about 1,860,000 annually, by the year 2015, which would equate to some 9,300,000 miles of travel per year. The anticipated number of major accidents for this amount of travel would be 24.97 incidents, or about two per month.

If each accident of this size warrants a response and follow-up effort by police employees equal to four worker-hours, with an estimated cost of $125 per hour (personnel, equipment and overhead), the total county expense for policing the Bypass would be about $12,485 per year in current dollars. Even with allowances for non-traffic related occurrences, the public safety response costs should be less than $15,000 annually.

It is assumed the time and costs relating to enforcing speed limits will be paid by the traffic fines collected.

Statistically, there is expected to be 18.70 traffic-related injuries per year resulting from vehicle accidents on the subject road by 2105, or just over one every three weeks. If on average, each injury elicited an average response, treatment and transport time equating to six worker hours (total of fire and emergency medical crews), with an average estimated cost of $200 per hour (more expensive equipment than

police), the total annual cost to county support services would be $22,440. Non-traffic calls and false alarms would be expected to add another 10 percent, for a total yearly cost of about $25,000.

These forecasts assume the roadway will have average incident levels. The modern deign and construction of the new road, its large right-of-way, the new surface condition, and lack of intersections or traffic convergence, should lower the frequency of accidents. Conversely, the higher speeds expected will make those which do occur more damaging.

While these costs have been included in our cash flow model because they will physically occur on the Bypass, they are not a direct result of its construction. The community would generate similar annual vehicle miles with or without the new road, and on average, a similar number of accidents and injuries would take place; they would just happen on Mamalahoa Highway.

In this regard, the true net additional cost to public agencies for police, fire and emergency support resulting from the subject road operation will be less than shown on the table. The actual extra expense would merely be the difference in response time and transportation efforts in answering a call on the Bypass versus along Mamalahoa Highway, where the departmental regional offices are located.

There are no major indirect/off-site public expenses anticipated to be associated with the Bypass. The right-of-way is rural and isolated, and will connect into existing arterials The road will be completed on a "turn-key" basis for dedication to public ownership.

There are no utility systems in-place which will require relocation or future upkeep, and frontage owners will be responsible for any development-oriented intersections or upgrades over the long term. Some enhancements may be desirable (landscaping, scenic viewpoints, shoreline access) but such opportunities would be a matter of civic choice, not a requirement of roadway construction.

Public Benefits

The proposed Bypass will directly contribute to the public purse through investment and tax dollars from four primary sources. Our estimates of these benefits are as follows:

Capital Asset Development -- The most significant benefit to the public will be the physical roadway asset. South-central Kona has needed additional transportation arterials for many years; and through the construction of the subject roadway, it will be receiving a valuable infrastructure component at minimal cost. The maximum dollar cost of this investment being made for the government is estimated at $24,000,000.

Real Property Taxes -- Although urban uses of the lands fronting the right-of-way corridor may be several decades removed, the mere existence of the roadway, providing access to currently inaccessible holdings, will increase the value of the adjoining parcels immediately upon completion and incrementally over time as development moves closer. This increase will be felt over an estimated 2,800 acres which currently have assessed values up to $15,000 per acre. The majority of lands have reduced assessments as they are dedicated agricultural holdings and taxes at a value of $50 to $60 per acre.

Even with the use dedication covering much of the area, over the long term, base assessment values will continue to escalate above the general rate of appreciation as development opportunities become more apparent. We have employed a "use potential value escalation factor" of five percent annually, compounded, to account for the trend towards urbanization over time.

In the first assessment year after opening, the increased real property taxes generated in the bypass corridor will be $2,331 above current receipts, escalating to a stabilized level of $11,656 annually over current levels upon the opening of the envisioned service station project.

Income Taxes -- Construction and operation workers on the Bypass will pay state income taxes on wages earned. Taxable direct employment wages are anticipated at $7,305,000 during the construction process, and at $15,000 annually during the initial years of the operating forecast period, increasing to $120,000 per year in the later forecast years.

According to the Tax Foundation of Hawaii, residents in the state paid income taxes equivalent to 4.85 to 5.42 percent of gross income and wages during the years 1991 through 1994, tending toward the higher figure in more recent years. Generally, workers receiving the pay scales associated with the type of jobs involved in the construction and operation of the roadway will be in the low- to mid-income brackets in regards to tax rates. We have, therefore, used a four percent of gross wages allowance to account for income tax receipts generated by direct employment (including a gas station/mini-mart forecast to open in year eight of operation).

Corporate income taxes will be paid by the companies doing the construction work and by any businesses along the right-of-way. The effective corporate income tax rate for years 1991 through 1993 (the most recent years for which full statistics are available) ranged from 3.15 to 3.31 percent of gross profits. Assuming each item in the construction contract generates a ten percent profit for the contracting/supply business, the gross taxable corporate profit for the development stage of the subject road will be $2,400,000, resulting in corporate income tax payments of $78,000 at an average tax rate of 3.25 percent of gross profits.

A gas station/mini-mart in this location within the envisioned traffic volume level would be expected to generate annualized gross sales of some $2,750,000 (equivalent to $7,500 per day), and a gross operating profit of about seven percent on sales, or $192,500 per year. The resulting income tax burden would be $6,256 annually.

The total state income tax paid during the construction period of the roadway will be some $1,072,200. During operation the amount will be $600 per year until opening of the service station, whereafter it will increase to $11,056 annually throughout the remainder of the study time frame.

Gross Excise Taxes -- This figure was calculated at 4.167 percent of all private business activity during the construction and operation of the Bypass. During construction, the total excise tax paid by all contributory businesses and components would be $1,000,080. The service center operation would

produce excise taxes of $114,593 per year in addition to state fuel taxes.

Indirect tax benefits will include those associated with off-site suppliers, services, and workers; and the effect their operations/earnings and spending have on the West Hawaii business community. If a conservative economic multiplier of 1.8 times the base activity is used to account for these items, the additional taxes generated from all indirect and secondary sources would be some $7,062,000 during the projection period.

Non-Economic Public Benefits

Among the primary non-economic contributions to West Hawaii which will be generated by the proposed subject project are:

- The fundamental public enhancement provided by the proposed Bypass will be its contribution to a congested regional transportation system. Beyond the quantifiable economic gains, the roadway will benefit the south-central Kona community through numerous intangible ways. Increased accessibility, less stressful commuting, greater time efficiency, and more appropriate vehicle mixes will all contribute to a better traffic flow--a major business and lifestyle consideration in a car-oriented society.

- The existence of a modern highway will create long-term land use opportunities beyond those properties having direct frontage. Shoreline access and recreational venues are severely limited in the study region due to lack of access. As evidenced by the state park acquisitions and initial development near Queen Kaahumanu Highway along the northern Kona coastline, a transportation corridor can serve to make public facilities among the first "uses" in a previously inaccessible area.

- By decreasing commuting times and spreading the flow of traffic along several thoroughfares, the pressure for further residential development can be extended over a broader area. The continuing emphasis on Mamalahoa Highway has served to destabilize the integrity of the choice agricultural lands near the existing communities, and a faster commute may allow

more outlying, less productive lands to be competitive in the housing market.

- Unlike many highway projects which cause major extended traffic disruptions during construction, and attendant loss of wages and time, the proposed Bypass can be developed with minimal impact on the surrounding community.

CERTIFICATION

We certify that to the best of our knowledge and belief:

- The statements of fact contained in this report are true and correct.

- The reported analyses, opinions, and conclusions are limited only by the reported assumptions and limiting conditions, and are our personal, unbiased professional analyses, opinions, and conclusions.

- We have no present or prospective interest in the property that is the subject of this report, and we have no personal interest or bias with respect to the parties involved.

- Our compensation is not contingent on an action or event resulting from the analyses, opinions, or conclusions in, or the use of, this report.

- Our analyses, opinions, and conclusions were developed, and this report has been prepared, in conformity with the Uniform Standards of Professional Appraisal Practice.

- We have made personal inspections of the property that is the subject of this report.

- No one other than the undersigned provided significant professional assistance to the persons signing this report.

THE HALLSTROM GROUP, INC.

James E. Hallstrom, Jr., MAI, SRA
Hawaii State Certified
General Appraiser, CGA-178
Exp. Date December 31, 1999

Tom W. Holliday /lst
Tom W. Holliday

/as

3926_R01

ADDENDA

LIMITING CONDITIONS AND ASSUMPTIONS

The research, analysis, conclusions, and certification performed by The Hallstrom Group, Inc. are subject to and influenced by the following:

- The report expresses the opinion of the signers as of the date stated in the letter of transmittal, and in no way has been contingent upon the reporting of specified values or findings.

- Any sketches, maps, plot plans, and photographs included in the report are intended only to show spatial relationships and/or assist the reader in visualizing the property. They are not measured surveys or maps and we are not responsible for their accuracy or interpretive quality.

- It is assumed that the subject property is free and clear of any and all encumbrances other than those referred to herein, and no responsibility is assumed for matters of a legal nature. The report is not to be construed as rendering any opinion of title, which is assumed to be good and marketable. No title information or data regarding easements which might adversely affect the use, access, or development of the property, other than that referenced in the report, was found or provided. The property is analyzed as though under responsible ownership and competent management.

- Preparation for, attendance, or testimony at any court or administrative hearing in connection with this report shall not be required unless prior arrangements have been made therefor.

- If the report contains a valuation relating to a geographical portion or tract of real estate, the value reported for such geographical portion relates to such portion only and should not be construed as applying with equal validity to other portions of the larger parcel or tract; and the value reported for such geographical portion plus the value of all other geographical portions may or may not equal the value of the entire parcel or tract considered as an entity.

- It is assumed that there are no hidden or inapparent conditions of the property, subsoil, or structures which would render it more or less valuable; we assume no responsibility for such conditions or for engineering which might be required to discover such factors.

- Information, estimates, and opinions provided by third parties and contained in this report were obtained from sources considered reliable and believed to be true and correct. However, no responsibility is assumed for possible misinformation.

- Possession of the report, or a copy thereof, does not carry with it the right of publication, and the report may not be used by any person or organization except the client without the previous written consent of the appraiser, and then only in its entirety. If the client releases or disseminates the reports to others without the consent of the appraiser, the client hereby agrees to hold the appraiser harmless, and to indemnify the analysts from any liability, damages, or losses which the analysts might suffer, for any reason whatsoever, by reason of dissemination of the report by the client. Further, if legal action is brought against the analyst by a party other than the client concerning the report or the opinions stated therein, the client agrees, in addition to indemnifying the analysts for any damages or losses, to defend said analysts in said action at client's expense. However, nothing herein shall prohibit the client or analysts from disclosing said report or opinions contained therein as may be required by applicable law.

- Disclosure of the contents of this report is governed by the By-Laws and Regulations of the Appraisal Institute. Neither all nor any part of the contents of this report (especially any conclusions as to value, the identity of the appraisers or the firm which they are connected, or any reference to the Appraisal Institute or to the MAI designation) shall be disseminated to the public through advertising media, public relations media, news media, sales media, or any public means of communication without the prior consent and approval of the appraisers.

- Unless otherwise stated in this report, the existence of hazardous material, which may or may not be present on the property, was not observed by the appraiser. The appraiser has no knowledge of the existence of such materials on or in the property. The appraiser, however, is not qualified to detect such substances. The presence of substances such as asbestos, urea-formaldehyde foam insulation, or other potentially hazardous materials may affect the value of the property. The value estimate is predicated on the assumption that there is no such material on or in the property that would cause a loss in value. No responsibility is assumed for any such conditions, or for any expertise or engineering knowledge required to discover them. The client is urged to retain an expert in this field, if desired.

- The Americans with Disabilities Act (ADA) became effective January 26, 1992. We have not made a specific compliance survey and analysis of this property to determine whether or not it is in conformity with the various detailed requirements of the ADA. It is possible that a compliance survey together with a detailed analysis of the

requirements of the ADA could reveal that the property is not in compliance with one or more of the requirements of the act. If so, this fact could have a negative effect upon the value of the property. We did not consider possible noncompliance with the requirements of ADA in estimating the value of the property.

