

**HoKua Place**  
**Section 343-5e HRS Second Draft**  
**Environmental Impact Statement (2<sup>nd</sup> DEIS)**  
**Volume II-B**  
**Exhibits I to Q**



Prepared for:  
**Accepting Authority**  
**State of Hawai'i Land Use Commission**  
**&**  
**Petitioner**  
**HG Kaua'i Joint Venture LLC**  
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**October 2018**

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**Exhibit I**

**Kapa'a Highlands Legal Description and Maps**

**Portion of Parcel 1**

All of that certain parcel of land, being a portion of Parcel 1 of Tax Map Key 4-3-03 (4<sup>th</sup> Division), being a portion of Grant 5266 to Rufus P. Spalding situate at Kapaa, Kauai, Hawaii and more particularly described as follows:

Beginning at the "+" on a concrete driveway at the East corner of this parcel of land at the North corner of Grant 8216 to Joe Martins on the Southwest side of Oloheua Road, the coordinates of which referred to Government Survey Triangulation Station "NONOU" being 5,660.65 feet North and 11,159.65 feet East and running by azimuths measured clockwise from True South:

1. 35 ° 59' 385.90 feet along Grant 8216 to Joe Martin to a pipe;
2. 22 ° 52' 212.20 feet along Grant 8216 to Joe Martin; and Kapaa Agricultural Lot 1 to a pipe;
3. 100 ° 09' 134.70 feet along Kapaa Agricultural Lot 1 to a pipe;
4. 13 ° 38' 502.70 feet along Kapaa Agricultural Lot 1 to a pipe;
5. 27 ° 12' 171.70 feet along Kapaa Agricultural Lot 1 to a pipe;
6. 37 ° 25' 44.50 feet along Kapaa Agricultural Lot 1 to a "+" on the rock;
7. 96 ° 52' 41.00 feet along Kapaa Agricultural Lot 1 to a pipe;
8. 24 ° 40' 202.40 feet along Kapaa Agricultural Lot 1 to a pipe;
9. 318 ° 05' 87.36 feet along Kapaa Agricultural Lot 1 to a pipe;
10. 30 ° 57' 297.55 feet along Kapaa Agricultural Lot 1 to a pipe;
11. Thence along Kapaa Agricultural Lot 1 on a curve to the right with a radius of 253.97 feet, the chord azimuth and distance being:  
62 ° 33' 30" 266.22 feet to a pipe;
12. 94 ° 10' 11.52 feet along Kapaa Agricultural Lot 1 to a pipe;
13. 194 ° 30' 134.28 feet along the Cane Haul Road Right-of-Way (Part 4) and Grant 5237 to Hee Fat to a pipe;

14. 91 ° 26'	1538.50 feet along Grant 5237 to Hee Fat to a pipe;
15. 34 ° 24'	140.00 feet along Grant 5237 to Hee Fat and the Cane Haul Road Right-of-Way (part 4) to a pipe;
16. 124 ° 24'	109.44 feet along Grant 5237 to Hee Fat;
17. 179 ° 07'	328.20 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
18. 161 ° 57'	433.00 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
19. 174 ° 26'	278.80 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
20. 58 ° 03'	228.00 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
21. 83 ° 46'	130.50 feet along Lot 3, Kapaa Rice and Kula Lots;
22. 193 ° 34'	142.10 feet along Lot 3, Kapaa Rice and Kula Lots;
23. 134 ° 25'	37.50 feet along Lot 3, Kapaa Rice and Kula Lots;
24. 61 ° 13'	102.60 feet along Lot 3, Kapaa Rice and Kula Lots;
25. 15 ° 18'	130.60 feet along Lot 3, Kapaa Rice and Kula Lots;
26. 71 ° 49'	37.10 feet along Lot 3, Kapaa Rice and Kula Lots;
27. 137 ° 54'	63.20 feet along Lot 3, Kapaa Rice and Kula Lots;
28. 196 ° 07'	588.10 feet along Lot 3, Kapaa Rice and Kula Lots;
29. 287 ° 25'	74.30 feet along L.C. Aw. 3554:1 to Keo;
30. 204 ° 43'	402.60 feet along L.C. Aw. 3554:1 to Keo to a pipe;
31. 191 ° 23'	213.70 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;

32. 127 ° 12'	175.90 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
33. 93 ° 47'	270.70 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
34. 139 ° 40'	130.10 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
35. 187 ° 18'	168.60 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
36. 145 ° 21'	184.30 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
37. 71 ° 54'	211.50 feet along Lot 3, Kapaa Rice and Kula Lots;
38. 115 ° 21'	123.70 feet along Lot 3, Kapaa Rice and Kula Lots;
39. 166 ° 33'	92.20 feet along Lot 3, Kapaa Rice and Kula Lots;
40. 216 ° 24'	260.40 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
41. 156 ° 33'	153.00 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
42. 73 ° 13'	340.60 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
43. 122 ° 08'	107.50 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
44. 150 ° 30'	118.03 feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;
45. 226 ° 13'	49.22 feet along Olohena Road to a pipe;
46. Thence along Olohena Road on a curve to the left with a radius of 1,115.00 feet, the chord azimuth and distance being: 218 ° 45' 289.79 feet to a P-K nail;	

47. 211 ° 17' 145.50 feet along Olohehena Road to a P-K nail;
48. Thence along Olohehena Road on a curve to the right with a radius of 65.00 feet, the chord azimuth and distance being:  
268 ° 48' 30" 109.67 feet  
to a pipe;
49. Thence along Olohehena Road on a curve to the left with a radius of 87.10 feet, the chord azimuth and distance being:  
299 ° 32' 78.54 feet  
to a pipe;
50. 272 ° 44' 249.69 feet along Olohehena Road to a pipe;
51. 281 ° 55' 203.19 feet along Olohehena Road to a pipe;
52. 291 ° 21' 251.40 feet along Olohehena Road to a pipe;
53. 261 ° 28' 149.18 feet along Olohehena Road to a pipe;
54. 286 ° 25' 226.46 feet along Olohehena Road to a pipe;
55. 325 ° 04' 288.93 feet along Olohehena Road to a pipe;
56. 317 ° 06' 310.87 feet along Olohehena Road to a pipe;
57. 3 ° 37' 476.50 feet along Lot 2, Olohehena Road widening parcel and Lot 1, Kapaa Intermediate School, and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
58. 323 ° 35' 304.65 feet along Lot 1, Kapaa Intermediate School, and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
59. 309 ° 45' 390.14 feet along Lot 1, Kapaa Intermediate School, and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
60. 268 ° 25' 554.33 feet along Lot 1, Kapaa Intermediate School, and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

61. 181 ° 14' 848.53 feet along Lot 1, Kapaa Intermediate School, and Lot 2, Olohehena Road widening Parcel and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
62. 257 ° 37' 127.84 feet along Olohehena Road;
63. 297 ° 22' 265.20 feet along Olohehena Road to a pipe;
64. 298 ° 02' 25.00 feet along Olohehena Road to a pipe;
65. Thence along Olohehena Road on a curve to the right with a radius of 375.00 feet, the chord azimuth and distance being:  
307 ° 06' 30" 118.30 feet;  
to a pipe;
66. 316 ° 11' 29.85 feet along Olohehena Road to a pipe;
67. 28 ° 30' 203.12 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
68. 335 ° 00' 100.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
69. 301 ° 35' 130.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
70. 278 ° 40' 50.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
71. 246 ° 30' 140.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;
72. 316 ° 11' 110.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe;

- |               |   |
|---------------|---|
| 73. 272 ° 20' | 46.00 feet along TMK: 4-3-03:13 and along the remainder of Grant 5266 to Rufus P. Spalding to a pipe; |
| 74. 300 ° 02' | 135.22 feet along Oloheua Road;   |
| 75. 307 ° 00' | 566.89 feet along Oloheua Road to the point of beginning and containing an AREA of 163.125 Acres.     |

SUBJECT, HOWEVER to an easement for the Temporary Kapaa By-Pass Road Right-of-Way containing an AREA of 7.859 Acres.

ALSO, SUBJECT, HOWEVER to Easements E-1, E-2, E-3 (60.00 ft. wide) and E-4 for electrical transmission lines and poles and containing areas of 79,706 s.f., 31,444 s.f., 21,431 s.f., and 1,947 s.f., respectively.

Also subject to a 20 ft. future road widening setback line along Oloheua Road.

WAGNER ENGINEERING SERVICES, INC.



November 13, 1997  
P.O. Box 851  
Hanalei, Hawaii 96714

*Ronald J. Wagner*  
\_\_\_\_\_  
Ronald J. Wagner  
Licensed Professional Land  
Surveyor Certificate No. 5074

### URBAN STATE LAND USE Portion of Parcel 1

All of that certain parcel of land being the Urban State Land Use District portion of Parcel 1 of Tax Map Key 4-3-03 (4<sup>th</sup> Division), being a portion of Grant 5266 to Rufus P. Spalding situate at Kapaa, Kauai, Hawaii and more particularly described as follows:

Beginning at the East corner of this parcel of land on the Southwest side of Oloheua Road, the coordinates of which referred to Government Survey Triangulation Station "NONOU" being 5,934.74 feet North and 10,795.91 feet East and running by azimuths measured clockwise from True South:

- |  |  |
|--|--|
| 1. 35 ° 13'  | 14.72 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;  |
| 2. 305 ° 13'   | 121.57 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 3. Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way Easement on a curve to the right with a radius of 50.00 feet, the chord azimuth and distance being:   | 344 ° 48' 44" 63.74 feet;  |
| 4. Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way Easement on a curve to the left with a radius of 1,030.00 feet, the chord azimuth and distance being: | 22 ° 40' 14" 62.45 feet;   |
| 5. 20 ° 56'  | 150.64 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 6. 110 ° 56'   | 30.00 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement;  |
| 7. 20 ° 56'  | 500.00 feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |



- |     |   |        |   |
|-----|---|--------|---|
| 8.  | 290 ° 56'   | 30.00  | feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 9.  | 20 ° 56'  | 531.65 | feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 10. | 110 ° 56'   | 30.00  | feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 11. | Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement on a curve to the right with a radius of 940.00 feet, the chord azimuth and distance being:<br>22 ° 33' 53.04 feet;  |        |   |
| 12. | 24 ° 10'  | 136.41 | feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 13. | Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement on a curve to the right with a radius of 940.00 feet, the chord azimuth and distance being:<br>29 ° 13' 165.49 feet; |        |   |
| 14. | 34 ° 16'  | 129.33 | feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 15. | Thence over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement on a curve to the right with a radius of 265.00 feet, the chord azimuth and distance being:<br>63 ° 01' 254.92 feet; |        |   |
| 16. | 91 ° 46'  | 938.55 | feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |

- |     |           |        |   |
|-----|-----------|--------|---|
| 17. | 91 ° 04'  | 580.00 | feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 18. | 181 ° 04' | 10.00  | feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 19. | 93 ° 59'  | 104.46 | feet over and across Parcel 1, Tax Map Key 4-3-03 along Kapaa By-Pass Road right-of-way easement; |
| 20. | 179 ° 07' | 165.42 | feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;   |
| 21. | 161 ° 57' | 433.00 | feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;   |
| 22. | 174 ° 26' | 278.80 | feet along Lot 3, Kapaa Rice and Kula Lots to a pipe;   |
| 23. | 273 ° 00' | 324.19 | feet over and across Parcel 1, Tax Map Key 4-3-03;  |
| 24. | 192 ° 00' | 193.74 | feet over and across Parcel 1, Tax Map Key 4-3-03;  |
| 25. | 113 ° 12' | 141.30 | feet over and across Parcel 1, Tax Map Key 4-3-03;  |
| 26. | 225 ° 54' | 399.65 | feet over and across Parcel 1, Tax Map Key 4-3-03;  |
| 27. | 171 ° 26' | 478.33 | feet over and across Parcel 1, Tax Map Key 4-3-03;  |
| 28. | 261 ° 26' | 128.70 | feet over and across Parcel 1, Tax Map Key 4-3-03;  |
| 29. | 233 ° 35' | 89.98  | feet over and across Parcel 1, Tax Map Key 4-3-03;  |

30. 323 ° 35' 47.54 feet along Lot 1, Kapaa Intermediate School;
31. 309 ° 45' 390.14 feet along Lot 1, Kapaa Intermediate School;
32. 268 ° 25' 554.33 feet along Lot 1, Kapaa Intermediate School;
33. 181 ° 14' 848.53 feet along Lot 1, Kapaa Intermediate School, and Lot 2, Olohena Road widening Parcel;
34. 257 ° 37' 127.84 feet along Olohena Road;
35. 297 ° 22' 265.20 feet along Olohena Road to a pipe;
36. 298 ° 02' 25.00 feet along Olohena Road to a pipe;
37. Thence along Olohena Road on a curve to the right with a radius of 375.00 feet, the chord azimuth and distance being:  
307 ° 06' 30" 118.30 feet;  
to a pipe;
38. 316 ° 11' 29.85 feet along Olohena Road to a pipe;
39. 28 ° 30' 203.12 feet along TMK: 4-3-03:13;
40. 335 ° 00' 100.00 feet along TMK: 4-3-03:13;
41. 301 ° 35' 130.00 feet along TMK: 4-3-03:13;
42. 278 ° 40' 50.00 feet along TMK: 4-3-03:13;
43. 246 ° 30' 140.00 feet along TMK: 4-3-03:13;
44. 316 ° 11' 110.00 feet along TMK: 4-3-03:13;
45. 272 ° 20' 46.00 feet along TMK: 4-3-03:13;
46. 300 ° 02' 135.22 feet along Olohena Road;

47. 307 ° 00' 111.44 feet along Olohena Road to the point of beginning and containing an AREA of 96.060 Acres.



September 23, 2011  
P.O. Box 851  
Hanalei, Hawaii 96714

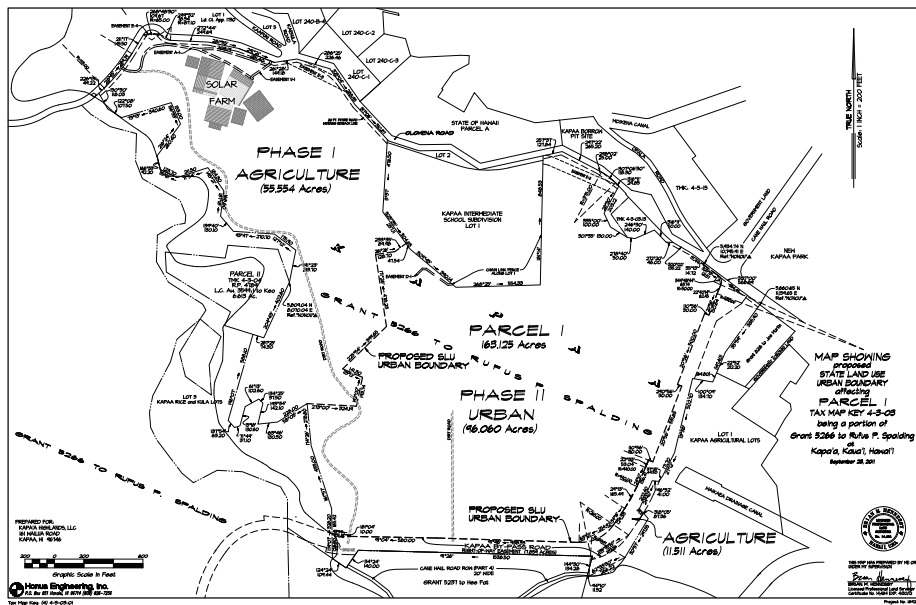
HONUA ENGINEERING INC.

*B. Hennessy*  
Brian M. Hennessy  
Licensed Professional Land Surveyor  
Certificate No. 14484  
Expires: 04/30/2012



## Exhibit J

### Botanical Survey Kapa'a Highlands Phase II TMK (4) 4-3-003:001 Kaua'i, Hawai'i



**Botanical Survey  
Kapa`a Highlands Phase II  
TMK (4) 4-3-003:001  
Kaua`i, Hawai`i  
April-May  
2012**

Prepared by

**Kenneth R. Wood<sup>1</sup> / Research Biologist  
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**Botanical Survey  
Kapa`a Highlands Phase II  
TMK (4) 4-3-003:001  
Kaua`i, Hawai`i  
April 2012**

Kenneth R. Wood, Research Biologist, & Megan Kirkpatrick, M.S. Environmental Science  
P.O. Box 745, `Ele`ele, Kaua`i, Hawai`i, U.S.A. 96705, [kwood@ntbg.org](mailto:kwood@ntbg.org),

**Summary:** During April and May of 2012 a botanical survey was conducted on a 97 acre parcel in Kapa`a, Kaua`i, referred to as Kapa`a Highlands Phase II (TMK (4)3-8-003:001). This research documented 44 vascular plant species within the survey area. Forty taxa were non-native plant species, three taxa were very common indigenous native species, and one taxon was a Polynesian introduction (Table 1). NO FEDERALLY LISTED AS THREATENED OR ENDANGERED PLANT SPECIES WERE OBSERVED WITHIN OR NEAR THE SURVEY AREA. This report includes a general description of the study site; the methods of survey; and a vascular plant checklist of all plant species observed.

**STUDY AREA.** On April 19, 2012 and May 7, 2012, K. R. Wood (Endangered Species Specialist) and assistant Megan D. Kirkpatrick (M.S. Environmental Science) conducted a biological inventory on an undeveloped parcel of property in Kapa`a, Kaua`i (TMK [4]3-8-003:001) (Figures 1 & 2). The survey area is approximately 97 acres of undeveloped land. The primary objectives of this field survey were to:

- a) search for threatened and endangered plant species as well as species of concern;
- b) provide a complete vascular plant checklist of both native and non-native plant taxa observed on property; and
- c) provide a summary concerning the conservation status of all native taxa observed;

**SURVEY METHODS.** A walk-through survey method was used. Transects included walking/driving around boundaries of property (TMK (4)3-8-003:001) and several transects through the interior portions of property. Plant identifications were made in the field and were recorded by the author (Table 1). Plant names and authors of dicots and monocots follow Wagner et al. (1990) and pteridophytes follow Palmer (2003). Plants of particular interest were collected by the second author (MK) as herbarium specimen vouchers and deposited at the National Tropical Botanical Garden (NTBG) herbarium. Specimens were placed in newspaper sheets and pressed in-between cardboard herbarium presses and dried at the NTBG.

**DESCRIPTION OF VEGETATION.**

The study area represents a lowland non-native mesic plant community dominated by secondary vegetation of trees, shrubs, and grasses, many of which are considered invasive. The land is vacant and currently undeveloped and has a past history of grazing and sugarcane cultivation. The non-native grass *Panicum maximum* (Poaceae – Guinea grass) and non-native shrub or small tree *Leucaena leucocephala* (Fabaceae – koa haole) are by far the dominant species found at the site. Additional common non-native trees and shrubs include: *Lantana camara* (Verbenaceae – lākana), *Indigofera suffruticosa* (Fabaceae – indigo), *Syzygium cumini* (Myrtaceae – Java plum), *Psidium guajava* (Myrtaceae – guava), *Spathodea campanulata* (Bignoniaceae – African tulip), and *Senna surattensis* (Fabaceae – kolomona). Several less common non-native trees and shrubs include: *Clidemia hirta* (Melastomataceae – Koster's curse), *Cinnamomum camphora* (Lauraceae – camphor tree), *Falcataria moluccana* (Fabaceae – albezia), *Ficus microcarpa* (Moraceae – Chinese banyan), and *Schefflera actinophylla* (Araliaceae – octopus tree). No Hawaiian endemic species (i.e., restricted to only Hawai`i) were observed. One Polynesian introduction was observed, namely *Aleurites moluccana* (Euphorbiaceae – kukui tree) which is common throughout the Hawaiian islands. The three indigenous species found at the site are quite common and include: *Hibiscus tiliaceus* (Malvaceae – hau) which is also often an invasive tree species, the fern species *Psilotum nudum* (Psilotaceae – moa), and *Waltheria indica* (Sterculiaceae – `uhaloa). For complete checklist of species see Table 1 which also includes the common names and status (i.e., indigenous/naturalized) category of each taxon.

**CONCLUSION.**

NO THREATENED OR ENDANGERED PLANT SPECIES WERE OBSERVED WITHIN OR ANYWHERE NEAR THE SURVEY AREA DURING RESEARCH -and therefore there are no concerns about possible impacts to rare plant species at the Kapa'a Highlands Phase II project. The current conditions of this study site indicate that the area has been dominated by non-native weedy species for a very long time. The senior author certifies his expertise with more than 25 years conducting biological inventories within the Hawaiian Islands and has specialized in the conservation of Hawai'i's *Federally Listed as Endangered* plant species, including those considered *Candidates* for listing, *Species of Concern*, or *Federally Listed as Threatened* (USFWS 1999a, 1999b, 2004, 2010).

**TABLE 1. Checklist of Vascular Plants Observed in Kapa'a Highlands Phase II Survey Area (TMK (4) 4-3-003:001)**

Status Symbols: ind=Indigenous (naturally occurring in Hawai'i, yet found in other areas of the world), nat=Naturalized (non-native), pol=Polynesian introduction. Note: Checklist alphabetical by genus. Flowering plants follow Wagner et al. 1990; pteridophytes follow Palmer 2003.

FAMILY	GENUS / SPECIES	COMMON NAME	STATUS
Asparagaceae	Agave sisalana Perrine	sisal, sisal hemp, century plant, malina	nat
Asteraceae	Ageratum conyzoides L.	maile hohono, maile honohono, maile kula	nat
Euphorbiaceae	Aleurites moluccana (L.) Willd.	kukui, kukui, candlenut	pol
Blechnaceae	Blechnum appendiculatum Willd.		nat
Poaceae	Brachiaria mutica (Forssk.) Stapf	California grass, Para grass	nat
Fabaceae	Canavalia cathartica Thouars	maunaloa	nat
Fabaceae	Chamaecrista nictitans (L.) Moench var. glabrata (Vogel) H. S. Irwin & Barneby	partridge pea, laukī	nat
Poaceae	Chloris barbata (L.) Sw.	swollen fingergrass, mau'u lei	nat
Lauraceae	Cinnamomum camphora (L.) J.Presl	camphor tree	nat
Melastomataceae	Clidemia hirta (L.) D.Don	Koster's curse	nat
Asteraceae	Cyanthillium cinereum (L.) H.Rob.	little ironweed	nat
Thelypteridaceae	Cyclosorus dentatus (Forssk.) Ching	pa'i'ihā	nat
Poaceae	Cynodon dactylon (L.) Pers.	Bermuda grass, mānienie	nat
Cyperaceae	Cyperus pilosus Vahl		nat
Poaceae	Eragrostis brownii (Kunth) Nees ex Steud.	sheepgrass	nat
Fabaceae	Falcataria moluccana (Miq.) Barneby & J.W. Grimes		nat
Moraceae	Ficus microcarpa L.f.	Chinese banyan, Malayan banyan	nat
Cyperaceae	Fimbristylis miliacea (L.) Vahl		nat
Malvaceae	Hibiscus tiliaceus L.	hau	ind
Lamiaceae	Hyptis pectinata (L.) Poit.	comb hyptis	nat
Fabaceae	Indigofera suffruticosa Mill.	indigo, 'inikō, 'inikoa, kolū	nat
Verbenaceae	Lantana camara L.	lākana, lā'au kalakala, lanakana (Ni'ihau),	nat



FAMILY	GENUS / SPECIES	COMMON NAME	STATUS
Fabaceae	<i>Leucaena leucocephala</i> (Lam.) de Wit	koa haole, ēkoa, lilikoa	nat
Malvaceae	<i>Malvastrum coromandelianum</i> (L.) Garcke	false mallow	nat
Poaceae	<i>Melinis repens</i> (Willd.) Zizka	Natal redbop, Natal grass	nat
Fabaceae	<i>Mimosa pudica</i> L.	sensitive plant, sleeping grass, pua hilahila	nat
Fabaceae	<i>Neonotonia wightii</i> (Wight & Arn.) Verdc.		nat
Lomariopsidaceae	<i>Nephrolepis brownii</i> (Desv.) Hovenkamp & Miyam.		nat
Poaceae	<i>Panicum maximum</i> Jacq.	Guinea grass	nat
Asteraceae	<i>Parthenium hysterophorus</i> L.	false ragweed, Santa Maria	nat
Asteraceae	<i>Pluchea carolinensis</i> (Jacq.) G.Don	sourbush, marsh fleabane	nat
Myrtaceae	<i>Psidium guajava</i> L.	common guava, kuawa,	nat
Psilotaceae	<i>Psilotum nudum</i> (L.) P.Beauv.	moa, moa nahele	ind
Euphorbiaceae	<i>Ricinus communis</i> L.	castor bean, pā'aia	nat
Araliaceae	<i>Schefflera actinophylla</i> (Endl.) Harms	octopus tree, umbrella tree	nat
Poaceae	<i>Schizostachyum</i> sp.	'ohe	nat
Fabaceae	<i>Senna surattensis</i> (Burm.f.) H.S.Irwin & Barneby	kolomona, kalamona	nat
Malvaceae	<i>Sida spinosa</i> L.	prickly sida	nat
Bignoniaceae	<i>Spathodea campanulata</i> P.Beauv.	African tulip tree, fountain tree	nat
Asteraceae	<i>Sphagneticola trilobata</i> (L.) Pruski	wedelia	nat
Verbenaceae	<i>Stachytarpheta jamaicensis</i> (L.) Vahl	Jamaica vervain, ōwī	nat
Myrtaceae	<i>Syzygium cumini</i> (L.) Skeels	Java plum, jambolan plum	nat
Acanthaceae	<i>Thunbergia fragrans</i> Roxb.	white thunbergia, sweet clock-vine	nat
Sterculiaceae	<i>Waltheria indica</i> L.	'uhaloa, 'ala'ala pū loa	ind



Figure 1. Aerial Image of Kapa`a Highlands Project Area.



Figure 2. Kapa`a Highlands Phase II concept plan.