THE HALLSTROM GROUP INC.

PROFESSIONAL BACKGROUND AND SERVICES

The Hallstrom Group, Inc. is a Honolulu based independent professional service organization that provides a wide scope of real estate consulting services throughout the State of Hawaii with particular emphasis on valuation studies. The purpose of the firm is to assist clients in formulating realistic real estate decisions. It provides solutions to complex issues by delivering thoroughly researched, objective analyses in a timely manner. Focusing on specific client problems and needs, and employing a broad range of tools including after-tax cash flow simulations and feasibility analyses, the firm minimizes the financial risks inherent in the real estate decision making process.

The principals and associates of the firm have been professionally trained, are experienced in Hawaiian real estate, and are actively associated with the Appraisal Institute, a nationally recognized appraisal and real estate counseling organization.

The real estate appraisals prepared by The Hallstrom Group accomplish a variety of needs and function to provide professional value opinions for such purposes as mortgage loans, investment decisions, lease negotiations and arbitrations, condemnations, assessment appeals, and the formation of policy decisions. Valuation assignments cover a spectrum of property types including existing and proposed resort and residential developments, industrial properties, high-rise office buildings and condominiums, shopping centers, subdivisions, apartments, residential leased fee conversions, special purpose properties, and vacant acreage, as well as property assemblages and portfolio reviews.

Market studies are research-intensive, analytical tools oriented to provide insight into investment opportunities and development challenges, and range in focus from highest and best use determinations for a specific site or improved property, to an evaluation of multiple (present and future) demand and supply characteristics for long-term, mixed-use projects. Market studies are commissioned for a variety of purposes where timely market information, insightful trends analyses, and perceptive conceptual conclusions or recommendations are critical. Uses include the formation of development strategies, bases for capital commitment decisions, evidence of appropriateness for state and county land use classification petitions, fiscal and social impact evaluations, and the identification of alternative economic use/conversion opportunities.

PROFESSIONAL QUALIFICATIONS OF JAMES E. HALLSTROM, JR., MAI, SRA

Business Background	Chairman and Former President	The Hallstrom Group, Inc. Honolulu, Hawaii
	Vice President	The Hallstrom Property Group, Inc. Honolulu, Hawaii
	Former Senior Vice President and Treasurer	Hastings, Martin, Hallstrom and Chew, Ltd., Honolulu, Hawaii (1972-1980)
	Former Vice President	Pacific Area Realty, Ltd. Honolulu, Hawaii (1972-1980)
	Former Real Property Appraiser and Analyst	Administration, Inc., a subsidiary of C. Brewer and Company, Limited Honolulu, Hawaii (1971-1972)
	Former Partner	Hallstrom and Gentner Madison, Wisconsin (1970-1971)
	Former Senior Real Property Appraiser and Analyst	Opitz Realty, Madison, Wisconsin (1969-1971)

Education

- M.S. (Real Estate Appraisal and Investment Analysis) 1971, University of Wisconsin at Madison
- B.A. (Economics) 1969, Brigham Young University at Provo
- Additional Real Estate Studies include credit for the following:

AIREA	Course IA	- Basic Appraisal Principles, Methods and Techniques
	Course IB	- Capitalization Theory and Techniques
	Course II	- Urban Properties
	Course II-3	- Standards of Professional Practice
	Course VI	- Introduction to Real Estate Investment Analysis
	Comprehensive Exam	- Composite Examination prior to being awarded MAI Designation
SREA	Course 101	- Introduction to Appraising Real Property
	Course 201	- Principles of Income Property Appraising
	Course R-2	- Residential Case Study
AI	Course 410	- Standards of Professional Practice-Part A
	Course 420	- Standards of Professional Practice-Part B
	Course 430	- Standards of Professional Practice-Part C

Other

- Currently has completed the requirements of the Appraisal Institute's Continuing Education Program
- Instructor for Society of Real Estate Appraisers Course 101, "Introduction to Appraising Real Property" and Course 201, "Principles of Income Property Appraising"
- Contributing author to the "Hawaii Real Estate Investor"
- Lecturer at numerous professional seminars and clinics

PROFESSIONAL QUALIFICATIONS OF THOMAS W. HOLLIDAY

Business Background	Senior Analyst	The Hallstrom Group, Inc. Honolulu, Hawaii
	Former Staff Appraiser	Davis-Baker Appraisal Co. Avalon, Santa Catalina Island, California

Education

- B.A. (Communications/Journalism) 1978 California State University at Fullerton
- SREA Course 201- Principles of Income Property Appraising
- Numerous professional seminars and clinics
- Contributing author to **Hawaii Real Estate Investor**, Honolulu Star Bulletin

On January 1, 1991, the American Institute of Real Estate Appraisers (AIREA) and the Society of Real Estate Appraisers (SREA) consolidated, forming the Appraisal Institute (AI).

Appendix J
Traffic Analysis Report
(M&E Pacific)

Draft
6/3/97

A TRAFFIC ANALYSIS FOR AN ENVIRONMENTAL IMPACT STATEMENT FOR THE NEW HIGHWAY, NORTH AND SOUTH KONA, HAWAII

By:

M&E Pacific, Inc.
100 Pauahi Street, Suite 212
Hilo, Hawaii 96720
Telephone: (808)961-2776

June, 1997

EXECUTIVE SUMMARY

This report documents the methodology and results of a study conducted to determine the traffic impacts of a proposed New Highway in North Kona and South Kona, Hawaii. The construction of the New Highway is contingent upon the Villages of Hokukano project being implemented. The proposed highway would run between Alii Highway in North Kona and the Mamalahoa Highway/Napoopoo Road intersection in South Kona. The five mile alignment will be makai of the Hawaii Belt Road (Kuakini Highway and Mamalahoa Highway).

The study analyzed the following scenarios:

1. Existing (1997).
2. Year 2010 "No-Build".
3. Year 2015 "No-Build".
4. Year 2010 "With Project" and Alii Highway Extension.
5. Year 2015 "With Project" and Alii Highway Extension.
6. Year 2010 "With Project" and No Alii Highway Extension.
7. Year 2015 "With Project" and No Alii Highway Extension.

Traffic counts were taken at six locations to determine existing traffic conditions. The years 2010 and 2015 correspond to the time periods when the Villages of Hokukano are expected to be at intermediate and full development, respectively. The "With Project" scenarios included the proposed highway section with and without the Alii Highway Extension. The "No-Build" scenarios did not include either highway project since neither one is constructed or scheduled for construction.

The "With Project" forecasts involved two steps. For each forecast year, the first step determined that about half of the future traffic would be diverted to the New Highway facility. Then the traffic which would be generated by the Villages of Hokukano project was added to the diverted traffic forecasts to obtain the total "With Project" forecasts.

A level of service analysis was conducted to qualify the traffic volumes forecasts. The procedures from the Transportation Research Board Highway Capacity Manual for calculating levels of service at signalized and unsignalized intersections were utilized.

CONCLUSIONS

The proposed New Highway will change traffic patterns in North Kona and South Kona. Its most significant impact would be to reduce traffic volumes on Hawaii Belt Road, which would otherwise require extensive improvements including roadway widening from Napoopoo Road to Kuakini Highway and the installation of traffic signals. However, the Hawaii Belt Road does not have sufficient right-of-way to be widened in many areas. Therefore, the New Highway is a feasible means to meet future travel demands. The specific positive impacts of the New Highway (with or without the Alii Highway Extension) in addition to reducing traffic volumes and improving traffic conditions on Hawaii Belt Road include:

1. Minimizing the need for traffic signals at the Mamalahoa Highway/Kuakini Highway intersection.

2. Improving traffic conditions significantly at the Mamalahoa Highway/ Halekii Street intersection through the reduction of traffic on Mamalahoa Highway and the installation of traffic signals.

3. Eliminating the need for additional improvements at the Kuakini Highway/ Kamehameha III Road intersection (with the Alii Highway Extension).

4. Eliminating the need for additional improvements at the Mamalahoa Highway/Konawaena School Access Road intersection.

5. Improving traffic flow on Mamalahoa Highway in the vicinity of the Kona Hospital, thereby improving emergency vehicle access.

RECOMMENDATIONS

It is recommended that the New Highway project be implemented to improve traffic conditions in North Kona and South Kona. Specific recommendations for improvements include:

1. Installing traffic signals at the new Mamalahoa Highway/New Highway/ Napoopoo Road intersection, when warranted, to accommodate the large number of left turns forecasted. A new intersection design is being developed.

2. Installing traffic signals at the New Highway/Halekii Street intersection, when warranted, to facilitate left turn and through movements from both approaches of Halekii Street.

3. Possibly requiring additional lanes on Alii Highway at the Kamehameha III Road intersection (with Alii Highway Extension).

4. If the Alii Highway Extension is not built with the New Highway, the highway projects recommended in the "Island of Hawaii Long Range Highway Plan" would need to be pursued:

   a. Widening Kuakini Highway to four lanes north of Kamehameha III Road.

   b. Installing a two way left turn lane on Kamehameha III Road. This improvement would be extended to include separate left turn lanes at the mauka and makai approaches of Kamehameha III Road at Kuakini Highway and Alii Highway, respectively.

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A TRAFFIC ANALYSIS FOR AN ENVIRONMENTAL IMPACT STATEMENT FOR THE NEW HIGHWAY, NORTH AND SOUTH KONA, HAWAII

This report documents the methodology and results of a study conducted to determine the traffic impacts of a proposed New Highway in North Kona and South Kona, Hawaii.

PROJECT DESCRIPTION

The proposed five mile New Highway alignment will be makai of the existing Kuakini Highway and Mamalahoa Highway. At its northern terminus, the highway would extend from the Alii Highway in Keauhou, North Kona. The southern terminus would be at the Mamalahoa Highway/Napoopoo Road intersection in South Kona. The proposed alignment is shown on Figure 1.

The New Highway will be initially built as a two-lane highway but will have sufficient right-of-way to expand to four lanes in the future. Its construction is contingent upon the Villages of Hokukano project being implemented. Therefore, the Villages are included in the "With Project" scenarios and are not included in the "No-Build" scenarios.

The New Highway is a variant of one of several highway improvement projects recommended for the Kona area in the "Island of Hawaii Long Range Highway Plan" (May 1991) prepared by Parsons Brinckerhoff Quade and Douglas, Inc. The list of recommended projects and their priorities included:

Tier 1, priority 9: Alii Highway Extension from Queen Kaahumanu Highway to Kamehameha III Road; build a new highway.

Tier 1, priority 15: Kuakini Highway from Alii Highway to Kamehameha III Road; widen to four-lane divided arterial.

Tier 1, priority 16: Hawaii Belt Road from Kamehameha III Road to Napoopoo Road; build a new (makai) four-lane divided arterial.