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**Exhibit K**

**Biological Surveys  
Conducted on the Kapa'a Highlands Phase II Project Site  
TMK: (4)-3-003:001, Island of Kaua'i, Hawai'i**

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**Biological Surveys Conducted on the Kapa‘a Highlands  
Phase II Project Site, TMK: (4)-3-003:001,  
Island of Kaua‘i, Hawai‘i**

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### ***Executive Summary***

Biological field surveys were conducted on an approximately 97-acre parcel of land identified as Tax Map Key (4) 3-8-003:001 located in Kapa'a, Island of Kaua'i. The owners are proposing to develop these lands as Phase II of the Kapa'a Highlands subdivision

The primary purpose of the surveys was to determine if there are any botanical, avian and terrestrial mammalian species currently listed, or proposed for listing under either federal or State of Hawai'i endangered species statutes within or adjacent to the study area. The avian and mammalian surveys were conducted May 21, 2012, and the botanical survey was conducted on April 19 and May 7, 2012.

No species currently proposed or listed as threatened or endangered under either the federal or state of Hawaii endangered species statutes was documented during the course of the biological surveys conducted on the subject property in April and May, 2012.

There is no federally delineated Critical Habitat for any species present on or adjacent to the project area. Thus the development and operation of the proposed project will not result in impacts to federally designated Critical Habitat. There is no equivalent statute under State law.

### ***Potential Impacts to Protected Species***

#### ***Botanical***

As all of the plant species recorded are either naturalized species or common indigenous species it is not expected that the development and operation of the proposed subdivision will result in deleterious impacts to any botanical species currently listed or proposed for listing under either federal or State of Hawai'i endangered species statutes.

#### ***Seabirds***

The principal potential impact that construction and operation of the Kapa'a Highlands Phase II project poses to protected seabirds is the increased threat that birds will be downed after becoming disoriented by lights associated with the project during the nesting season. The two main ways that outdoor lighting could pose a threat to these nocturnally flying seabirds is if, 1) during construction it is deemed expedient, or necessary to conduct nighttime construction activities, and 2) following build-out, the potential operation of streetlights and exterior safety and security lighting.

#### ***Hawaiian hoary bat***

The principal potential impact that the development of the Kapa'a Highlands Phase II project poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site may temporarily displace individual bats, which may use the vegetation as a roosting location. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females

carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled. Potential adverse effects from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 meters (15-feet), between June 15 and September 15, the period in which bats are potentially at risk from vegetation clearing.



## Introduction and Background

An avian and mammalian survey was conducted on an approximately 97-acre parcel of land identified as Tax Map Key (4) 3-8-003:001 located in Kapa'a, Island of Kaua'i (Figure 1). The owners are proposing to develop these lands as Phase II of the Kapa'a Highlands subdivision.

This report describes the methods used and the results of the avian and terrestrial mammalian surveys conducted on the project site by this author and a summary of the results of the botanical surveys conducted on the site by Wood and Kirkpatrick (2012)<sup>1</sup>. Both surveys were conducted as part of the environmental disclosure process associated with the proposed project.

The primary purpose of the surveys was to determine if there are any botanical, avian and terrestrial mammalian species currently listed, or proposed for listing under either federal or State of Hawai'i endangered species statutes within or adjacent to the study area. The federal and State of Hawai'i listed species status follows species identified in the following referenced documents, (Department of Land and Natural Resources (DLNR) 1998; U. S. Fish & Wildlife Service (USFWS) 2005, 2012). The avian and mammalian surveys were conducted May 21, 2012, and the botanical survey was conducted on April 19 and May 7, 2012.

Hawaiian and scientific names are italicized in the text. A glossary of technical terms and acronyms used in the document, which may be unfamiliar to the reader, are included at the end of the narrative text.

## General Site Description

The approximately 97 acre project site is bound to the north by Olohena Road (SR 581) and Kapa'a Middle School, to the east and south by the Kapa'a Bypass Road and to the west by undeveloped land and a new solar power generating facility (Figure 1). The site is made up of gently rolling hills that attain a maximum elevation of ~ 45 meters above mean sea level in the northwestern corner, sloping *makai* in an east-southeast direction down to an elevation of approximately ~ 6 meters ASL at the intersection of Olohena Road and the Kapa'a Bypass Road.

The site has a long history of sugar cultivation, followed by use as cattle pasturage. The vegetation currently on the site is dominated almost to the exclusion of native species by Guinea grass (*Panicum maximum*), koa haole (*Leucaena leucocephala*), lantana (*Lantana camara*), with Java plum trees (*Syzygium cumini*), dotted across the landscape (Figure 2). The southwestern boundary of the site has fairly dense stands of *hau* (*Hibiscus tiliaceus*) along the boundary (Figure 3).

<sup>1</sup> Wood, K.R., and M. Kirkpatrick. 2012. Botanical Survey Kapa'a Highlands Phase II TMK (4) 4-3-003:001 Kaua'i, Hawai'i April-May 2012, is appended to this document as Appendix A.





Figure 2 – Typical Guinea grass/koa haole shrub vegetation looking northwest



Figure 3 – Hau bushes along southwestern boundary

## Methods

Plant names mostly follow *Manual of the Flowering Plants of Hawai'i* (Wagner et al., 1990, 1999). The avian phylogenetic order and nomenclature used in this report follows the *AOU Check-List of North American Birds* (American Ornithologists' Union, 1998), and the 42nd through the 52nd supplements to the Check-List (American Ornithologists' Union, 2000; Banks et al., 2002, 2003, 2004, 2005, 2006, 2007, 2008; Chesser et al., 2009, 2010, 2011). Mammalian species scientific names follow (Tomich, 1986). Place names follow (Pukui et al., 1974).

### Botanical Survey Methods

The botanical survey was conducted using a pedestrian (walking) transect methodology to cover the project area. Wood and Kirkpatrick's methodologies are detailed in Appendix A.

### Avian Survey Methods

A total of six avian point count stations were sited roughly equidistant from each other within the project site. Six-minute point counts were made at each of the count stations. Each station was counted once. Field observations were made with the aid of Leica 8 X 42 binoculars and by listening for vocalizations. Point counts were concentrated during the early morning hours, the peak of daily bird activity. Time not spent counting was used to search the remainder of the project site for species and habitats that were not detected during count sessions.

### Mammalian Survey Methods

With the exception of the endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*), or 'ōpe'ape'a as it is known locally, all terrestrial mammals currently found on the Island of Kaua'i are alien species, and most are ubiquitous. The survey for terrestrial mammalian species was limited to visual and auditory detection, coupled with visual observation of scat, tracks, and other animal sign. No trapping program or heterodyne bat detection survey methods were used during the course of this survey. A running tally was kept of all terrestrial vertebrate mammalian species detected within the project area during time spent within the project site.

## Results

### Botanical Survey

A total of 44 species of vascular plants were identified from the survey area. Three of the species detected *moa* (*Psilotum nudum*), *hau* (*Hibiscus tiliaceus*) and '*uhaloa* (*Waltheria indica*) are common indigenous species in the Islands. One species *kukui* (*Aleurites moluccana*) is a Polynesian introduction (Wood and Kirkpatrick, 2012).

Wood and Kirkpatrick did not detect any botanical species currently listed as endangered or threatened under either federal or State of Hawai'i endangered species statutes. For a detailed description of their findings please see Appendix A.

### Avian Survey Results

A total of 193 individual birds of 17 species, representing 13 separate families, were recorded during station counts (Table 1). All 17 species recorded are alien to the Hawaiian Islands (Table 1).

Avian diversity and densities were in keeping with the location of the property and the habitat presently on the site. Four species, House Finch (*Carpodacus mexicanus*), Nutmeg Mannikin (*Lonchura punctulata*), Japanese White-eye (*Zosterops japonicus*) and Zebra Dove (*Geopelia striata*) accounted for slightly more than 45 percent of all birds recorded during station counts. The most commonly recorded species was House Finch, which accounted for 14 percent of the total number of individual birds recorded. An average of 32 individual birds was recorded per station count; a number that is about average for point counts in this area on the Island of Kaua'i.

No avian species currently proposed or listed under either the State of Hawai'i or federal endangered species statutes was detected during the course of this survey, nor would they be expected given the habitat currently present on the site.

### Mammalian Survey Results

Four terrestrial mammalian species were detected while on the site. Numerous dogs (*Canis f. familiaris*) were heard barking from areas adjacent to the site. Tracks and scat of pig (*Sus s. scrofa*) were encountered within the site. Tracks, and scat of both horse (*Equus c. caballus*) and cow (*Bos taurus*), were also encountered within the site.

Table 1 – Avian Species Kapa'a Highlands Phase II Point Counts

Common Name	Scientific Name	ST	RA
GALLIFORMES			
PHASIANIDAE – Pheasants & Partridges			
Phasianinae – Pheasants & Allies			
Red Junglefowl	<i>Gallus gallus</i>	A	1.50
PELECANIFORMES			
ARDEIDAE - Herons, Bitterns & Allies			
Cattle Egret	<i>Bubulcus ibis</i>	A	0.83
COLUMBIDAE - Pigeons & Doves			
Spotted Dove	<i>Streptopelia chinensis</i>	A	2.00
Zebra Dove	<i>Geopelia striata</i>	A	2.67
PASSERIFORMES			
CETTIIDAE - Cettia Warblers & Allies			
Japanese Bush-Warbler	<i>Cettia diphone</i>	A	1.17
ZOSTEROPIDAE - White-eyes			
Japanese White-eye	<i>Zosterops japonicus</i>	A	1.17
TIMALIIDAE - Babblers			
Chinese Hwamei	<i>Garrulax canorus</i>	A	0.50
TURDIDAE - Thrushes			
White-rumped Shama	<i>Copsychus malabaricus</i>	A	1.17
STURNIDAE - Starlings			
Common Myna	<i>Acridotheres tristis</i>	A	2.50
EMBERIZIDAE - Emberizids			
Red-crested Cardinal	<i>Paroaria coronata</i>	A	1.00
CARDINALIDAE - Cardinals Saltators & Allies			
Northern Cardinal	<i>Cardinalis cardinalis</i>	A	1.67
ICTERIDAE - Blackbirds			
Western Meadowlark	<i>Sturnella neglecta</i>	A	0.67
FRINGILLIDAE - Fringilline and Cardueline Finches & Allies			
Carduelinae - Carduline Finches			
House Finch	<i>Carpodacus mexicanus</i>	A	4.50
ESTRILDIDAE - Estrildid Finches			
Estrildinae - Estrildine Finches			
Red Avadavat	<i>Amandava amandava</i>	A	0.56
Nutmeg Mannikin	<i>Lonchura punctulata</i>	A	4.33
Chestnut Munia	<i>Lonchura atricapilla</i>	A	2.17
Java Sparrow	<i>Padda oryzivora</i>	A	1.33

#### Key to Table 1

ST Status

A Alien - Introduced to the Hawaiian Islands by humans

RA Relative Abundance - Number of birds detected divided by the number of count stations (6)

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## Discussion

### Botanical Resources

Only nine percent of the plant species (~4/~44) detected on the subject property were either indigenous or early Polynesian introductions. This proportion is remarkably low for lowland areas on Kaua'i, and graphically illustrates the highly disturbed and depauperate nature of the native vegetation present on this site. Please see Appendix A for a more detailed discussion of the botanical resources present on the site.

### Avian Resources

The findings of the avian survey are consistent with the location of the property, and the habitat present on the site. As previously stated all of the avian species detected during the course of this survey are alien to the Hawaiian Islands.

Although not detected during this survey, the endangered Hawaiian Petrel (*Pterodroma sandwichensis*), and the threatened endemic sub-species of the Newell's Shearwater (*Puffinus auricularis newelli*) have been recorded over-flying the project site between April and the end of November each year (David, 1995; Morgan *et al.*, 2003, 2004; David and Planning Solutions 2008). Additionally, the Save Our Shearwaters Program has recovered both species from the general project area on an annual basis over the past three decades (Morgan *et al.*, 2003, 2004; David and Planning Solutions, 2008; Save our Shearwater Program, 2012).

The petrel is listed as endangered, and the shearwater as threatened under both Federal and State of Hawai'i endangered species statutes. The primary cause of mortality in both Hawaiian Petrels and Newell's Shearwaters is thought to be predation by alien mammalian species at the nesting colonies (USFWS 1983, Simons and Hodges 1998, Ainley *et al.*, 2001). Collision with man-made structures is considered to be the second most significant cause of mortality of these seabird species in Hawai'i. Nocturnally flying seabirds, especially fledglings on their way to sea in the summer and fall, can become disoriented by exterior lighting. When disoriented, seabirds can collide with manmade structures, and if they are not killed outright, the dazed or injured birds are easy targets of opportunity for feral mammals (Hadley 1961; Telfer 1979; Sincock 1981; Reed *et al.*, 1985; Telfer *et al.*, 1987; Cooper and Day, 1998; Podolsky *et al.* 1998; Ainley *et al.*, 2001; Hue *et al.*, 2001; Day *et al.* 2003). There are no nesting colonies nor appropriate nesting habitat for either of these listed seabird species within the current study site.

Following build out it is probable that cleared areas, especially those that are landscaped as lawns, and or parking lots will provide loafing habitat for Pacific Golden-Plover (*Pluvialis fulva*). The plover is an indigenous migratory shorebird species which nests in the high Arctic during the late spring and summer months, returning to Hawai'i and the Tropical Pacific to spend the fall and winter months each year. They usually leave Hawai'i for their

trip back to the Arctic in late April or the very early part of May each year. This species is a common site around the state during the late fall and winter months.

### Mammalian Resources

The findings of the mammalian survey are consistent with the location of the property and the habitat currently present on the site. We did not record Hawaiian hoary bats overflying the site. Hawaiian hoary bats are widely distributed in the lowland areas on the Island of Kaua'i, and have been documented in and around almost all areas that still have some dense vegetation (Tomich, 1986; USFWS 1998, David, 2012).

Although no rodents were detected during the course of this survey, it is virtually certain one or more of the four established alien muridae found on Kaua'i, roof rat (*Rattus r. rattus*), Norway rat (*Rattus norvegicus*), European house mouse (*Mus musculus domesticus*) and possibly Polynesian rats (*Rattus exulans hawaiiensis*) use various resources found within the general project area. All of these introduced rodents are deleterious to native ecosystems and the native faunal species dependant on them.

### Potential Impacts to Protected Species

#### Botanical

As all of the plant species recorded are either naturalized species or common indigenous species it is not expected that the development and operation of the proposed subdivision will result in deleterious impacts to any botanical species currently listed or proposed for listing under either federal or State of Hawai'i endangered species statutes.

#### Seabirds

The principal potential impact that construction and operation of the Kapa'a Highlands Phase II project poses to protected seabirds is the increased threat that birds will be downed after becoming disoriented by lights associated with the project during the nesting season. The two main ways that outdoor lighting could pose a threat to these nocturnally flying seabirds is if, 1) during construction it is deemed expedient, or necessary to conduct nighttime construction activities, and 2) following build-out, the potential operation of streetlights and exterior safety and security lighting.

#### Hawaiian hoary bat

The principal potential impact that the development of the Kapa'a Highlands Phase II project poses to bats is during the clearing and grubbing phases of construction as vegetation is removed. The removal of vegetation within the project site may temporarily displace individual bats, which may use the vegetation as a roosting location. As bats use multiple roosts within their home territories, the potential disturbance resulting from the removal of the vegetation is likely to be minimal. During the pupping season, females carrying their pups may be less able to rapidly vacate a roost site as the vegetation is cleared. Additionally, adult female bats sometimes leave their pups in the roost tree while they forage. Very small pups may be unable to flee a tree that is being felled. Potential



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adverse effects from such disturbance can be avoided or minimized by not clearing woody vegetation taller than 4.6 meters (15-feet), between June 15 and September 15, the period in which bats are potentially at risk from vegetation clearing.

#### **Critical Habitat**

There is no federally delineated Critical Habitat for any species present on or adjacent to the project area. Thus the development and operation of the proposed project will not result in impacts to federally designated Critical Habitat. There is no equivalent statute under State law.

#### **Recommendations**

- All exterior lights installed in conjunction with the proposed project should be shielded to reduce the potential for interactions of nocturnally flying seabirds with external lights and man-made structures (Reed *et al.*, 1985; Telfer *et al.*, 1987). Any lighting fixtures that meet the “Dark Skies” guidelines are appropriate.
- It is recommended that woody vegetation taller than 4.6 meters (15-feet), not be cleared between June 1 and September 15, the period in which bats are potentially at risk from vegetation clearing.
- It is recommended that, where appropriate and practicable, native plant species be used in landscaping efforts. Not only is this ecologically prudent, but also if the appropriate plants are used, it will also likely save maintenance and water costs over the long term.

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#### **Glossary**

Alien – Introduced to Hawai'i by humans  
Commensal – Animals that share human food and lodgings, such as rats, mice cats and dogs.  
Crepuscular – Twilight hours  
Endangered – Listed and protected under the Endangered Species Act of 1973, as amended (ESA) as an endangered species  
Endemic – Native to the Hawaiian Islands and unique to Hawai'i  
Indigenous – Native to the Hawaiian Islands, but also found elsewhere naturally  
*makai* – Down-slope, towards the ocean  
Muridae – Rodents, including rats, mice and voles, one of the most diverse families of mammals  
Naturalized – A plant or animal that has become established in an area that it is not indigenous to  
Nocturnal – Night-time, after dark  
*ʻŌpeʻapeʻa* – Endemic endangered Hawaiian hoary bat (*Lasiurus cinereus semotus*)  
Pelagic – An animal that spends its life at sea – in this case seabirds that only return to land to nest and rear their young  
Phylogenetic – The evolutionary order that organisms are arranged by  
Ruderal – Disturbed, rocky, rubbishy areas, such as old agricultural fields and rock piles  
Sign – Biological term referring to tracks, scat, rubbing, odor, marks, nests, and other signs created by animals by which their presence may be detected  
Threatened – Listed and protected under the ESA as a threatened species.

ASL – Above mean sea level  
DLNR – Hawai'i State Department of Land & Natural Resources  
DOFAW – Division of Forestry and Wildlife  
ESA – Endangered Species Act of 1973, as amended  
TMK – Tax Map Key  
USFWS – United State Fish & Wildlife Service

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***Appendix A***

Wood, K.R., and M. Kirkpatrick. 2012.  
Botanical Survey Kapa'a Highlands Phase II  
TMK (4) 4-3-003:001  
Kaua'i, Hawai'i April-May 2012.

**Exhibit L**

**An Archaeological Assessment for the Proposed Kapa`a  
Highlands Phase II Project  
Kapa'a Ahupua'a, Kawaihau, Kaua'i**





**HISTORIC PRESERVATION DIVISION  
DEPARTMENT OF LAND AND NATURAL RESOURCES**

601 Kamokila Boulevard, Suite 555  
Kapolei, HI 96806

March 31, 2014

Nancy McMahon  
Exploration Associates, Limited  
3-2600 Kaumualii Highway, Suite 1300, PMB 306  
Līhu'e, HI 96766

LOG NO: 2013.5628, 2014.00035  
DOC NO: 1403LS26  
Archaeology

Dear Ms. McMahon:

**SUBJECT: Chapter 6E-42 Historic Preservation Review –  
Archaeological Assessment for the Kapa'a Highlands Phase II Project  
Kapa'a Ahupua'a, Kawaihau District, Island of Kaua'i  
TMK: (4) 4-3-003:001**

Thank you for the opportunity to review the revised draft reports titled *An Archaeological Assessment with Subsurface Testing for the Proposed Kapa'a Highlands Phase II Project, Kawaihau District, Kaua'i TMK: (4) 4-3-003:001* (McMahon and Tolleson). We received the first revised draft on September 27, 2013 (Log No. 2013.5628), the second on January 2014 (Log No. 2014.00035), and final revisions, including Figure 9, on March 26, 2014. SHPD made several requests that an archaeological inventory survey including subsurface testing be conducted on the property due to the identification of historic properties on nearby parcels including TMK: (4) 4-3-003:004, 005 (June 28, 2010, Log No. 2010.2441, Doc. No. 1006MV50; and October 1, 2012, Log No. 2012.1541, Doc. No. 1209SL24). The current AIS yielded no historic properties and was re-designated an archaeological assessment pursuant to Hawai'i Administrative Rules (HAR) §13-284-5.

The archaeological inventory survey (AIS) was conducted on behalf of Three Stooges LLC in support of a residential subdivision development on a 97-acre property. The AIS involved a 100% pedestrian survey and subsurface testing consisting of excavation of three backhoe trenches. No previously- or newly-identified historic properties were documented in the project area. The project area was assessed as having been extensively subjected to sugar cane plantation agriculture and to now be void of any surface plantation architecture or infrastructure remnants and to lack evidence of subsurface cultural deposits below the agricultural zone.

The revisions adequately address the issues and concerns raised in our earlier correspondence (October 1, 2012; Log No. 2012.1541, Doc. No. 1209SL24) and in our consultations. The revised report provides adequate discussion of the project location, environs, cultural and historical background, previous investigations, field methods, and findings. The report meets the standards set forth in HAR §13-276-5. It is accepted by SHPD. Please send one hardcopy of the document, clearly marked **FINAL**, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office, attention SHPD Library.

Please contact me at (808) 692-8019 or [Susan.A.Lebo@hawaii.gov](mailto:Susan.A.Lebo@hawaii.gov) if you have any questions or concerns regarding this letter.

Aloha,

A handwritten signature in cursive script that reads "Susan A. Lebo".

Susan A. Lebo, PhD  
Oahu Lead Archaeologist



# An Archaeological Assessment With Subsurface Testing for the Proposed Kapa`a Highlands Phase II Project, Kapa`a Ahupua`a, Kawaihau, Kaua`i TMK (4) 4-3-3: 1

By

Nancy McMahon, M.A. and Wendy Tolleson, M.A.

Prepared for:  
Three Stooges LLC

Exploration Associates, Ltd

Revised September 2013

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# INTRODUCTION

## Project Background

At the request of Three Stooges LLC., Exploration Associates Ltd. (EAL) conducted an archaeological assessment of a parcel of land (referred to hereafter as Kapa`a Highlands Phase II) in Kapa`a (in TMK 4-3-3:1) (Figures 1 & 2). The survey was performed to address any historic preservation or cultural impact issues that might affect the proposed development.

The proposed development, Kapa`a Highlands Phase II, project involves the development of a residential subdivision on a 97 acre parcel. Approximately 69 acres will be subdivided into residential lots both single family and multi-family units. In addition the breakdown of Phase II will include: roads - 9.4 acres; church - 0.8 acres; general commercial - 0.4 acres; parks - 3.1 acres and open space - 14.3 acres.

## Scope of Work

The purpose of this archaeological investigation is to address any archaeological and/or historical concerns. The proposed work includes a surface survey, subsurface testing, and a report detailing methods and any finds. This archaeological work meets the requirements of an inventory-level survey per the rules and regulations of (State Historic Preservation Division/Department of Land and Natural Resources) SHPD/DLNR. The level of work is sufficient to address site types, locations, and allow for future mitigation recommendations if appropriate. Any property over 50 years of age must be evaluated for historic Significance on the National Register of Historic places, and include remnant pre-contact and historic period site.

The scope of work includes:

- Historical research includes study of archival sources, historic maps, Land Commission Awards and previous archaeological reports to construct a history of land use and to determine if archaeological sites have been recorded on or near this property.
- Pedestrian survey of 100% of the subject parcel to identify any surface archaeological features and investigate and assess the potential for impact to such sites, and limited subsurface testing to identify any subsurface sensitive areas that may require further investigation or mitigation before the project proceeds.
- Preparation of a report which will include the results of the historical research and the fieldwork with an assessment of archaeological potential based on that research with recommendations for further archaeological work, if appropriate. It also will provide mitigation recommendations if there are archaeologically sensitive areas that require further consideration.

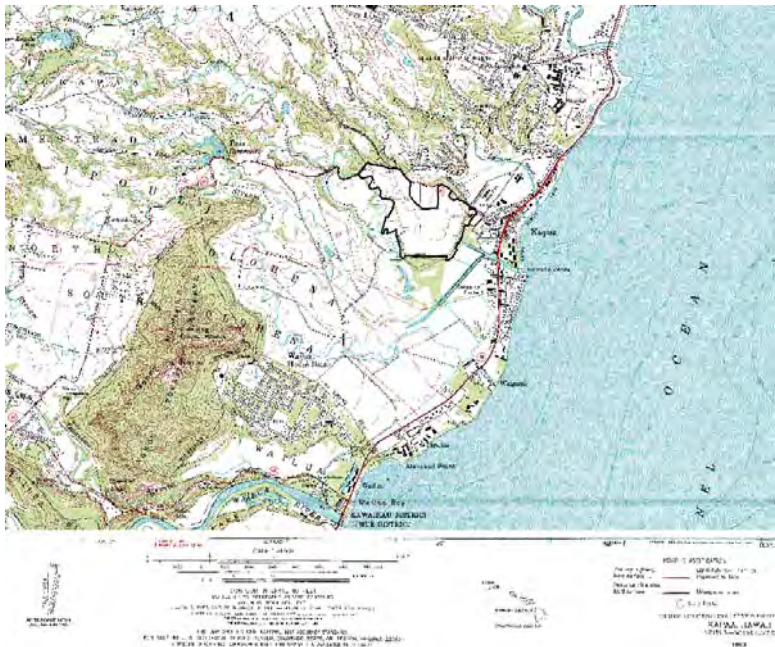


Figure 1. USGS Map Showing Project Area



Figure 2. Project location and surveyed area outlined in purple.

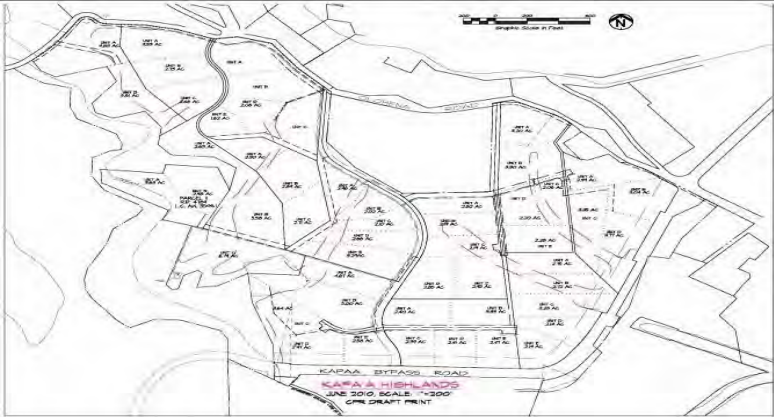


Figure 3. Project development map.