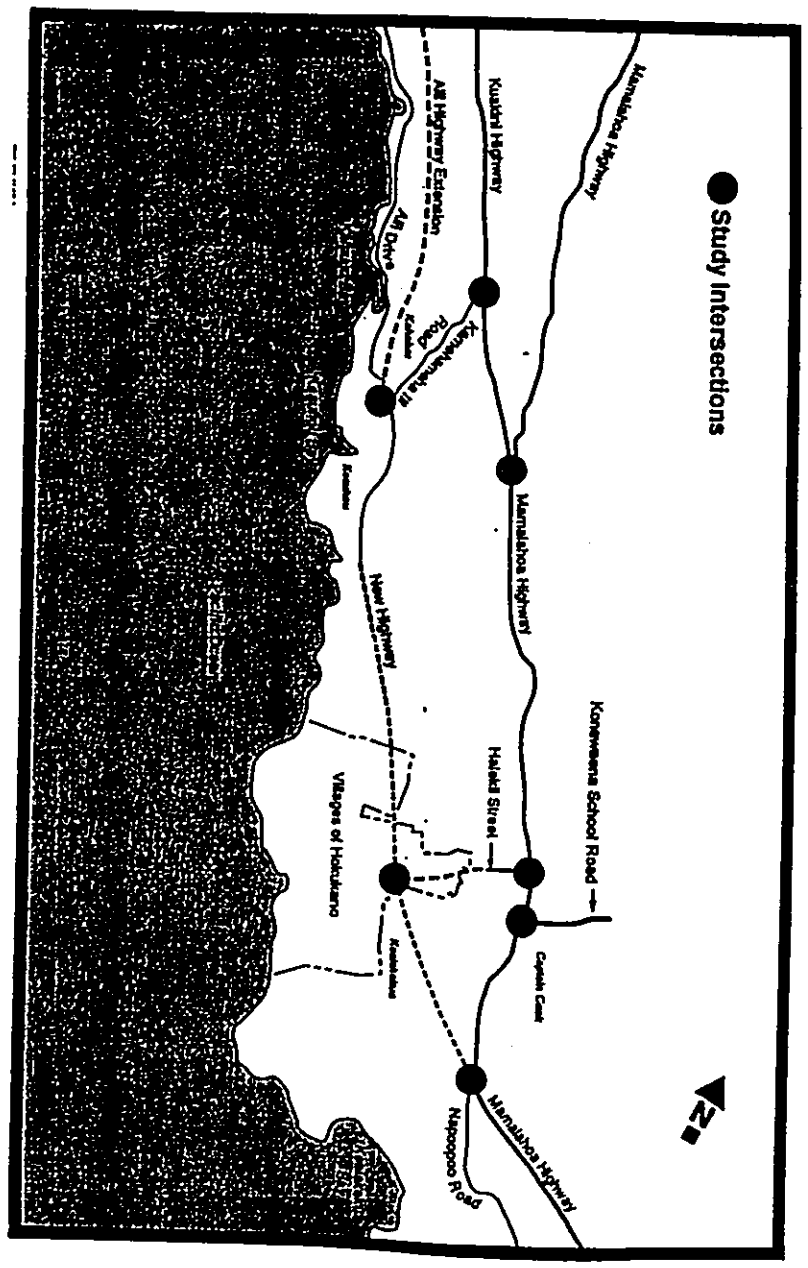

FIGURE 1

LOCATION MAP
Not to Scale

Tier 2, priority D: Kamehameha III Road; widen to provide a two-way left turn lane.

Tier 2, priority I: Napoopoo Road; improve to provide standard width lanes and shoulders.

The New Highway is a variant of the third recommended project in that it matches the general location but not the specifically proposed alignment. It should be noted that a purpose of long-range highway plans is to identify the general corridors of recommended improvements and not necessarily their specific alignments.

STUDY METHODOLOGY

The study utilized the following procedures:

1. Review of existing conditions, including roadway configurations and traffic volumes.

2. Forecast of future traffic with and without the proposed highway project.

3. Analysis of existing and forecast traffic conditions with recommendations for the proposed highway project.

The study analyzed the following scenarios:

1. Existing (1997).
2. Year 2010 "No-Build" (without project).
3. Year 2015 "No-Build" (without project).
4. Year 2010 "With Project" and Alii Highway Extension.
5. Year 2015 "With Project" and Alii Highway Extension.
6. Year 2010 "With Project" and No Alii Highway Extension.
7. Year 2015 "With Project" and No Alii Highway Extension.

The second and third scenarios forecast future traffic conditions if the two recommended highways are not built. The fourth and fifth scenarios forecast

future conditions with the two highways built and the Villages of Hokukano at intermediate and full development, respectively. The last two scenarios forecast future traffic conditions if the New Highway and Villages of Hokukano are built without the Alii Highway Extension.

The traffic forecasts include the traffic volumes which can be expected in the future and the quality of traffic, as measured by levels of service at key signalized and unsignalized intersections in the study area which was bounded by Kamehameha III Road, Kuakini Highway, Mamalahoa Highway, and Napoopoo Road. Levels of service were analyzed for the seven intersections identified on Figure 1:

1. Kuakini Highway at Kamehameha III Road
2. Kuakini Highway at Mamalahoa Highway
3. Mamalahoa Highway at Halekii Street
4. Mamalahoa Highway at Konawaena School Access Road
5. Mamalahoa Highway at Napoopoo Road
6. Kamehameha III Road at Alii Highway
7. New Highway at Halekii Street

The first six intersections are existing, the last will be built to serve the Villages of Hokukano.

EXISTING CONDITIONS

A. Roadway Conditions

Kuakini Highway and Mamalahoa Highway are the main north-south roadways on the Kona Coast in the study area and are referred to as the Hawaii Belt Road. It is primarily a two-lane arterial with left turn lanes at selected intersections. The two highways intersect near the town of Honalo, where the Mamalahoa Highway goes on a mauka alignment as the Old Mamalahoa Highway. The Kuakini Highway continues north to the town of Kailua.

The Alii Highway currently begins as a continuation of Alii Drive north of the Keauhou Shopping Center. It continues south past the Kamehameha III Road

intersection and terminates by the Keauhou-Kona Golf Course. It is a two-lane undivided highway with traffic signals and lane channelization at the Kamehameha III Road intersection. Alii Drive and Alii Highway currently provide a makai travel route between Kailua and Keauhou.

Kamehameha III Road is a two-lane undivided roadway that provides a connection between the mauka Kuakini Highway and the makai Alii Highway. The Kuakini Highway intersection is signalized and channelized. Walua Road, which serves a residential area, is the mauka approach to the intersection.

Halekii Street is a two-lane mauka-makai connector roadway between Mamalahoa Highway and the Kona Scenic subdivision. Its intersection with Mamalahoa Highway is channelized and stop controlled. The roadway also serves a post office and commercial center on the southwest corner of the intersection.

The Mamalahoa Highway at Konawaena School Access Road intersection was recently improved to include traffic signals and separate turning lanes. The latter roadway provides access to Konawaena School mauka of Mamalahoa Highway.

Napoopoo Road is a substandard roadway that provides access to the makai communities. Its intersection with Mamalahoa Highway is at an upgrade, at a non-right angle, and has space for separate left and right turn lanes. At this point Mamalahoa Highway is at about a four percent upgrade to the south and there is no turning lane for traffic turning left into Napoopoo Road.

The existing lane configurations at the study intersections are graphically shown on Figure 2 and the signalized intersections identified. The existing intersection designs were used for subsequent analysis except at Mamalahoa Highway/ Napoopoo Road.

B. Traffic Volumes

Traffic turning movement counts were taken at the six study intersections during the morning and afternoon peak periods on Wednesday, January 8, 1997.

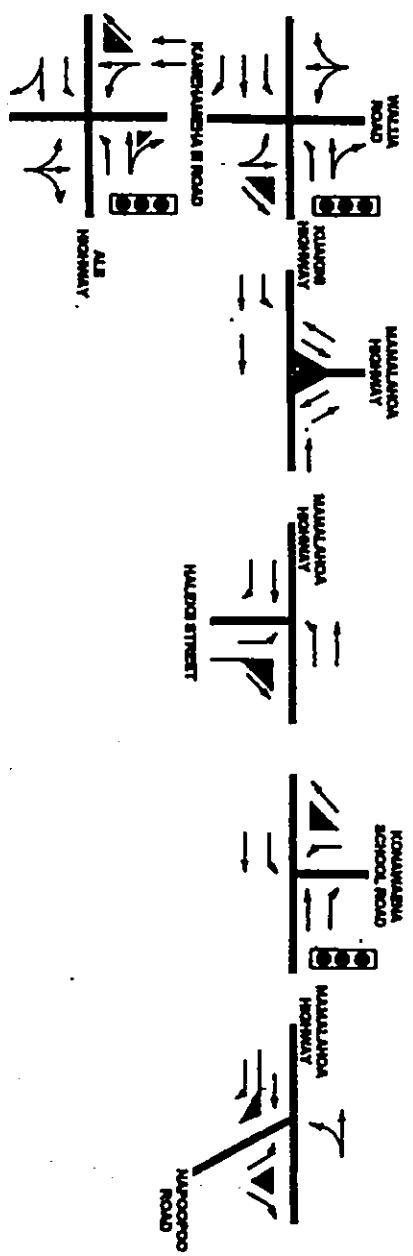

FIGURE 2

EXISTING LANE CONFIGURATIONS AND TRAFFIC CONTROL

Traffic turning movement counts required workers to station themselves by each study intersection and record each vehicle movement as through or turning movements by 15 minute intervals. The worksheets for the traffic counts are included in the Appendix. The traffic count at the Kuakini Highway/ Kamehameha III Road intersection did not include Walua Road since traffic counts for this minor approach were available from another study and are expected to remain unchanged. Therefore, the traffic volumes into and from this approach were taken from the other report. The resultant peak hour movements are summarized on Figure 3, with traffic volumes rounded to the nearest five vehicles per hour.

The State Department of Transportation takes metered traffic counts every two years at selected roadway sections on Hawaii. Traffic counts were taken at four of the six study intersections in July, 1996:

1. Kuakini Highway at Kamehameha III Road
2. Kuakini Highway at Mamalahoa Highway
3. Mamalahoa Highway at Napoopoo Road
4. Kamehameha III Road at Alii Highway

The daily traffic volumes from the State traffic counts are shown on Figure 4.

TRAFFIC FORECASTS

Traffic forecasts were prepared for the years 2010 and 2015, when the Villages of Hokukano project is expected to be at intermediate and full development. Traffic forecasts were first developed for the "No-Build" scenarios. These traffic volumes were then diverted to the New Highway for the "With Project" and Alii Highway Extension scenarios. The traffic which would be generated by the Villages of Hokukano project was added onto the latter forecasts to obtain the total "With Project" and Alii Highway Extension forecasts. Finally, the total forecasts were adjusted to account for a scenario in which the Alii Highway Extension would not be built.

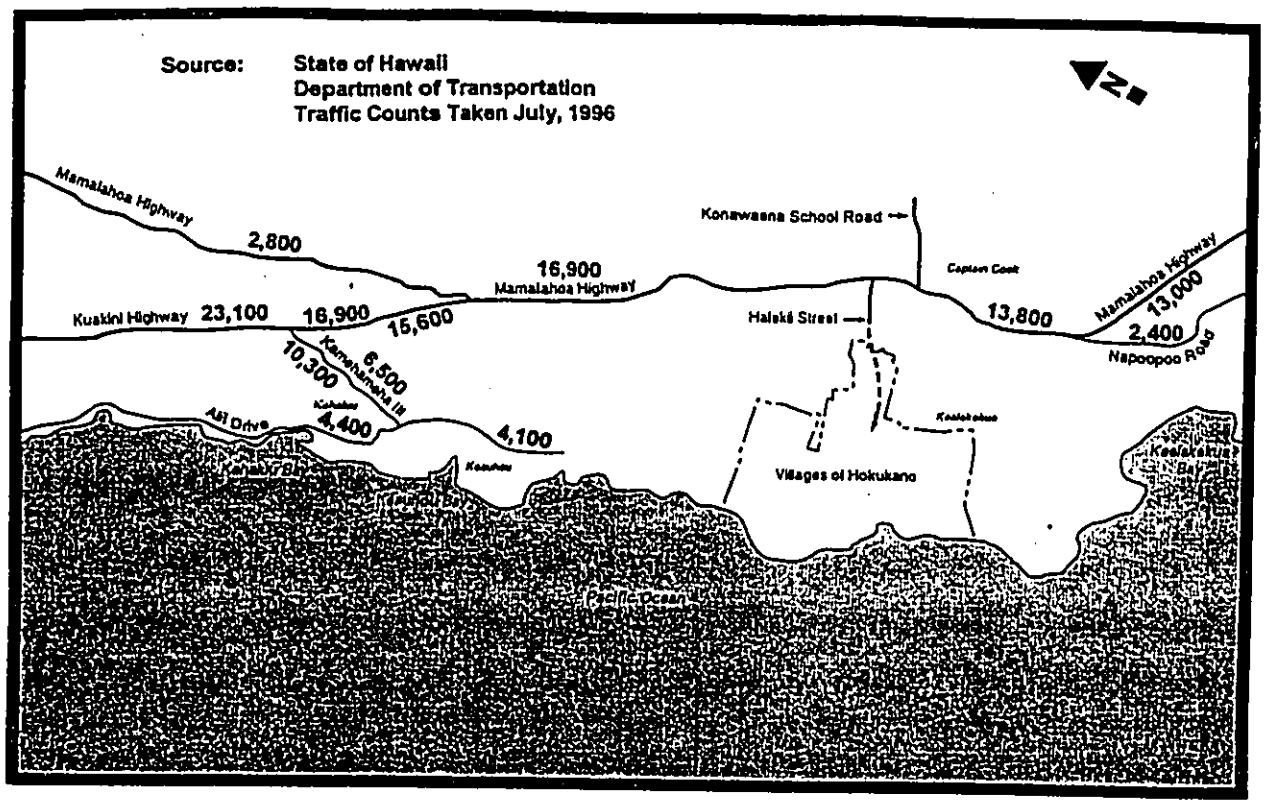

FIGURE 4

EXISTING TWO-WAY DAILY TRAFFIC VOLUMES

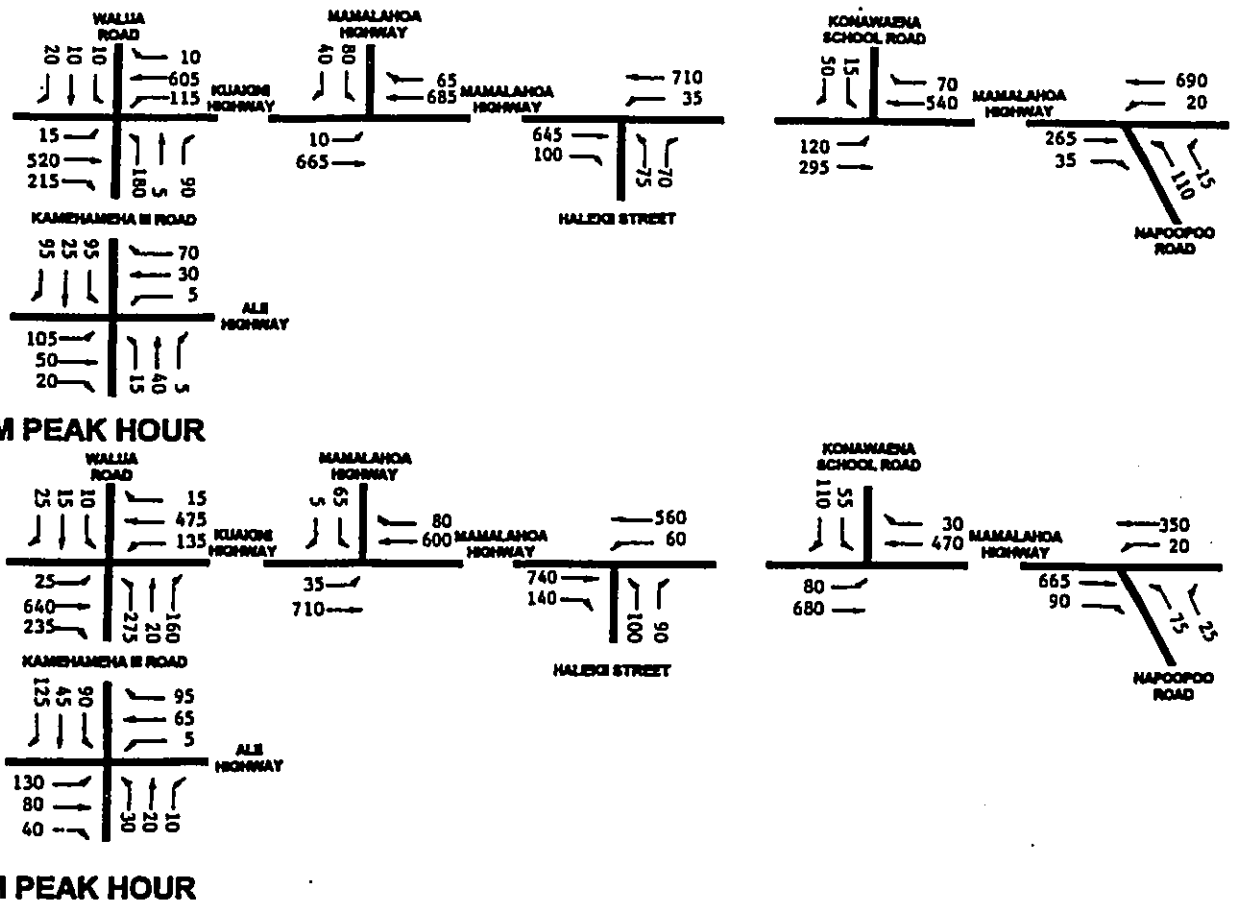

FIGURE 3
EXISTING TRAFFIC VOLUMES

A. No-Build Scenarios

The existing highway network was assumed for the "No-Build" scenarios. The Villages of Hokukano project was not included. It was also assumed that the New Highway and the Alii Highway Extension projects would not be included in the "No-Build" scenarios since both projects are not "committed." Committed projects are either under construction or are budgeted for construction. Based on federal guidelines for highway planning purposes, an "uncommitted" project should not be in the base network.

The aforementioned long range highway plan (published in 1991) developed traffic forecasts for the years 2000 and 2010. The plan's base highway network was the existing network at that time without any improvements. The 1997 forecast volumes for segments of the Hawaii Belt Highway in the study area were interpolated from the 1986 (existing) and year 2000 forecasts on Table IV-4A of the plan report. The ratios of the year 2010 to year 1997 forecasts for the different segments were a uniform 152%. Therefore, it was assumed that the 52% represented a regional traffic growth rate for the period from 1997 to 2010. The existing peak hour traffic volumes (from Figure 3) were factored by 52% to obtain the year 2010 traffic forecasts.

It was assumed that traffic on Halekii Street would also increase at the regional traffic growth rate. It should be noted that traffic on Halekii Street could grow at a different rate from the regional growth rate due to the presence of the post office at this location. The relocation of the post office would take away traffic. A change in the post office's rural delivery policy could increase or decrease the amount of postal traffic at this intersection

It was assumed that traffic on several side streets would not increase: Walua Road, Konawaena School Access Road, and Napoopoo Road. The area served by Walua Road is limited with small potential for development. The narrowness of Napoopoo Road would restrict development.

Although there are several changes planned for the Konawaena schools, the net effect of these changes is expected to be no change in traffic conditions on the school access road. The proposed opening of the Kealakehe High School can

be expected to initially reduce the number of students traveling south in the morning peak. However, the southbound traffic volumes would gradually increase to current levels for the following reasons:

- There were only 120 vehicles turning left into the school access road in the morning peak hour. This would indicate that "Kailua traffic" is not a major factor, and that students are using the school bus.

- General growth in the Konawaena High School district north of the school would replace the traffic lost to Kealakehe High School.

The long range highway plan did not have traffic forecasts to the year 2015. The long range plan did show that traffic on the different segments of the Hawaii Belt Road would be increasing at an average annual rate of slightly less than four percent between the years 2000 and 2010. It was assumed that the annual rate of traffic growth would decrease slightly after the year 2010 to three percent. Therefore, the year 2010 traffic volumes on Figure 5 were increased 15% to calculate the year 2015 traffic forecasts. The traffic on Konawaena School Access Road and Napoopoo Road were also increased by 15% to match the general regional growth. The traffic volumes on Walua Road were still kept constant. The resultant forecasts are shown on Figure 6.

The traffic volumes on Hawaii Belt Road are expected to increase significantly without the construction of alternative routes. The forecast traffic volumes on Hawaii Belt Road are sufficiently high that they could not be accommodated by an undivided two-lane highway. The long range highway plan recommended a new four lane arterial in this region since "commercial and residential developments along the existing roadway limit opportunities for road widening through much of the corridor" (page VI-10).

B. "With Project" and Alii Highway Scenarios

The "With Project" scenarios had to account for the introduction of the Alii Highway and New Highway onto the highway system and traffic generated by the Villages of Hokukano project.

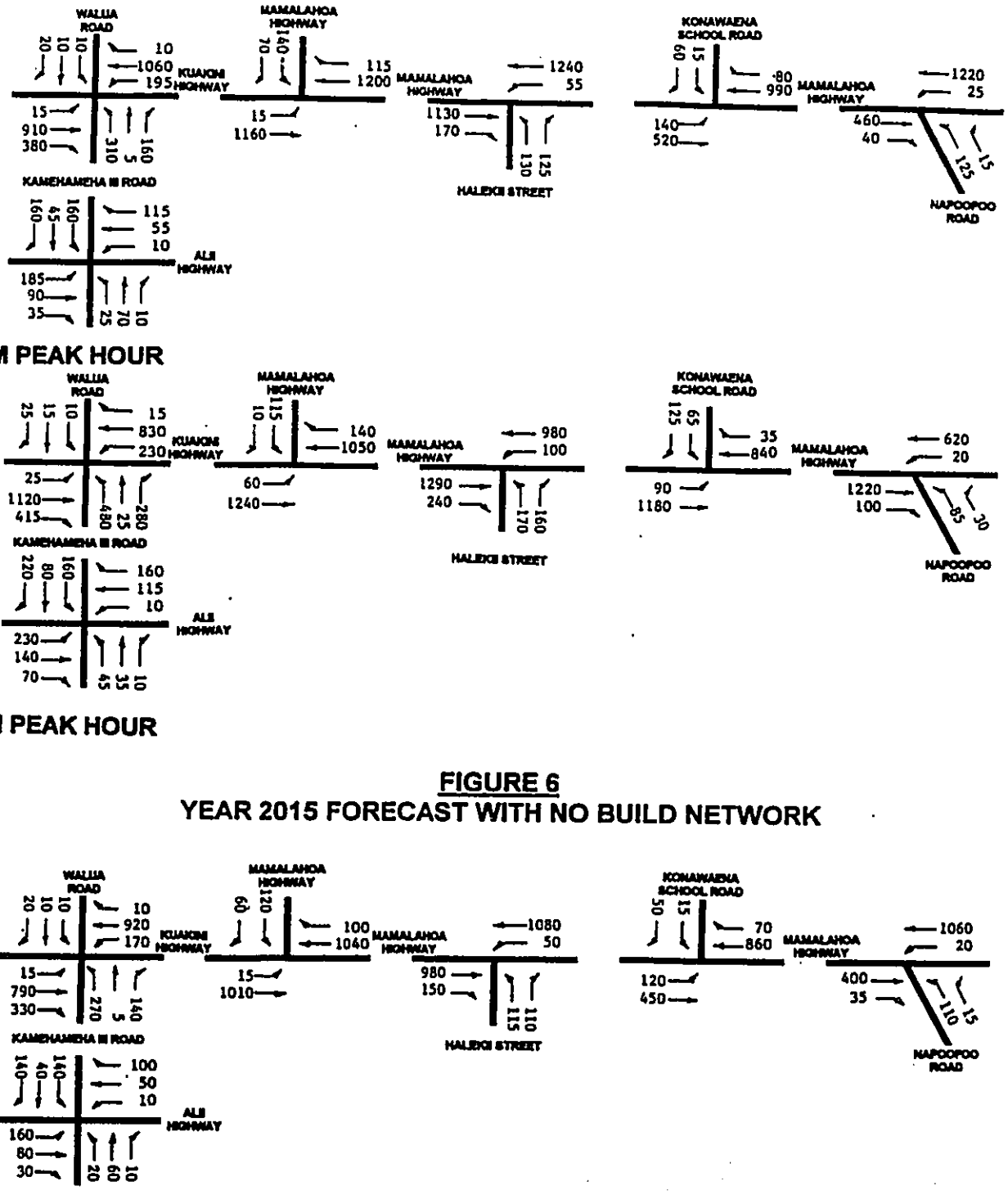

FIGURE 6
YEAR 2015 FORECAST WITH NO BUILD NETWORK

FIGURE 5
YEAR 2010 FORECAST WITH NO BUILD NETWORK

The first step was to determine how much traffic would divert to the New Highway sections (Villages of Hokukano project not included). It was assumed that about half of the peak direction (northbound in the morning and southbound in the evening) would divert to the new facility. However, more than half of the lower volume, off peak direction traffic would stay on the Hawaii Belt Road since it was assumed there would be less through traffic. The results of these analyses are shown on Figure 7 for forecast year 2010 and Figure 8 for 2015.