Figure 4 Aerial View of the Kapa'a Highlands Phase II Looking West.



Figure 5. Aerial View of Kapa'a Highlands Phase II Looking Mauka.

## Methods

On January 3, 2012 and April 25, 2012 and November 11, 2012 a survey of the Kapa'a Highlands Phase II project area was conducted by Exploration Associates Ltd. by archaeologist Nancy McMahon, M.A. Survey transects oriented north-south were spaced 10 m. apart where possible through thick guinea grass. Field observations were recorded and photographs were taken of the project area, the surrounding area, and the backhoe trenches. Three test trenches were machine excavated to examine the soils and determine if any stratigraphy or buried cultural deposits was present. Soils were classified using a Munsell color chart, then photographed.

Historical research includes a review of previous archaeological studies on file at the State Historic Preservation Division of the Department of Land and Natural Resources; studies of documents at Hamilton Library UH Manoa, the Kapa'a and Lihue Public Libraries, the Kaua'i Museum, the Kaua'i Historical Society and from the study of maps at the Survey Office of the Department of Land and Natural Resources. Nineteenth-century Land Commission Award claim records were accessed via the Internet from the *Mahele* Database prepared by Wai'hona 'Aina Corp.

## Natural Setting/Project Area

The subject parcel is located north of Kapa'a town on former cane lands situated on a bluff adjacent to the coastal plain. It is bordered by Oloheua Road to the north and the Kapa'a Bypass Road on the south and east. Kapaa Intermediate School is located on state land near the middle of the northern portion of the property. A Phase I parcel has an existing solar farm and equipment building.

The southern border of the project area is adjacent to the by-pass road within an elevation of approximately 55 feet above msl. The topography of the project area rises in elevation to the northern border approximately 130 feet above msl or an average increase of less than 5%. There are particular areas of the property with 20% slopes. The project area is currently fallow and is vegetated with Guinea Grass (*Panicum maximum*), Koa Haole (*Leucaena leucocephala*), and Java Plum (*Syzygium cumini*). The last cultivation of sugar cane on the project area was 15 years ago, but due to the poor soil, strong trade winds and the salt spray from the ocean, the viability of agricultural crops is limited. Solar farming, goat and cattle grazing are the current utilization of the property.

Foot et al (1972) described the soil in this area as Lihue-Puhi association, deep, nearly level to steep, well drained soils with fine texture and moderately fine texture subsoil. Permeability is moderately rapid, run-off is slow and erosion hazard is slight. The mean annual rainfall throughout the study area is about 22 inches per year. Average temperatures in the region range from the 60s to the low 90s, Fahrenheit. Temperature differences between day and night are about 15 degrees. The consistent direction of the tradewinds is from the northeast at between 10 and 15 miles per hour.



# HISTORICAL BACKGROUND

## From Puna District to Kawaihau District

The *ahupua'a* of Kapa'a belongs in the ancient district of Puna, one of five ancient districts on Kaua'i (King 1935: 228). Puna was the second largest district on Kaua'i, behind Kona, and extended from Kipu, south of Lihue to Kama'oma'o'o, just north of Kealia. For taxation, educational and judicial reasons, new districts were created in the 1840s. The Puna District, with the same boundaries became the Lihu'e District, named for an important town in that district. In 1878, King Kalakau'a in securing a future name for the new *Hu'i* Kawaihau, created the new district of Kawaihau. This new district encompassed the *ahupua'a* ranging from Olohena on the south to Kilauea on the north. Subsequent alterations to district boundaries in the 1920s left Kawaihau with Olohena as its southernmost boundary and Moloa'a as its northernmost boundary (King 1935:222).

## Traditional and Legendary Accounts of Kapa'a

A more in depth study of the legends and mythology of Kapa'a can be found in the Cultural Impact Assessment for the Proposed Kapa'a Highlands Phase II [EAL 2012]. Just a few of some of the legends of the area are included in this report.

Palila and Ka'ea

High in the *mauka* region of Kapa'a in the Makaleha mountains at a place called Ka'ea, is reported to be the supernatural banana grove of the Kaua'i kupua or demigod Palila, grandson of Hina (Handy and Handy 1972:424). In a 1913 edition of the newspaper Ka'oko'a Joseph Akina describes Pahla's banana grove:

The stalk could hardly be surrounded by two men, and was about 35 feet high from the soil to the lowest petiole. The length of the cluster from stem to lowest end of the bunch of bananas was about 1 3/4 fathoms long (one anana and one muku). There were only two bananas on each about 4 inches around the middle. There were just two bananas, one on the east side and one on the west, each about a foot or more in length. The one on the east side was tartish, like a *wai'awi* (Spanish guava) in taste and the one on the west was practically tasteless. The diameter of the end of the fruit stem of this banana seemed to be about 10 feet. This kind of banana plant and its fruit seemed almost supernatural... (Akina, 1913:5).

Ka Lulu o Mo'ikeha

Kapa'a was the home of the legendary Mo'ikeha. Born at Waipi'o on the island of Hawai'i, Mo'ikeha sailed to Kahiki (Tahiti), the home of his grandfather Maweke, after a disastrous flood. On his return to Hawai'i, he settled at Kapa'a, Kaua'i. Kila, Mo'ikeha's favorite of three sons by the Kaua'i chiefess Ho'oi'poi'kamalani, was born at Kapa'a and was said

to be the handsomest man on the island. It was Kila who was sent by his father back to Kahiki to slay his old enemies and retrieve a foster son, the high chief La'amaikahiki (Handy and Handy 1972:424; Beckwith 1970:352-358; Kalakaua 1888:130-135; Fornander 1916, vol.4 pt.1:160). Mo'ikeha's love for Kapa'a is related in the *'olelo no'eau*: Ka lulu o Mo'ikeha i ka laula o Kapa'a. "The calm of Moikeha in the breadth of Kapa'a" (Pukui, 1983: 157).

"Lulu-o-Mo'ikeha" is described as being situated "near the landing and the school of Waimahanalua" (Akina, 1913: 5). The landing in Kapa'a was known as the Makee Landing and was probably constructed in the late 1870s, along with the Makee sugar mill. Today, in place of the old Makee Landing is part of a breakwater located on the north side of Mo'ikeha Canal near the present day Coral Reef Hotel, and approximately half-a-mile north of Waikaea Bridge.

Akina (1913) tells the story of how Mo'ikeha's son, Kila stocks the islands with the fish *akule*, *kawakawa* and *'opelu*. When Kila travels to Kahiki, he seeks out his grandfather Maweke and explains that he is the child of Mo'ikeha. When Maweke asks Kila if Mo'ikeha is enjoying himself, Kila answers with the following chant:

My father enjoys the billowing clouds over Pohaku-pili,

The sticky and delicious poi,

With the fish brought from Puna,

The broad-backed shrimp of Kapalua,

The dark-backed shrimp of Pohakuhapai,

The potent awa root of Maiaki'i,

The breadfruit laid in the embers at Makialo,

The large heavy taros of Keahapana

The crooked surf of Makalwa too

The bending hither and thither of the reed and rush blossoms,

The swaying of the kalukalu grasses of Puna The large, plump, private parts of my mothers,

Of Ho'oi'poi'kamalani and Hinau'u, The sun that rises and sets,

He enjoys himself on Kaua'i,

All of Kaua'i is Mo'ikeha's. (Akina, 1913: 6)

Maweke was delighted and when the boy is questioned as to his purpose, Kila tells his grandfather he is seeking fish for his family. Maweke tells Kila to lead the fish back to his homeland. This is how Kila led the *akule*, *kawakawa* and *opelu* to Hawai'i.

Paka'a and the wind gourd of La'amaomao (Keahiahi)

Kapa'a also figures prominently in the famous story of Paka'a, and the wind gourd of La'amaomao. Paka'a was the son of Kuanu'uaua, a high-ranking retainer of the Big Island ruling chief Keawenuie'umi (the son and heir to the legendary

Chief, Umi), and La'amaomao, the most beautiful girl of Kapa'a and member of a family of high status *kahuna*. Kuanu'uano left the island of Hawai'i, traveled throughout the other islands and finally settled on Kaua'i, at Kapa'a. It was there that he met and married La'amaomao, although he never revealed his background or high rank to her until the day a messenger arrived, calling Kuanu'uano back to the court of Keawenuia' umi.

Intent on seeking out his real father and making himself known to him, Paka'a prepared for the journey to the Big Island. His mother presented to him a tightly covered gourd containing the bones of her grandmother, also named La'amaomao, the goddess of the winds. With the gourd and chants taught to him by his mother, Paka'a could command the forces of all the winds in Hawai'i. While this story continues on at length about Paka'a and his exploits on the Big Island and later on Moloka'i, it will not be dwelt upon further here. It is important to note that several versions of this story do include the chants which give the traditional names of all of the winds at all the districts on all the islands, preserving them for this and future generations (Nakuina 1990; Rice 1923:69-89; Beckwith 1970:86-87; Thrum 1923:53-67; Fomander 1918-19 vol. 5 pt.1:78- 128).

Frederick Wichman (1998:84) writes that Paka'a grew up on a headland named Keahiahi. Here, Paka'a learned to catch *malolo*, his favorite fish. After studying the ocean and devising his plan to fabricate a sail, Paka'a wove a sail in the shape of a crab claw and tried it out on his uncle's canoe. One day, after going out to catch *malolo*, he challenged the other fishermen to race to shore. He convinced them to fill his canoe with fish suggesting it was the only way he could truly claim the prize if he won:

The fishermen began paddling toward shore. They watched as Paka'a paddled farther out to sea and began to fumble with a pole that had a mat tied to it. It looked so funny that they began to laugh, and soon they lost the rhythm of their own paddling. Suddenly Paka'a's mast was up and the sail filled with wind. Paka'a turned toward shore and shot past the astonished fishermen, landing on the beach far ahead of them. That night, Paka'a, his mother, and his uncle had all the *ma'o'o* they could eat (Wichman 1998:85).

#### Kaweloleimakua

Kapa'a is also mentioned in traditions concerning Kawelo (Kaweloleimakua), Ka'ililauokekoa (Mo'ikeha's daughter, or granddaughter, dependent on differing versions of the tale), the mo'o Kalamainu'u and the origins of the *hina'i hinalea* or the fish trap used to catch the hinalea fish, and the story of Lonoikamakahiki (Fomander 1917, vol.4 pt.2:318, vol.4 pt. 3:704- 705; Rice 1923:106-108; Thrum 1923:123-135; Kamakau 1976:80).

#### Kalukalu grass of Kapa'a

"Kiimoena kalukalu Kapa'a" or "Kapa'a is like the *kalukalu* mats" is a line from a chant recited by Lonoikamakahiki. Kalukalu is a sedge grass, apparently used for weaving mats (Fomander 1917, Vol. IV, Pt. 2, pp. 318-19). Pukui (1983: 187) associates the kalukalu with lovers in "ke kalukalu moe ipo o Kapa'a; the *kalukalu* of Kapa'a that sleeps with the lover". According to Wichman (1998:84), "a kalukalu mat was laid on the ground under a tree, covered with a thick pile of grass, and a second mat was thrown over that for a comfortable bed", thus the association with lovers. Kaua'i was famous for this peculiar grass, and it probably grew around the marshlands of Kapa'a. It is thought to be extinct now, but an old-time resident of the area recalled that it had edible roots, "somewhat like peanuts." Perhaps it was a famine food source (Kapa'a Elementary School 1933:VI).

## Heiau of Kapa'a

During their expeditions around Hawai'i in the 1880's, collecting stories from *ka po'e kahiko*, Lahainaluna students stopped in Kapa'a and Kealia and gathered information regarding *heiau* of the region. Altogether, fourteen *heiau* were named in Kapa'a and Kealia, suggesting the two *ahupua'a* were probably more politically significant in ancient times. Table 1 lists the names of the ten *heiau* identified in the *ahupua'a* of Kapa'a, their location if known, their type, and associated chief and priest.

Table 1. *Heiau* of Kapa'a

Name	Location	Type	Associated
Mailehuna	Kapa'a (Mailehuna is the area of the present day Kapa'a School)	Unknown	Kiha, Kaumuali'i/ Lukahakona
Pueo	Kapa'a	Unknown	Kiha, Kaumuali'i/
Pahua	Kapa'a/Kealia	Unknown	Kiha/ Lukahakona
Kumalae	Kapa'a/Kealia	Unknown	Kiha/ Lukahakona
Waiehumalama	Kapa'a/Keilia	Unknown	Kiha/ Lukahakona
Napu'upa'akai	Kapa'a/Kealia	Unknown	Kiha/ Lukahakona
Noeamakali'i	Kapa'a/Kedlia	Heiau for birth of Kaua'i Chiefs, like Holoholoku	Unknown
Pu'ukoa	Kapa'a/Kealia	Unu type heiau	Unknown
Piouka	Kapa'a/Kealia	Unu type heiau	Unknown
Una	Kapa'a/Kealia	Unknown	Kiha/ Lukahakona
Mano	Kapa'a/Kealia	Unknown	Kiha/ Lukahakona
Kuahiahi	Kapa'a (govmt) school stands on site now)	Unknown	Kaumuali'i/ Lukahakona
Makanalimu	Upland of Kawaihau	Unknown	Kaumuali'i
Kaluluomoikeha	Kapa'a	Unknown	Moikeha

The exact locations of these *heiau* are unknown. The locations of two of the *heiau* correlate with the locations of *wahi pana* which are known to be close to Kuahiahi and Kaluluomo'ikeha. Kuahiahi (also spelled Kaahiahi and Keahiahi) is the rocky headland at the north end of Kapa'a where the first Kapa'a School was once located. Kaluluomo'ikeha is thought to be the general area near the Mo'ikeha Canal and the present day Coral Reef Hotel.