The next step was to add the traffic which would be generated by the Villages of Hokukano project. The trip generation analyses, including the Villages of Hokukano land uses, are summarized on Table 1. The trip assignment for 2010 is shown on Figure 9, the trip assignment for 2015 is shown on Figure 10.

The traffic forecasts for trips diverted to the New Highway were added to the Villages of Hokukano trip assignment to obtain the total, "With Project" forecast. The traffic forecast volumes on Figure 7 were added to the trip assignment forecasts on Figure 9 to obtain the traffic forecasts on Figure 11. The traffic forecast volumes on Figure 8 were added to the trip assignment forecasts on Figure 10 to obtain the traffic forecasts on Figure 12.

The "With Project" and Alii Highway Extension traffic forecasts show that the New Highway will cause traffic volumes on Hawaii Belt Road north of Napoopoo Road to decrease below existing traffic volumes. The New Highway will also create significant left turn movement volumes during the afternoon peak at the Mamalahoa Highway/ Napoopoo Road intersection. The implications of these forecasts on traffic operations are discussed below in the "Level of Service Analysis" Section.

C. "With Project" and No Alii Highway Scenarios

If the Alii Highway Extension is not constructed, traffic from the New Highway will utilize the Kamehameha III Road to get to Kuakini Highway. The years 2010 and 2015 forecasts from the with Alii Highway Extension analysis (Figures 11 and 12) were adjusted to account for this traffic pattern change. It was assumed that there would not be less traffic using the New Highway due to the slightly longer

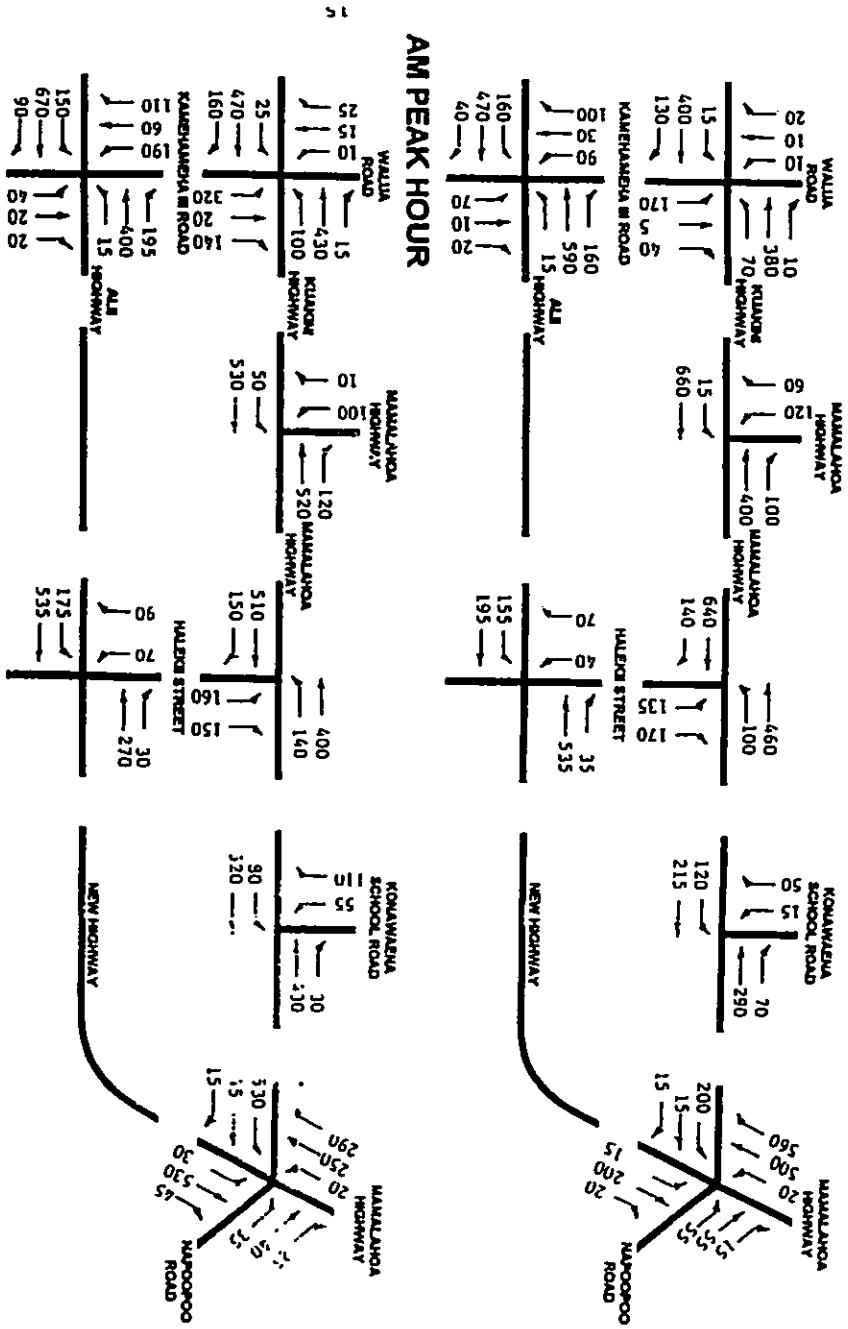

FIGURE 7
YEAR 2010 FORECAST WITH NEW HIGHWAY AND
NO VILLAGES OF HOKUKANO PROJECT

TABLE 1
TRIP GENERATION FOR THE VILLAGES OF HOKUKANO

Land Use	Peak Hour	Quantity	Enter Rate	In Trips	Exit Rate	Out Trips
Phase I						
Single Family Residential	AM	362 Units	0.15	54	0.42	152
	PM		0.54	195	0.29	105
Golf Course	AM	1 Course		52		8
	PM			8		59
Lodge Facility	AM	80 Rooms	0.20	16	0.13	10
	PM		0.18	14	0.30	24
	AM	Total Phase I		122		170
	PM			217		188
Phase 2 Additional						
Single Family Residential	AM	368 Units	0.15	55	0.49	155
	PM		0.54	199	0.29	107
	AM	Total Phases 1 & 2		177		325
	PM			416		295

Source: Parsons, Brinckerhoff Quade and Douglas, Inc. "Traffic Impact Study Villages of Hokukano, North and South Kona, Hawaii" (November, 1995).

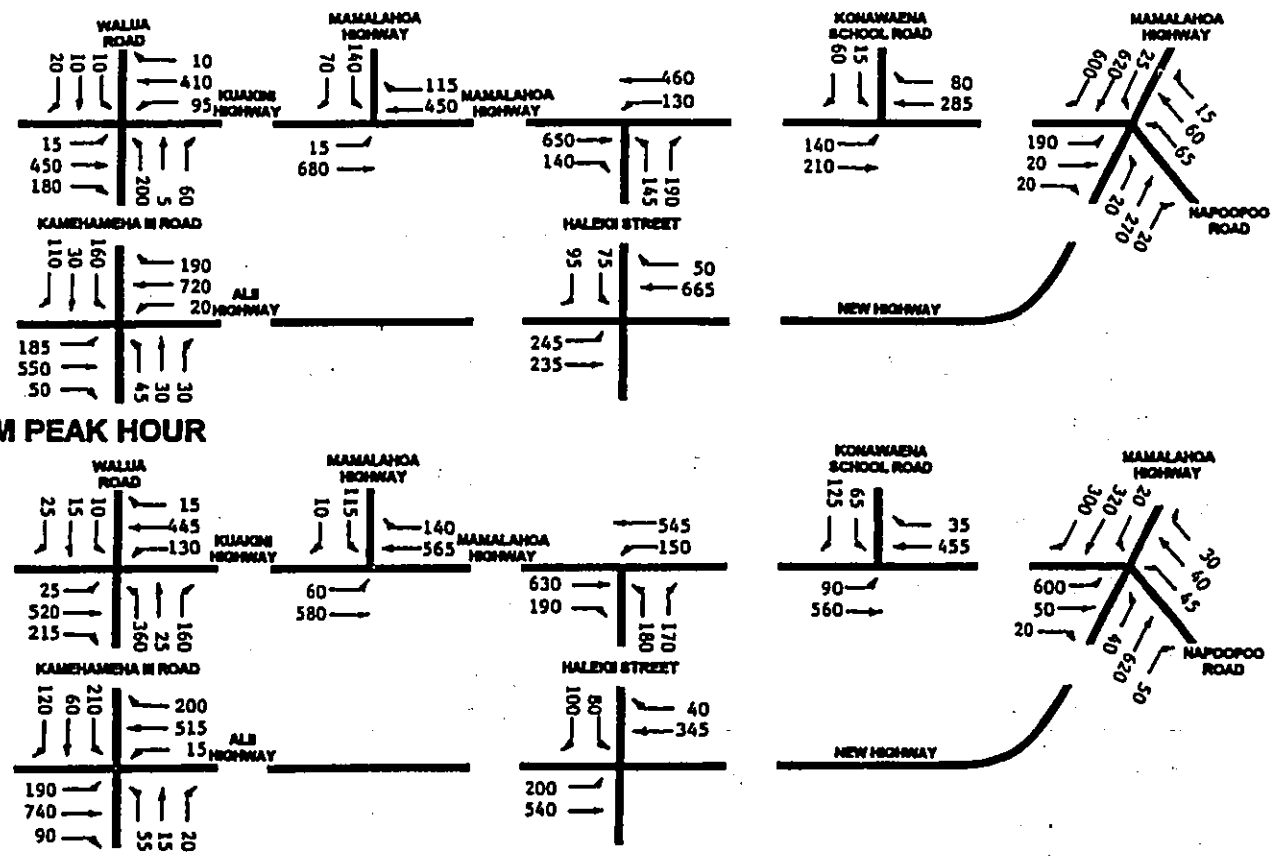

FIGURE 8
YEAR 2015 FORECAST WITH NEW HIGHWAY AND NO VILLAGES OF HOKUKANO PROJECT

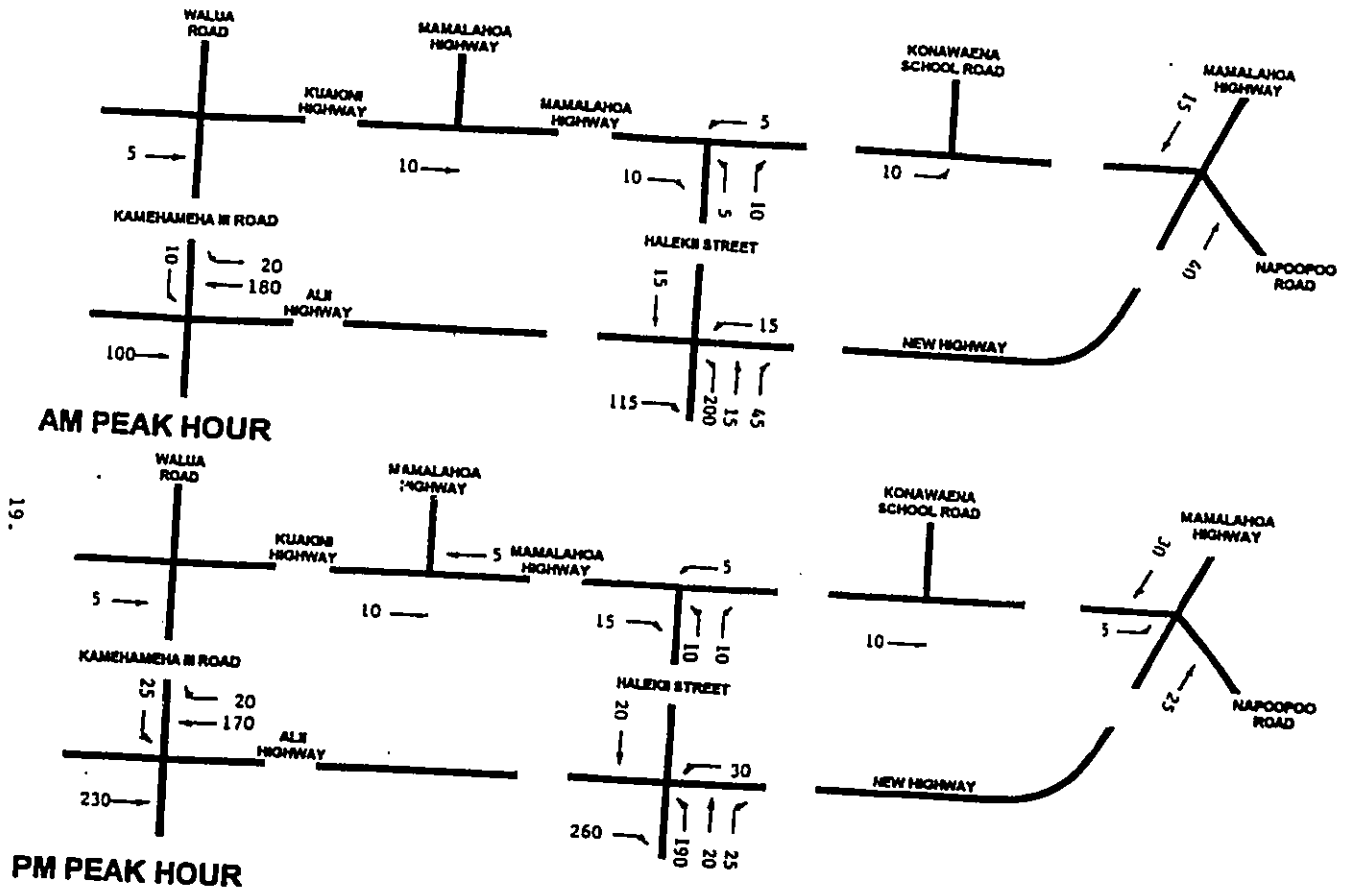

FIGURE 10
YEAR 2015 TRIP ASSIGNMENT FOR VILLAGES OF HOKUKANO PROJECT

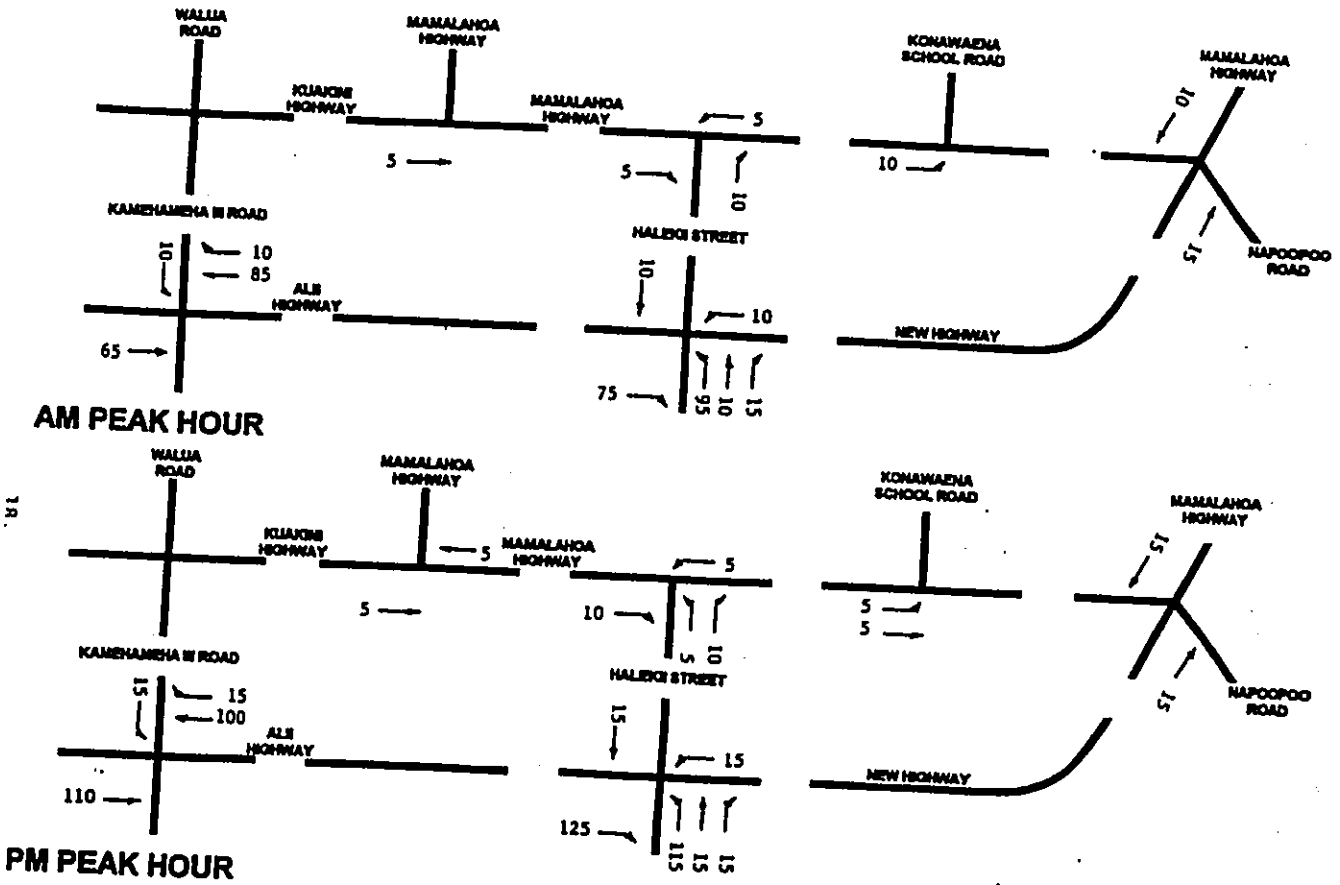

FIGURE 9
YEAR 2010 TRIP ASSIGNMENT FOR VILLAGES OF HOKUKANO PROJECT

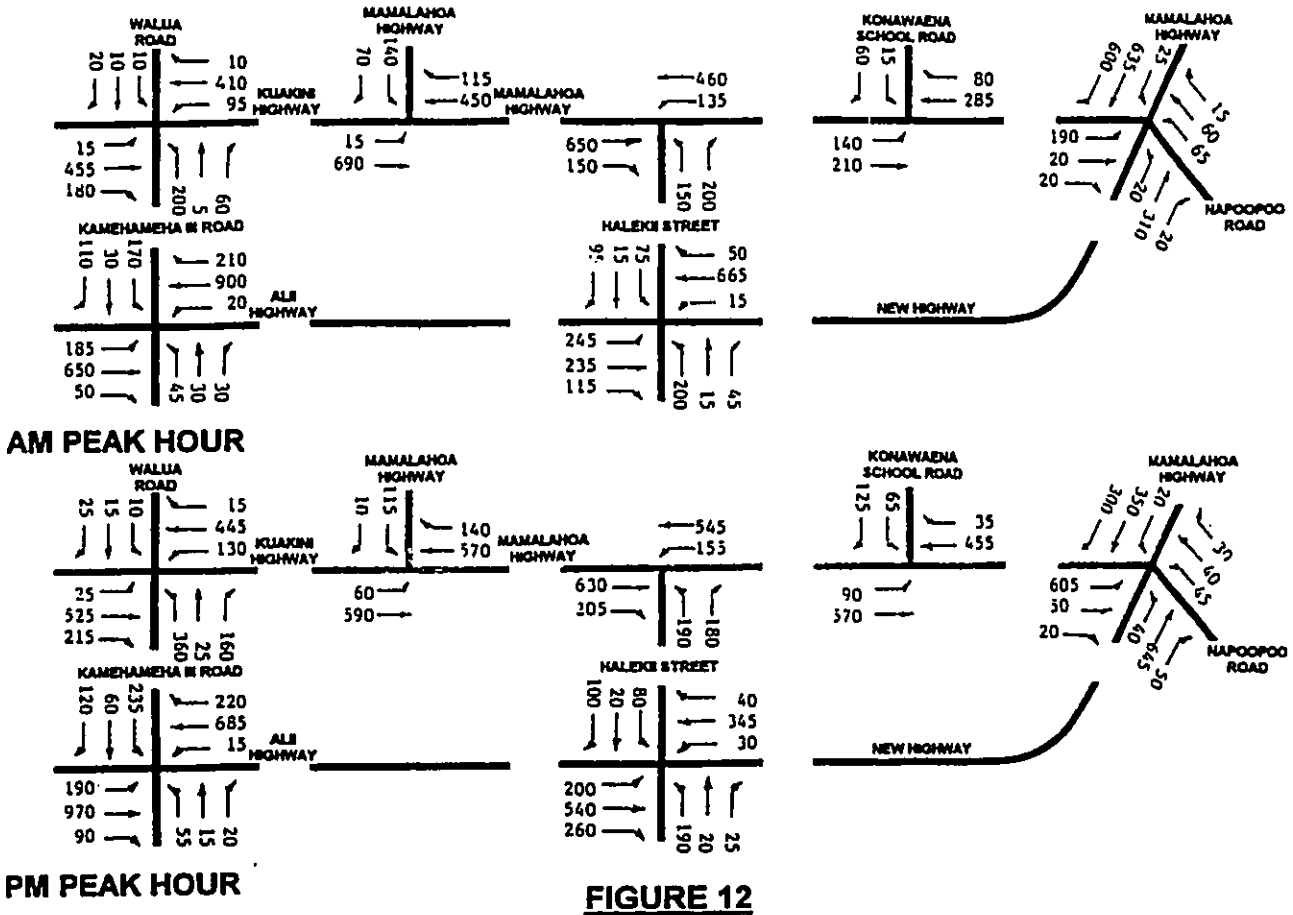

FIGURE 12
YEAR 2015 FORECAST WITH NEW HIGHWAY AND VILLAGES OF HOKUKANO PROJECT

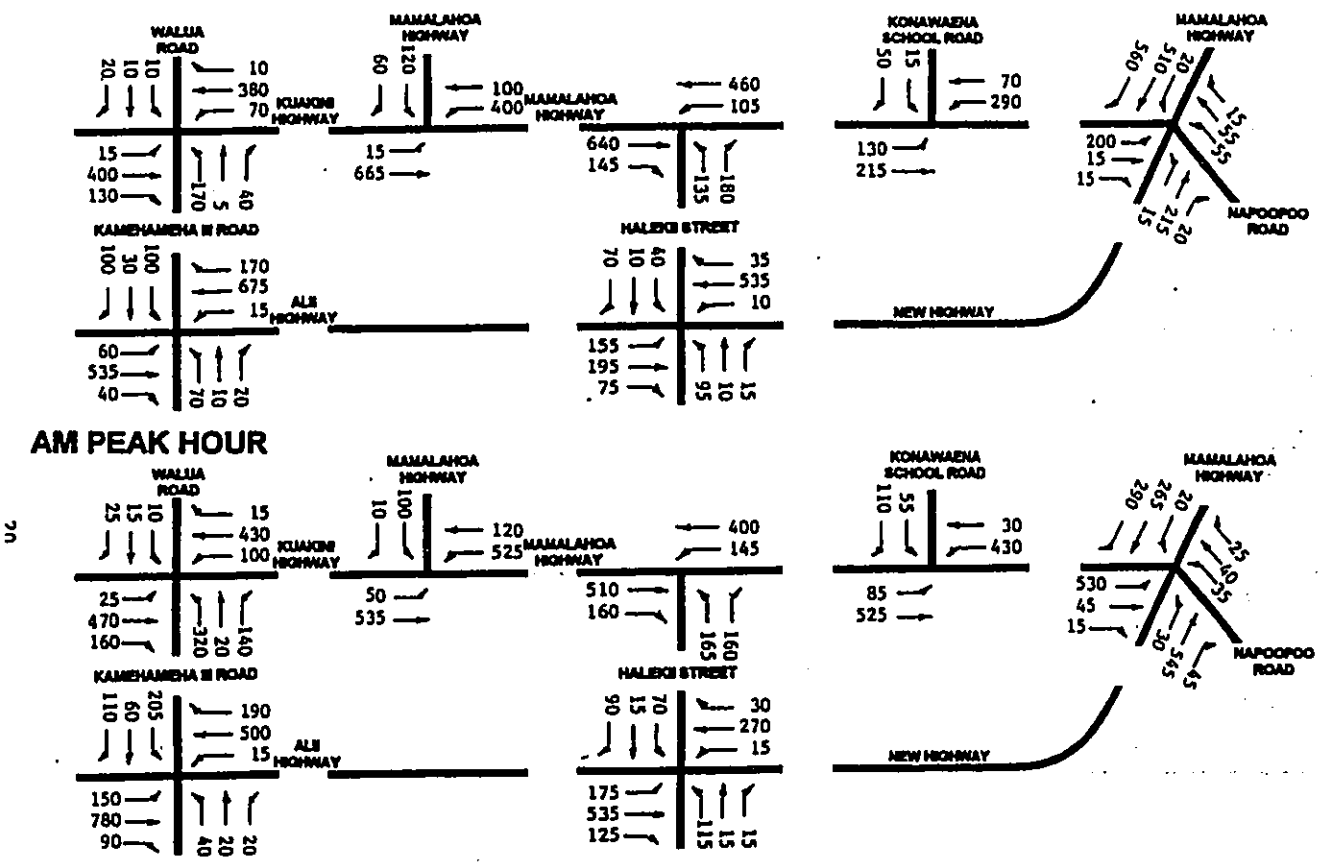

FIGURE 11
YEAR 2010 FORECAST WITH NEW HIGHWAY AND VILLAGES OF HOKUKANO PROJECT

travel times without the Alii Highway Extension. Therefore, traffic volumes on Kuakini Highway/ Mamalahoa Highway and on the New Highway south of Kamehameha III Road would remain as shown on Figures 11 and 12. The resultant traffic forecasts are shown on Figures 13 and 14.

LEVEL OF SERVICE ANALYSIS

The traffic forecast volumes in themselves do not give an indication of the quality of traffic flow. The Transportation Research Board has addressed this matter by developing the concept of level of service. Their Highway Capacity Manual, Special Report 209 (Third Edition, 1994) has separate procedures for calculating levels of service at signalized and unsignalized intersections. The procedures in this manual are generally recognized as a national standard since they were developed under the auspices of the U. S. Department of Transportation. Traffic improvements are generally required for level of service F conditions, while level of service D or better are desired for non-urban areas such as the study area.

The methodology for signalized intersections calculates levels of service for turning movement lane groups, approaches and intersections as the whole based on the average delay. The methodology for unsignalized intersections calculates levels of service for movements from the side streets and left turns from the through lanes, based on the average delay. The above methodologies were used on existing intersections assuming current lanesage. For new intersections, separate lanes were assumed for each turning movement.