## The Mahele: Kapa'a Land Commission Awards

The Organic Acts of 1845 and 1846 initiated the process of the *Mahele*, the division of Hawaiian lands, which introduced private property into Hawaiian society. In 1848 the crown and the *ali'i* received their lands. The common people received their *kuleana* in 1850. It is through records for Land Commission Awards (LCAs) generated during the Mahele that specific documentation of traditional life in Kapa'a Ahupua'a comes to light. During the *Mahele*, Kapa'a was taken as Crown Lands (Office of the Commissioner of Public Lands of the Territory of Hawaii, 1929). The *i'i* of *Paikahawai* and *Ulukiu* in Kapa'a Ahupua'a were retained as Government Lands.

Table 2. Mahele Land Claims in Kapa'a Ahupua'a

LCA Number	Ahupua'a	Claimant	'Ili of the Ahupua'a	Village/Farm	Land Use	Number of Āpana
3971	Kapa'a	Honolii,	Kapana	Kupanihi Village	6 <i>lo'i</i> (uncult), house lot	2 (2 acres, 1 rood, 1 rod)
3554	Kapa'a	Keo	Kahanui	Puhi Village	15 <i>lo'i</i> , house lot	2 (7 acres, 1 rood, 17 rods)
3638	Kapa'a	Hululi	Maeleele	Kaloko Village	12-15 <i>lo'i</i> , house lot	2 (5 acres, 1 rood, 19 rods)
8247	Kapa'a	Ehu	Moalepe/Noalepe		20 <i>lo'i</i> ,	1 (3 rods)
8837	Kapa'a	Kamapaa	Ulukiu lalo Awawaloa Ulukiu		3 <i>lo'i</i> , 2 <i>lo'i</i> , house lot	1 (2 acres, 2 rods, 27 rods)
8843	Kapa'a	Kiau	Apopo	Kalolo Village	6 (5) <i>lo'i</i> and <i>kula</i> , house lot	2 (2.75 acres 3 rods)
10564	Kapa'a	Oleloa Daniel		Hikinui Farm	Fishpond, 10 <i>lo'i</i>	

The land claims during this period show that only five individuals were awarded land parcels in the relatively large *ahupua'a* of Kapa'a. The five awardees were Kiau (#08843), Kamapaa (#08837), Mane Honolii (#03971) Hulili (#03638) and Ehu (#08247). All four had *lo'i* or irrigated *kalo* fields on the *mauka* side of the lowland swampy area, sometimes extending a short distance up into small, shallow gulches and valleys. Many of these *lo'i* parcels name *pali* or hills/cliffs as boundaries. Each LCA also had a separate house lot located on the *makai* side of the swamp, near the beach. Three of the land claims name ponds on their lands, including Puhi Pond (LCA #03554), and fishponds in Kupanihi 'Ili (LCA #03971) and Hahanui 'Ili (LCA #10564). *Loko* Kihapai may be the same as the fishpond in the same land claim. The other two *loko* are associated with house lots, situated on the *makai* edge of the Kapa'a swamplands suggesting modification of the natural swamplands.

Other natural and cultural resources mentioned in the LCAs include freshwater springs, pig pens, *hau* bushes, *hala* clumps, streams, *'auwai*, and *kula* or pasturelands.

Interestingly, the residential "village" of Kapa'a did not exist as a single entity, but was likely a series of small settlements or compounds, perhaps even individual house lots which stretched along the shoreline of the *ahupua'a* and included (south to north) Kupanihi (Makahaikupanihi), Kalolo (Kaulolo), Puhi, and Uluki.

The fifth individual, Ehu (LCA #08247), was the only person to be awarded a single parcel in the upland area of Kapa'a, Moalepe Valley, approximately five miles one mile southwest of the project area. In 1848, when Ehu made his claim, he was the only one living there. A few years later, according to Honolii's testimony to support Ehu's claim, "There are no houses and no people now living on the land. Ehu found himself lonely there, all his neighbors having either died or left the land. Ehu now lives in Wailua." Evidently Ehu may have been the last person to live at and cultivate in the traditional way, the far *mauka* region of Kapa'a (Van Ryzin and Hammat 2004).

## Early Historic Accounts of Kapaa (1830s-1900s)

Although most of the historic record documents for Kaua'i in this period revolve around missionary activities and the missions themselves, there was indication that the Kapaa area was being considered for new sugar cane experiments, similar to those occurring in Kōloa In 1835 Ladd and Company received a 50 year lease on land in Kōloa from Kamehameha III and Kaua'i Governor Kaikio'ewa of Kaua'i. The terms of the lease allowed the new sugar company "the right of someone other than a chief to control land" and had profound effects on "traditional notions of land tenure dominated by the chiefly hierarchy" (Donohugh, 2001: 88). In 1837, a very similar lease with similar terms was granted to Wilama Ferani, a merchant and U.S. citizen based in Honolulu (Hawai'i State Archives, Interior Dept., Letters, Aug. 1837). The lease was granted by Kauikeaouli for the lands of Kapaa, Kealia and Waipouli for twenty years for the following purpose:

...for the cultivation of sugar cane and anything else that may grow on said land, with all of the right for some place to graze animals, and the forest land above to the top of the mountains and the people who are living on said lands, it is to them whether they stay or not, and if they stay, it shall be as follows: They may cultivate the land according to the instructions of Wilama Ferani and his heirs and those he may designate under him... (Hawai'i State Archives, Interior Dept. Letters, Aug. 1837).

Unlike Ladd & Company which eventually became the Kōloa Sugar Company, there is no further reference to Wilama Ferani and his lease for lands in Kapaa, Kealia and Waipouli. In a brief search for information on Honolulu merchant, Wilama Ferani, nothing was found. It is thought that perhaps Wilama Ferani may be another name for William French, a well-known Honolulu merchant who is documented as having experimented with grinding sugar cane in Waimea, Kaua'i at about the same time the 1837 lease for lands in Kapaa, Kealia and Waipouli was signed (Joesting 1984: 152).

In 1849, son of Wai'oli missionary, William P. Alexander, recorded a trip he took around Kaua'i. Although, he focuses on the larger mission settlements like Kōloa and Hanalei, he does mention Kapa'a.

A few miles from Wailua, near Kapaa we passed the wreck of a schooner on the beach, which once belonged to Capt. Bernard. It was driven in a gale over the reef, and up on the beach, where it now lies. A few miles further we arrived at Kealia. We had some difficulty crossing the river at this place, owing to the restiveness of our horses. The country here near the shore was rather uninviting, except the valley which always contained streams of water (Alexander 1991: 123).

In later years, the notorious Kapaa reef was to become the location of many shipwrecks once a landing was built there in the 1880s.

The first large scale agricultural enterprise was begun in Kapaa in 1877 by the Makee Sugar Plantation and the *Hui Kawaihau* (Dole 1916: 8). Originally a choral society begun in Honolulu its membership consisted of many prominent names, both Hawaiian and *haole*. It was Kalakau'a's thought that the *Hui* members could join forces with Makee, who had previous sugar plantation experience on Maui, to establish a successful sugar corporation on the east side of Kaua'i. Captain Makee was given land in Kapaa to build a mill and he agreed to grind cane grown by *Hui* members. Kalakau'a declared the land between Wailua and Moloaa, the Kawaihau District, a fifth district and for four years the *Hui* attempted to grow sugar cane at Kapahi, on the plateau lands above Kapaa town. After a fire destroyed almost half of the *Hui*'s second crop and after the untimely death of one of their principal advocates, Captain James Makee, the *Hui* began to disperse and property and leasehold rights passed on to Makee's son-in-law and new Makee Plantation owner, Colonel Z.S. Spalding (Dole 1916: 14).

As part of the infrastructure of the new plantation, a sugar mill was erected and the Makee Landing was built in Kapaa during the early years of operation of the Makee Sugar Plantation. Following Captain Makee's death, Colonel Spalding took control of the plantation and in 1885 moved the mill to Kealia (Cook 1999: 51). The deteriorating stone smokestack and landing were still there well into the 1900s (Damon 1931:359). Conde´ and Best (1973:180) suggest that railroad construction for the Makee Plantation began just prior to the mid-1890s. There is one reference to a railroad line leading from the Kapaa landing to Kealia in 1891. During Queen Lili'uokalani's visit to Kaua'i in the summer of 1891, the royal party was treated to music by a band, probably shipped in from O'ahu. "The band came by ship to Kapaa and then by train to Kealia" (Joesting 1984:252). This railroad line is depicted on a 1910 USGS map which shows the line heading south from Kealia Mill and splitting near the present Coral Reef Hotel, another line going to the old Kapaa Landing (Makee Landing) and another line heading *mauka*, crossing the present Moikeha Canal, traveling southwest up Lehua Street and through what is now goat pasture, along a plateau and into the *mauka* area behind Kapaa swamplands. This railroad line was part of a twenty mile network of plantation railroad with some portable track and included a portion of Kealia Valley and in the *mauka* regions of the plateau lands north of Kealia (Conde´ and Best 1973:180).

By the late 1800s hundreds of Portuguese and Japanese immigrants found work on Makee Plantation and the new influx of immigrants required more infrastructure (Cook 1999:51). In 1883, a lease for a school lot was signed between Makee Sugar Company and the Board of Education (Kapaa School 1983: 9). Stipulations in the Portuguese immigrant contracts with Makee Sugar Company stated that "children shall be properly instructed in the public schools" (Garden Island April 1, 1983). The original Kapaa School was constructed in 1883 on a rocky point adjacent to the Makee Sugar Company railroad. Traditionally, this point was known as Kaahiahi (Kapaa School 1983: 10). In 1908, Kapaa School was moved to its present site directly *mauka* and up the hill at Mailehune.

Narrow wagon roads gave way to macadamized roads in the early part of the 20th century. One of these new roads was called the Kaua'i Belt Road and parts of it are thought to have followed along the "Old Government Road" (Cook, 1999). In Kapaa, the present day Kuhio Highway likely follows the same route as the original Government Road and subsequent Kaua'i Belt Road. In fact, the locations of the *kuleana* awards in Kapaa indicate that the majority of the house lots were situated along the Government Road. LCA 3243 names a "road" as one of its boundaries.

In the latter half of the 1800s, following Makee's death, Chinese rice farmers began cultivating the lowlands of Kapaa with increasing success. Several Hawaiian *kuleana* owners leased or sold their parcels *mauka* of the swamp land to Chinese rice cultivators. Other Chinese rice cultivators appealed to the government for swamplands, first leasing and later buying the land. The economic activity displaced the house lot *kuleana* on the *makai* side of the marsh for increasing commercial and residential development (Lai 1985:148-161).

## 20th Century History of Kapa'a (1900 - Present)

In the early 1900s, to help with the burgeoning plantation population, government lands were auctioned off as town lots in Kapaa. One *kama'aina* mentioned that in the 1930s and 1940s, the area north of Moikeha Canal in Kapaa was mostly settled by Portuguese families (Bushnell et al 2002). The Japanese were also very prominent in the 1920s and 1930s largely replacing the Chinese merchants in the Kapaa business sector (Bushnell et al. 2002). Starting in 1926, the territorial Board of Health ran a dispensary in Kapaa, which was located at the *makai* edge of Niu Street, near the extant Kapaa Beach Park parking lot and bike path. The location of the former dispensary currently is a vacant lot. Elsewhere in the vicinity, a fire station occupies the location of the former Coral Reef Hotel, and a courthouse and a jail once stood where the present Kapaa Neighborhood Center is located. It is not known when these structures were abandoned or removed.

In 1913, Hawaiian Canneries opened in Kapaa at the site now occupied by Pono Kai Resort (Cook, 1999: 56). Through the Hawaiian Organic Act, Hawaiian Canneries Company, Ltd. purchased land they were leasing, approximately 8.75 acres, in 1923 (Bureau of Land Conveyances, Grant 8248). A 1923 sketch of the cannery shows only four structures, one very large structure assumed to be the actual cannery and three small structures *makai* of the cannery. By 1956, the cannery was producing 1.5 million cases of pineapple. By 1960, 3400 acres were in pineapple and there were 250 full time employees and 1000 seasonal employees (Honolulu Advertiser, March 20, 1960). In 1962, Hawaiian Canneries went out of business due to competition from third world countries.

The Ahukini Terminal & Railway Company was formed in 1920 to establish a railroad to connect Anahola, Kealia, Kapaa to Ahukini Landing and "provide relatively cheap freight rates for the carriage of plantation sugar to a terminal outlet" (Conde´ and Best, 1973: 185). This company was responsible for extending the railroad line from the Makee Landing, which was no longer in use, to Ahukini Landing, and for constructing the original Waikaea Railroad Bridge and the Moikeha Makai Railroad Bridge.