The results of level of service analyses for the existing year (1997), year 2010 and year 2015 are shown on Tables 2 and 3 for unsignalized and signalized intersections, respectively. For each forecast year, the "No-Build" (no New Highway) scenario is shown alongside the with New Highway scenario. Each scenario includes the morning (AM) and afternoon (PM) peak hours. Table 2 shows the levels of service for each of the critical turning movements at the unsignalized intersection. Table 3 shows the levels of service for the signalized intersections as a whole. For the "With Project" and No Alii Highway Extension scenario, the levels of service for only the Kuakini Highway/Kamehameha III Road and Alii Highway/Kamehameha III Road intersections are shown since the other intersections' levels of service remain the same as the with Alii Highway

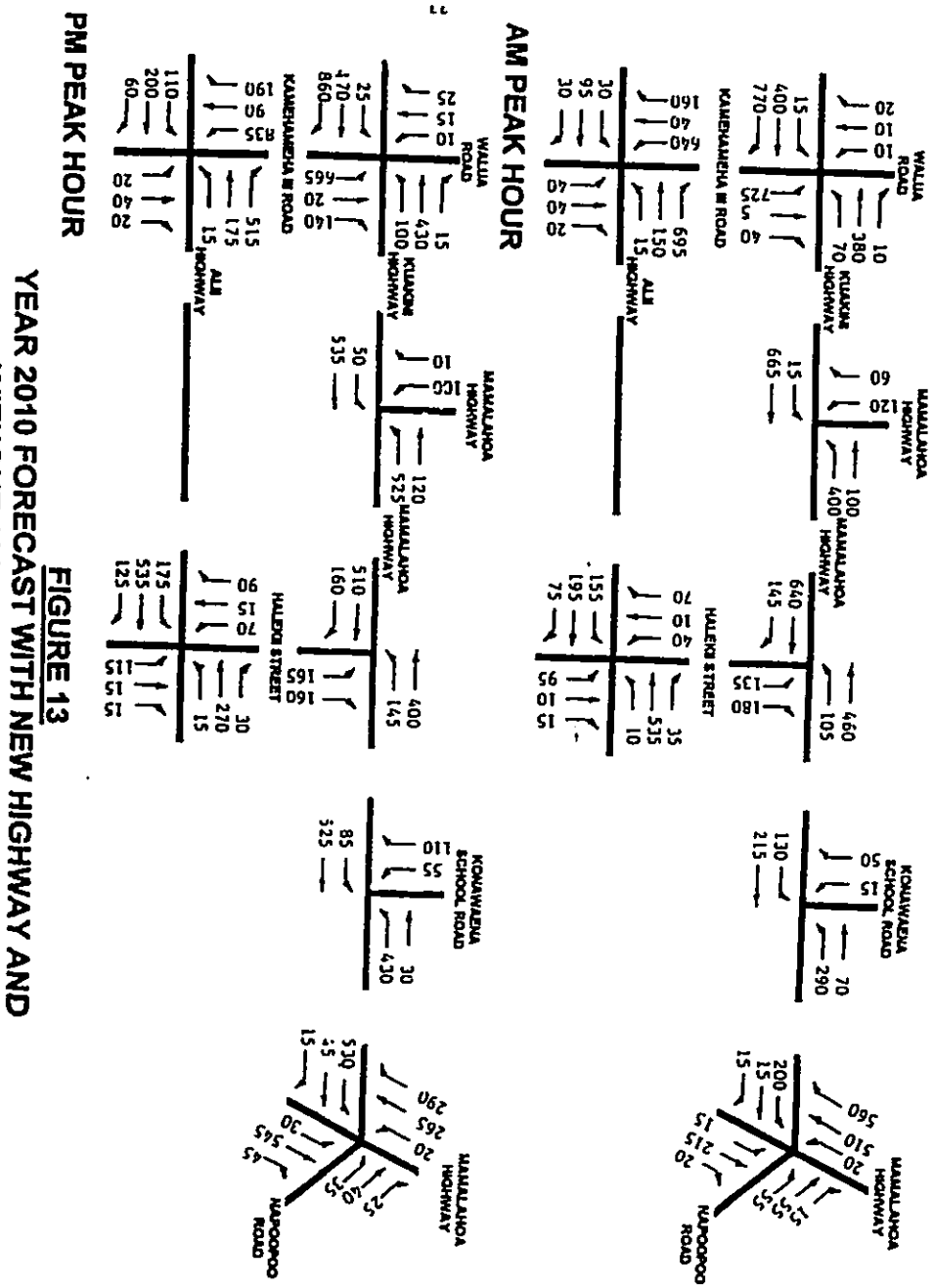

FIGURE 13
YEAR 2010 FORECAST WITH NEW HIGHWAY AND WITHOUT ALII HIGHWAY EXTENSION

TABLE 2
UNSIGNALIZED INTERSECTION LEVEL OF SERVICE ANALYSIS

	1997		2010				2015			
	Existing		No New Highway		With New Highway		No New Highway		With New Highway	
Unsignalized Intersection	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Mamalahoa Hwy./Kuakini Hwy.										
Mamalahoa Hwy. WB Right	B	B	C	B	A	B	C	C	B	B
Mamalahoa Hwy. WB Left	F	F	F	F	F	F	F	F	F	F
Kuakini SB Left	B	A	B	B	A	A	C	B	A	A
Mamalahoa Hwy./Halekii Street										
Halekii EB Left	F	F	F	F	F	F	F	F	F	F
Halekii EB Right	B	B	E	D	C	B	D	E	C	B
Mamalahoa Hwy. NB Left	B	B	C	B	B	B	C	C	B	B
Mamalahoa Hwy./Napoopoo Road										
Napoopoo EB Left	F	F	F	F	F	E	F	F	F	F
Napoopoo EB Right	A	B	A	C	A	B	A	C	A	B
Mamalahoa Hwy. NB Left	A	B	A	B	A	A	A	C	A	A
New Highway SB Left					B	F			C	A
"Old" Mamalahoa WB Left					F	F			F	F
"Old" Mamalahoa WB Through					C	C			C	D
"Old" Mamalahoa WB Right					B	A			B	A
New Highway/Halekii Street										
Halekii EB Left					F	F			F	F
Halekii EB Through					C	C			F	D
Halekii EB Right					A	B			A	B
Halekii WB Left					D	E			F	F
Halekii WB Through					C	C			E	D
Halekii WB Right					B	A			B	A
New Highway NB Left					A	A			A	A
New Highway SB Left					B	A			B	A