In 1934, the Lihue Plantation Company absorbed the Ahukini Terminal & Railway Company and Makee Sugar Company (Conde´ and Best, 1973: 167). The railway and rolling stock owned by Makee Sugar Company became the Makee Division of the Lihue Plantation. At this time, besides hauling sugar cane, the railroad was used to haul plantation freight including "fertilizer, etc... canned pineapple from Hawaiian Canneries to Ahukini and Nawiliwili, pineapple refuse from Hawaiian Canneries to a dump near Anahola and fuel oil from Ahukini to Hawaiian Canneries Co., Ltd." (Hawaiian Territorial Planning Board, 1940: 11). Former plantation workers and *kama'aina* growing up in Kapaa remember when the cannery would send their waste to the pineapple dump, a concrete pier just north of Kumukumu Stream (State Site No. 50- 30-08-789) by railroad. The structure is built over the water where the rail cars would dump the pineapple waste. The current would carry the waste to Kapaa which would attract fish and sharks (Bushnell et al. 2002).

Lihue Plantation was the last plantation in Hawaii to convert from railroad transport to trucking (Conde´ and Best, 1973: 167). "By 1957 the company salvaged a part of their plantation railroad, which was being supplanted by roads laid out for on or close to the old rail bed" (Ibid: 167). By 1959, the plantation had completely converted over to trucking. The Cane Haul Road which begins near the intersection of Haua'ala Road and Kuhio Highway is thought to date to the late 1950s and follows the alignment of the old railroad until just before or near `Alibi Point.

Severe floods in Kapaa in 1940 led to the dredging and construction of the Waikaea and Mokeha Canals sometime during that decade. (Hawaii Territorial Planning Board, 1940: 7). Although the Waikaea Canal, bordering the Kapaa Pineapple Cannery, had been proposed as early as 1923, nothing was constructed until after the floods (Bureau of Land Conveyances, Grant 8248). A Master Plan for Kapaa, published in 1940, asks the Territorial Legislature for funds to be set aside for the completion of a drainage canal and for filling *makai* and *mauka* of the canal (Hawaii Territorial Planning Board, 1940:7). In 1955, the local newspaper reported the dredging of coral from the reef fronting Kapaa Beach Park for the building of plantation roads (Garden Island Newspaper, September 21, 1955). This dredging was later blamed for accelerated erosion along Kapaa Beach (Garden Island Newspaper, October 30, 1963). Today, there are several sea walls along the Kapaa Beach Park to check erosion. Old time residents claim the sandy beach in Kapaa was once much more extensive than it is now (Bushnell et al. 2002).

In the 1930s after the incorporation of Makee Sugar Company into Lihue Plantation, Kealia Town was slowly abandoned. Many of the plantation workers bought property of their own and moved out of the plantation camps. The camps which bordered Kuhio Highway were disbanded in the 1980s. In the last part of the 20th century the Lihue Plantation began to phase out and Kapaa Town suffered after the closing of the Kapaa Cannery; however the growing tourist industry helped to ease the economic effects of the Cannery's closing.

# PREVIOUS ARCHAEOLOGICAL RESEARCH

## Archaeological Studies and Sites in Kapa'a *Ahupua'a*

The following table outlines the archaeological research (Table 3) and historic properties (Table 4) identified in Kapa'a *Ahupua'a*. These tables are followed by discussion of the research and historic properties. Table 3 provides a list of archaeological research conducted within Kapa'a *Ahupua'a*, including columns for source, location, nature of study, and findings. The locations of these archaeological studies are shown in Figure 4. Table 4 is a list of known historic properties within the *ahupua'a* and includes columns for state site numbers, site type, location and reference. The locations of identified sites within Kapa'a *Ahupua'a* are shown in Figure 5. All site numbers are numbered 50-30-08-SHIP site number. Here only the SHIP sit number designation will be used

Table 3. Previous Archaeological Studies in coastal Kapa'a.

Source	Location	Nature of Study	Findings
Bennett 1931	Island wide: identifies 2 sites: Site 110 Taro terraces and bowl and Site 111 A large simple dirt Hawaiian ditch	Archaeological Reconnaissance	Identifies 2 sites: Site 110 Taro terraces and bowl and Site 111 A large simple dirt Hawaiian ditch
Handy and Handy 1972	Archipelago-wide	Native Planter study	Discusses "highly developed irrigation system"
Ching 1976	Just south of the Waikaea Drainage Canal	Archaeological Reconnaissance	No significant findings
Hammatt 1981	Upland Kapaa	Archaeological Reconnaissance	No significant findings
Hammatt 1986	Upper reaches of the Makaleha stream valley.	Archaeological Reconnaissance	No significant findings
Hammatt 1991	Along Kuhio Highway	Subsurface Testing	Identifies two sub-surface cultural layer sites
Kikuchi and Remoaldo 1992	Around Kapaa Town	Cemeteries of Kauai	Identifies six cemeteries
Spear 1992	South side Waikaea Canal, <i>mauka</i> of Kuhio Highway. (TMK: 4-5-05:04, 09)	Monitoring Report	Designated subsurface Site 547



Source	Location	Nature of Study	Findings
Chaffee, Burgett & Spear 1994a	A house lot near the corner of Kukui and Ulu Streets in <i>mauka</i> Kapaa Town. [TMK: 4-5-09:10]	Archaeological Inventory Survey	No significant findings
Chaffee, Burgett & Spear 1994b	Hamane Street Kapaa Town. [TMK: 4-5-09:51]	Archaeological Inventory Survey	No significant findings
Hammatt, Ida & Chiogioji 1994	Proposed bypass routes <i>mauka</i> of Kapaa Town	Archaeological Assessment	No new field work, literature review only
Hammatt, Ida & Folk 1994	South side Waikaea Canal, <i>mauka</i> of Kuhio Highway [TMK: 4-5-05:06]	Archaeological Inventory Survey	Weak cultural layer designated Site 748
Kawachi 1994	Inia Street (Jasper) [TMK 4-5-08:33]	Burial Report	Designated Site 871
McMahon 1994	"behind the armory in Kapa'a near the god stones" The location is uncertain, and at "Buzz's near the Coconut Marketplace"	Documents a report of two burials	16 sets of human remains. Site numbers unknown
Creed, Hammatt, Ida, Masterson & Winieski 1995	Kapa'a a Sewer line project, Kuhio Highway, south and central Kapaa Town	Archaeological Monitoring Report	Documents cultural layer of Site - 1848 and (an enlarged) Site - 1849 & recovery of thirty burials at Sites —867, -868, -871, and - 1894
Jourdane 1995	1382-A Inia Street, <i>makai</i> of Kuhio Highway, central Kapaa Town	Burial Report	Site 626
McMahon 1996	South side Waikaea Canal, <i>mauka</i> of Kuhio Highway [TMK: 4-5-05:08]	Archaeological Inventory Survey	No significant cultural material
Hammatt, Chiogioji, Ida & Creed 1997	Test excavations focused inland of Kapaa Town	Archaeological Inventory Survey	Four test trenches were excavated inland of Kapaa Town
Borthwick and Hammatt 1999	Kapaa Seventh-Day Adventist Church at 1132 Kuhio Highway	Archaeological Monitoring and Burial Treatment Plan	Monitoring was indicated as this parcel lay within designated Site 1848.



Figure 6. Map showing previous archaeological studies in Kapa'a.

Table 4. Historic Properties in Kapa'a Ahupua'a

Site #	Ahupua'a	Site Type/ Name (if any)	Location	Site Constraints	Reference
B001	Kapa'a	Historic Cemetery	South of bend of Kapa'a Stream, a kilometer mauka from Kuhio Hwy	Appears to be a discrete historic cemetery	Kikuchi and Remoaldo 1992
B002	Kapa'a	Historic Cemetery	Just mauka from Kuhio Highway, south of Kapa'a Stream	Appears to be a discrete historic cemetery	Kikuchi and Remoaldo 1992
B003	Kapa'a	Kapa'a Public Cemetery	South of Kanaele Road, one kilometer inland of Kuhio Highway	Appears to be a discrete historic cemetery	Kikuchi and Remoaldo 1992
B004	Kapa'a	Historic Cemetery	North of Apopo Road, one kilometer inland of Kuhio Highway	Appears to be a discrete historic cemetery	Kikuchi and Remoaldo 1992
B013	Kapa'a	Historic Cemetery	Just mauka from Kuhio Highway, north of the Waikaea Canal	Appears to be a discrete historic cemetery	Kikuchi and Remoaldo 1992
B014	Kapa'a	All Saints Episcopal Church Cemetery	Just mauka from Kuhio Highway, south of the Waikaea Canal	Appears to be a discrete historic cemetery	Kikuchi and Remoaldo. 1992:62-65
547	Kapa'a	Sub-surface features including a firepit and a possible house foundation	South of bend of Waikaea Canal, mauka of Kuhio Highway	Archaeological monitoring in the vicinity recommended	Spear 1992:3
626	Kapa'a	Burial	Inia Street, makai of Kuhio Highway,	Consultation and monitoring in vicinity indicated	Jourdane 1995
748	Kapa'a	Minimal findings, a weak cultural layer (buried A-horizon)	South of the bend of the Waikaea Canal, mauka of Kuhio Highway	Considered no longer significant within project area	Hammatt et al. 1994
789	Kapa'a/Kealia	Historic Road	Coastal Cane Haul Road near Kawaihau Road turn off	Unknown	Perzinski et. al. 2000

Site # 50-30-08-	Ahupua'a	Site Type/ Name (if any)	Location	Site Constraints	Reference
867	Kapa'a	1 set of human remains	Kukui Street, just mauka of Kuhio Highway, Kapa'a Town	Consultation and monitoring in vicinity indicated	Creed et al. 1995:50
868	Kapa'a	1 set of human remains	Lehua Street mauka of Kuhio Highway, Kapa'a Town	Consultation and monitoring in vicinity indicated	Creed et al. 1995:50
871	Kapa'a	13 sets of human remains (Creed et al. 1995:50)	Inia Street, makai of hio Highway	Consultation and monitoring in vicinity indicated	Kawachi 1994; Creed et al. 1995:50
1848	Kapa'a	Cultural layer and sub-surface features	Along Kuhio Highway between Wana Road and the Waikaea Drainage Canal	Archaeological monitoring in the vicinity recommended	Hammatt 1991; Creed et al. 1995
1849	Kapa'a	Cultural layer and sub-surface features; Creed et al. 1995:53 expands boundaries to incl. burial sites 626, -867, -868 - 871, and -1894	Along Kuhio Highway between Inia Street and Kauwila Street extending to the coast	Consultation and monitoring in vicinity indicated	Hammatt 1991; Creed et al. 1995
1894	Kapa'a	11 sets of human remains	Ulu Street, just north of Kuhio Highway, Kapaa Town	Consultation and monitoring in vicinity indicated	Creed et al. 1995:50
2075	Kapa'a/Kealia	Highway Bridge Foundation (old Kaua'i Belt Road)	Kuhio Highway at Kapa'a/ Kealia River	Unknown	Bushnell et al. 2002:55
2076	Kapa'a	Petroglyph	Rocky coast below former cane haul road (Site -789)	Preservation	Bushnell et al. 2002:55
2077	Kapa'a	Concrete steps (related to historic beach pavilion)	Near present Kapaa Beach Park Pavilion	Unknown	Bushnell et al. 2002:55

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### Pattern of Archaeological Sites in Kapa`a

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cultural layers has not been clearly defined. The five *kuleana* awarded during the *Mahele* are located adjacent to the present coastal highway. The areas directly *mauka* of Kapaa Town are marshy though much of it has been filled in recent decades for the Bypass Road and shopping centers and housing. These cultural deposits associated with pre-historic and early historic habitation are known to exist in a relatively narrow sand berm that makes up the physiogeography of Kapa'a. The more *mauka* studies but still lower coastal areas, suggest they are located towards the *mauka* fringe of the sand berm, approaching more marshy conditions and have generally reported no significant or minimal findings (Spear 1992; Chaffee et al. 1994a & 1994b; Hammatt et al. 1994, 1997; McMahon 1996). Less than 1.5 km to the south of Waikaea Canal at the southern boundary of Waipouli adjacent to Uhalekawa'a Stream (Waipouli Stream) and the ocean is another extensive subsurface cultural deposit which is associated with a pre-contact fishing encampment located (Hammatt et al. 2000).

Anticipated sites based on historic and archaeological studies in *mauka* Kapa'a are the remains of cane cultivation infrastructure such as ditches and pre-contact too historic period Native Hawaiian terracing for *lo'i* cultivation with nearby habitation sites in the gulches, however the gulches lay outside the current project area.

## RESULTS OF FIELD WORK

### Pedestrian Survey

On January 3 and April 25, 2012 Exploration Associates Ltd. archaeologist Nancy McMahon, M.A. made field inspections on proposed Kapa'a Highlands project area. Access was made via Oloheua Road (two gates). North-south oriented transects were utilized to 100% survey the project area. Because of known historic cane cultivation in this area of Kapa'a, predicted sites might be historic plantation related infrastructure such as ditches, flumes, roads, temporary cane-haul railroad berms and reservoirs. None were observed during the survey. The shallow ravine the project area were surveyed and tested, however no pre-Contact or historic era terraces or habitation sites were revealed. The parcel contains no surface archaeological sites. The access road is related to access for construction of the buildings already present on the Phase I parcel.