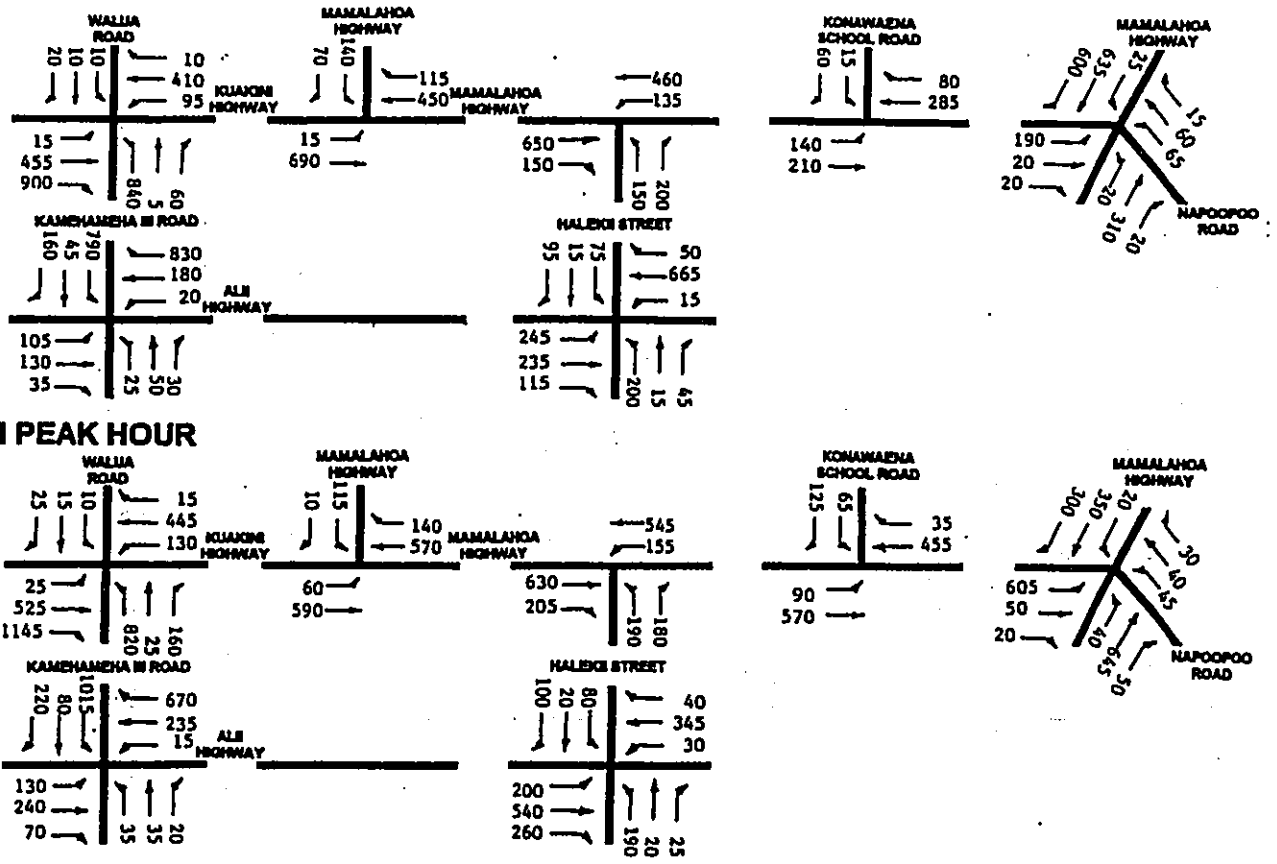

FIGURE 14
YEAR 2015 FORECAST WITH NEW HIGHWAY AND WITHOUT ALII HIGHWAY EXTENSION

TABLE 3

SIGNALIZED LEVEL OF SERVICE ANALYSIS

SIGNALIZED INTERSECTION	1997		2010						2015					
	Existing		No New Highway		With New Highway		Without Alt Highway Extension		No New Highway		With New Highway		Without Alt Highway Extension	
	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM	AM	PM
Kuakini Hwy./Kamehameha III Rd.	C	D	D	F	B	C	F	F	C	E	B	B	F	F
Mamalahoa Hwy./Halekil St.														
Mamalahoa Hwy./Konawaena School Rd.	B	B	C	C	B	B	B	B	C	C	B	B	B	B
Mamalahoa Hwy./Napoopoo Rd./New Highway*														
Alt Hwy./Kamehameha III Rd.	B	B	B	B	B	B	B	B	C	C	B	B	B	B
New Hwy./Halekil St.*														
"S" Signalized					C	D	E	F	C	D	C	C	E	F

Extension scenario. The following paragraphs discuss each intersection in the order shown on Tables 2 and 3, respectively.

A. Mamalahoa Highway/Kuakini Highway Intersection

The Mamalahoa Highway/Kuakini Highway intersection is actually two intersections. The Old Mamalahoa Highway westbound approach was put around a large traffic island to separate turning movement conflicts and improve traffic flow. The north approach handles southbound left turns from Kuakini Highway to Old Mamalahoa Highway and westbound right turns from Old Mamalahoa Highway to Kuakini Highway. The south approach handles westbound left turns from Old Mamalahoa Highway to Mamalahoa Highway. The intersection was analyzed as two separate intersections but the results are shown as a single intersection on Table 2.

The westbound left turn is the critical movement at the intersection. It is currently at level of service F and will remain at level of service F with or without the New Highway. Although not shown, the average delay times for this movement are higher for the "No-Build" scenarios than the "With Project" scenarios indicating a greater magnitude problem for the "No-Build" scenario. This trend is reflected in the other two turning movements of the intersection, where levels of service improve or remain the same for the with highway scenarios.

The above analysis would indicate that traffic improvements such as traffic signals would be required to facilitate the left turn movement. However, the placement of traffic signals are justified by meeting a separate set of warrants and not on the basis of level of service alone. Therefore, this intersection could remain unsignalized for the "With Project" scenario in the future if these warrants are not met.

B. Mamalahoa Highway/Halekil Street Intersection

This intersection shows a similar trend to the previous intersection. Table 2 shows that the eastbound left turn movement from the side street is at level of service F for all scenarios while the other movements have better levels of

service. The average delay times for the left turn movement are higher for the "No-Build" scenarios than the "With Project" scenarios. The eastbound right turn degrades to levels of service D and E for the "No-Build" scenarios, indicating very undesirable conditions.

A traffic signal would probably be warranted with the "No-Build" scenario but may not be for the build highway scenario. The developer of the Villages of Hokukano project is committed to signalizing and channelizing the intersection by the conditions of approval of zoning. With traffic signals, the intersection is expected to operate at level of service B for the two forecast scenarios, as shown on Table 3.

C. Mamalahoa Highway/Napoopoo Road Intersection

As with the previous unsignalized intersections, the left turn from the side street (Napoopoo Road) is currently at level of service F and will remain so with the "No-Build" scenario. The large increase in average delay would probably require traffic signals as a mitigation measure.

The New Highway will require a new intersection at this location. A final design for the proposed intersection is being prepared for incorporation into the Environmental Impact Statement. In lieu of a final design, a four-lane approach intersection with separate left turn lanes on each approach was assumed for this analyses.

The large volumes of left turns from the Old Mamalahoa Highway to the southbound Mamalahoa Highway can only be accommodated by a signalized intersection, as indicated with the level of service F for the "with highway" scenario on Table 2. Therefore, this intersection was also analyzed with signals.

As shown on Table 3, the new signalized intersection is forecast to operate at levels of service B and C in the morning peak of years 2010 and 2015, respectively. It is forecast to operate at levels of service C and D in the afternoon peak of years 2010 and 2015, respectively. The levels of service in the afternoon peak are worse than the morning peak due to the large volume of left turns.

D. New Highway/Halekii Street Intersection

This new intersection was initially analyzed as an unsignalized intersection with separate lanes for all movements. The results shown on Table 2 indicate that traffic from Halekii Street would have a difficult time crossing the New Highway. Therefore, this intersection was also analyzed as a signalized intersection. The results on Table 3 show that this intersection would operate at level of service B with signalization.

E. Kuakini Highway/Kamehameha III Road Intersection

As shown on Table 3, this signalized intersection is currently operating at levels of service B/C in the morning and afternoon peak hours, respectively. With the "No-Build" scenario, this intersection is forecast to degrade to levels of service D/F in the year 2010 and E/F in the year 2015. These levels of service imply the need for additional lanes to meet the demand.

With the New Highway and Alii Highway Extension, the levels of service will improve to B/C in the years 2010 and 2015, which are the current levels of service. No additional improvements at this intersection would be required.

If the New Highway is built without the Alii Highway Extension, the levels of service can be expected to decrease to level of service F. As a mitigating measure, an additional left turn lane on Kamehameha III Road approach would be required to maintain acceptable levels of service at D or better. Kuakini Highway will need to be widened to four lanes north of Kamehameha III Road to accommodate the larger volumes, per the recommendations of the long range highway plan.

F. Mamalahoa Highway/Konawaena School Access Road Intersection

This signalized intersection is currently operating at level of service B during both peaks and will continue to operate at the same level with the New Highway. For the "No-Build" scenario, it is expected to operate at level of service C to the

year 2015, which is acceptable. No additional improvements would be required at this intersection for either scenario.

It should be noted that the newly installed traffic signals were not yet operational at the time of this study. The poor traffic conditions on Mamalahoa Highway during the morning peak period should be rectified with the newly installed traffic signals and separate turning lanes. The intersection should be operating at level of service B when the traffic signals are made operational.

G. Alii Highway/Kamehameha III Road Intersection

This intersection is currently at level of service B during both peak periods and is expected to remain so with the "No-Build" scenarios. Unlike the Hawaii Belt Road intersections which experiences traffic decreases, traffic on Alii Highway will increase with the New Highway and with Alii Highway Extension scenarios and levels of service can be expected to decrease. The intersection level of service will decrease to C/D in the year 2010 morning and afternoon peaks, respectively. It will further decrease to E/E in the year 2015. This implies that highway widening or intersection improvements may be required.

If the Alii Highway Extension is not built, levels of service would decrease to E/F in the year 2010 morning and afternoon peaks, and be at F for both peaks in the year 2015. An additional left turn lane on Kamehameha III Road as a mitigating measure would accommodate the additional left turn volumes and improve level of service to C. Per the recommendations of the long range highway plan, a two way left turn lane should be installed on Kamehameha III Road between Kuakini Highway and Alii Highway. The additional left turn lane on Kamehameha III Road required as mitigation measures at both intersections could be an extension of this recommendation.

H. Kona Hospital Access Road

Although the Mamalahoa Highway intersection serving the Kona Hospital was not studied, a concern was raised regarding the poor traffic conditions that sometimes impedes emergency access to the hospital. The New Highway is expected to decrease traffic volumes on Mamalahoa Highway and improve traffic

conditions. Emergency vehicles would then encounter less traffic congestion and be able to reach the hospital faster.

CONCLUSIONS

The proposed New Highway will change traffic patterns in North Kona and South Kona. Its most significant impact would be to reduce traffic volumes on Hawaii Belt Road, which would otherwise require extensive improvements including roadway widening from Napoopoo Road to Kuakini Highway and the installation of traffic signals. However, the Hawaii Belt Road does not have sufficient right-of-way to be widened in many areas. Therefore, the New Highway is a feasible means to meet future travel demands. The specific positive impacts of the New Highway (with or without the Alii Highway Extension) in addition to reducing traffic volumes and improving traffic conditions on Hawaii Belt Road include:

1. Minimizing the need for traffic signals at the Mamalahoa Highway/Kuakini Highway intersection.

2. Improving traffic conditions significantly at the Mamalahoa Highway/ Halekii Street intersection through the reduction of traffic on Mamalahoa Highway and the installation of traffic signals.

3. Eliminating the need for additional improvements at the Kuakini Highway/ Kamehameha III Road intersection (with the Alii Highway Extension).

4. Eliminating the need for additional improvements at the Mamalahoa Highway/Konawaena School Access Road intersection.

5. Improving traffic flow on Mamalahoa Highway in the vicinity of the Kona Hospital, thereby improving emergency vehicle access.

RECOMMENDATIONS

It is recommended that the New Highway project be implemented to improve traffic conditions in North Kona and South Kona. Specific recommendations for improvements include:

1. Installing traffic signals at the new Mamalahoa Highway/New Highway/ Napoopoo Road intersection, when warranted, to accommodate the large number of left turns forecasted. A new intersection design is being developed.

2. Installing traffic signals at the New Highway/Halekii Street intersection, when warranted, to facilitate left turn and through movements from both approaches of Halekii Street.

3. Possibly requiring additional lanes on Alii Highway at the Kamehameha III Road intersection (with Alii Highway Extension).

4. If the Alii Highway Extension is not built with the New Highway, the highway projects recommended in the "Island of Hawaii Long Range Highway Plan" would need to be pursued:

   a. Widening Kuakini Highway to four lanes north of Kamehameha III Road.

   b. Installing a two way left turn lane on Kamehameha III Road. This improvement would be extended to include separate left turn lanes at the mauka and makai approaches of Kamehameha III Road at Kuakini Highway and Alii Highway, respectively.