### Subsurface Testing

On November 11, 2012, three trenches were excavated with a backhoe with a 24 in. width bucket (Figure ). Trench 1 was excavated to a depth of 183 cm with a length of 10 meters. Trench 2 was excavated to a depth of 160 cm and a length of 3 m. Trench 3 was excavated to a depth of 260 cm and a length of 2.5 m. Each evinced the same soil composition. A description of the soils representing all three trenches is presented here.

A representative profile description evinced the same stratigraphy consisting in all three trenches, consisting of three soil layers with only a single clear boundary delineating the topsoil from the underlying soils. Soil differences could only be determined utilizing the Munsell Color Chart. The topsoil in each trench 5 YR 4/3 *reddish brown organic*. The other two layers are classified as 5 YR 5/6 *yellowish red* [20 cmbs] and 5 YR 4/6 *yellowish red* [20cmbs to base of excavation]. Characteristics are dry to very dry, crumbly, medium firm, clayey silt. It is pretty much cultivated soils. A local informant, Mr. Vasquez, who worked for the Lihue plantation most of his life Informant stated the plantation chain and ball dragged this land several time over.

A geologic survey was undertaken on the adjacent Phase I parcel prior to the construction of a solar farm. Soils extracted and examined in test trenches revealed only agricultural soils. No buried cultural layers or plantation infrastructure was present.



Figure 8. Trench locations, facing northeast.



Figure 9. Profile Test Trench 2 on the left and Trench 3 right.



Figure 10. Entrance off Olohena Road looking makai in the distance the Solar Farm part of Phase I



Figure 11. Access Road to Solar Farm with Cattle Grazing in the Distance.





Figure 12. Lower Elevation Outside Project Area from the access road.



Figure 13. View Across the Project Area, Facing Makai and Northeast.





*Figure 14. The Roof of Kapaa Middle School on State land*

## RECOMMENDATIONS

As no archaeological sites are present, there are no historic preservation concerns for this project. We recommend no further historic preservation work. Though highly unlikely, if any human remains or other significant subsurface deposits are encountered during the course of development activities all work in the immediate area should stop and the State Historic Preservation Division promptly notified.

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## APPENDIX A

### Photos of the Area Surveyed



Figure 1. View of Project Area from the gate at the top of Olohehena Road.



Figure 2. Solar Farm on Phase I Property view to north



Figure 3. Cattle Grazing in the Project Area.



*Figure 4. Fence in the left side of photo indicating property boundary.*



*Figure 5. Goats Grazing in the Project Area.*



## APPENDIX B

State Historic Preservation Letter (June 2010) Requesting Survey

State Historic Preservation Letter (December 1999) Subdivision  
"No Effect"





## Report of Geotechnical Evaluation Kapaa Solar Field

Mr. Greg Kamm  
P.O. Box 1200  
Kailua, HI 96756

LOG NO. 24572 -  
DOC NO. 9912NM02

Dear Mr. Kanani:

**SUBJECT:** Chapter 61-42, Historic Preservation Review --  
Subdivision Permit Application 5-99-45 (Silagi Family Trust  
and Hillside Corp. Center I.L.C.)  
TMK: 4-3-03: 01 per  
Kapaa, Kawaihau, Kua'i

Thank you for submitting the 1975 air photo of the above subject parcels. We agree that the land has been extensively altered by cane cultivation and filling. Therefore, we now believe that this project will have "no effect" on significant historic sites.

If you have any questions, please call Nancy McMahon at 742-7033.

Aloha,

DON HIBBARD, Administrator  
State Historic Preservation Division

NAME \_\_\_\_\_

c. D. Crowell, Planning Department County of Kauai



REPORT OF  
GEOTECHNICAL EVALUATION-  
KAPAA SOLAR FIELD  
KAPAA, KAUAI

PREPARED FOR  
WAGNER ENGINEERING SERVICES, INC.

PREPARED BY:

D.A.Evans, Inc.  
P.O. Box 745  
Kilauea, HI., 96754



REPORT OF  
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KAPAA SOLAR FIELD  
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## INTRODUCTION

This report summarizes the results of our evaluation of the geotechnical feasibility of construction of a solar farm west of the town of Kapaa, Kauai. We understand the installation will be used to supply electric power to the Kauai Island Utility Cooperative.

## PURPOSE

This report is for the exclusive use of our client, Wagner Engineering Services, Inc. Its purpose is to satisfy the terms of the contract between our two firms. The report summarizes the findings, conclusions and recommendations which were generated by the evaluation. The intent of the report has been to present conclusions and recommendations of a geotechnical nature in such a way as to assist the owner and their design team in preparing plans and specifications for construction.

## SCOPE

As outlined in our contract dated August 22, 2010, the following work elements were performed.

- Review of available geologic data and stereographic aerial photographs.
- Subsurface exploration using a rubber-tired "Extendahoe" backhoe.
- Laboratory testing of selected samples of soil collected during subsurface exploration.
- Preparation of a formal report summarizing our findings, conclusions and recommendations.

## LOCATION

The site is located slightly less than three miles west of the town of Kapaa. It is accessed by an unpaved road exiting from Olohena Road. The site is shown on Plate 1- Location Map.

## REFERENCES

The following references were used in preparing our proposal, conducting our evaluation and preparing this report.



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#### SITE CONDITIONS AND PROPOSED DEVELOPMENT

The site, as evidenced by preliminary topography and USGS mapping, is located on an elevated stream terrace on the south side of Oloheua Road, 2.8 miles west of old Kapaa town and about 4000 feet northeast of the Nonou Forest Reserve. At the time of our exploration, vegetation was sparse due to the ongoing drought. Topography slopes toward the ancestral channel with the steepest portion immediately below Oloheua Road.

Detailed plans of the proposed development were not available at the time of our exploration although, because of the nature of the development, the knowledge that it is a solar field is sufficient for our purposes. Drawings which have been provided by your office indicate that the project will consist of six solar panel arrays of varying size mounted on a shallow foundation system.

#### GEOLOGIC CONDITIONS

The Lihue Depression is the dominant geologic feature which has influenced the site. The Lihue Depression is apparently the remains of the caldera of the ancestral Wai'ali'ali shield volcano. The caldera was displaced during the massive landsliding which caused the collapse of the portion of the island now occupied by Kapaa and Waipouli. The site is on the northern edge of the depression.

Although there is evidence to suggest that the island is still undergoing some settlement associated with the collapse of the volcano, the amount of movement is apparently so small as to be undetectable without instrumentation and there is no longer volcanic activity on the island.



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Our subsurface exploration indicates that the site is an erosion terrace formed by previous stream action. Subsequent erosion has produced a residual soil profile which grades from a fully developed, moderately firm, surface soil to very stiff weathered rock at a depth of about six feet. In this area, as is the case on the majority of the eastern side of the island, the underlying rock is part of the Koloa series of volcanic flow material.

#### TSUNAMIS

The island of Kauai is susceptible to damage from tsunamis. Although there is a comparatively sophisticated early warning system in place world-wide, the ability of the system to predict the size of any particular event is limited. The general consensus is that tsunamis are certain to occur but their frequency is uncertain. Published data suggest that the site is not vulnerable to damage from tsunami run-up of the magnitude experienced in the Hawaiian Islands historically.

#### SURFACE AND SUBSURFACE WATER

Drainage on the property occurs as southwesterly sheet flow from the slope below Oloheua Road toward the established stream. At the time of our exploration, drought conditions existed on the island and surface was non-existent.

We found no subsurface water to the depth of exploration. Because of the existing drought conditions, the near-surface soil was dry and brittle.

#### CONCLUSIONS

Based on the results of our geotechnical evaluation, we can offer the following conclusions.

#### FEASIBILITY

In our opinion, it is geotechnically feasible to develop the site essentially as proposed provided the improvements are properly designed and constructed.

#### SITE PREPARATION

We have assumed that little or no grading, other than that required for the creation of an access road and support facilities will be needed. Moreover, it is our understanding that the arrays will be supported by some form of pipe piles. As a result, it is likely that site preparation will be minimal.





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### EARTHQUAKES

The island of Kauai is in Uniform Building Code seismic zone 1, a designation indicative of a low level of seismic activity. Published data indicate that, during the period 1962 to 1980, for example, there were no recorded earthquakes with a Richter Magnitude greater than 3.0 with an epicenter on or near Kauai. Within the last two years, however, earthquakes in the Richter Magnitude 3 to 4 range have occurred offshore of Maui and Oahu as well as the Loihi seamount east of the Big Island and magma production from Kilauea has altered perceptibly. Of particular importance was the October 15, 2006, M=6.7 and the November 23, 2006, M=5.0 events off the Kona Coast. This may be indicative of shifts in the Pacific tectonic plate which could generate an increase in seismic activity for the near future. As part of our evaluation, we have provided below the numeric parameters necessary to perform the site characterization analysis required by the 1997 Uniform Building Code.

Soil Profile- S<sub>6</sub>  
 $z = 0.075$   
 $c_u = 0.12$   
 $c_v = 0.18$   
 $N_u = 1.0$   
 $N_v = 1.0$

In our opinion, it is likely that the site will experience low-level ground shaking due to volcanic activity on or near the Big Island, but the magnitude and number of these events will not be larger than those in the historic record.

### TSUNAMI

Tsunami run-up of historic proportions has been in the 10 to 40 foot range and, historically, has been concentrated on the north shore of the island. Although the pre-historic "monster" tsunami is still a theoretical possibility, the design practice in coastal areas of the island has apparently been to consider the run-up of historic proportion. The site of the proposed solar field is well above the elevation of historic run-up.

### FOUNDATION DESIGN

The upper two feet of the surface soil in the area of the arrays is poorly consolidated and should not be relied for either foundation support or uplift resistance. Below two feet, the soil is stiff and capable of generating more than 2500 pounds per square foot for bearing. Uplift resistance can be determined using the relationship  $(1100)d + W$  where "d" is outside shaft diameter, "W" is unit weight of the shaft and "l" is shaft length below two feet. This assumes that the shaft consists of a



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protected metal shaft encased in concrete. A passive pressure of 300 pounds per cubic foot (equivalent fluid) is reasonable for the soil below a depth of two feet.

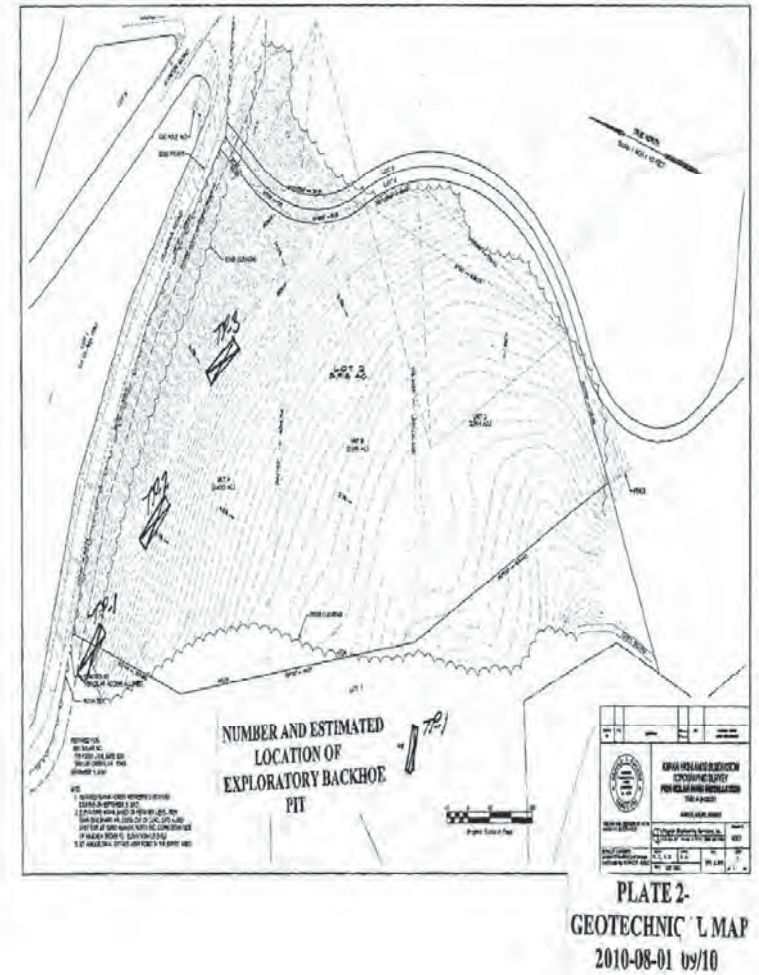
Laboratory tests to determine the relative corrosivity of the soil are currently being performed and the results will be reported under separate cover. However, our work on the island has shown, as the result of a number of tests, that the soil derived from the Koloa volcanic material is highly to severely corrosive to both concrete and metal. The results of the on-site tests will be submitted under separate cover.

### SURFACE DRAINAGE

Runoff from rainfall and irrigation should be directed away from the proposed structures to an approved drainage device.

The Plates which are attached and complete this report are listed in the Table of Contents.  
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## APPENDIX SUPPORTING DATA AND PROCEDURES

### SURFACE GEOLOGIC MAPPING

A limited amount of surface geologic mapping was performed as part of our evaluation. This mapping was performed both physically and with the aid of topographic maps before and during the subsurface exploration. The results of this work were assimilated with the subsurface exploration.

### SUBSURFACE EXPLORATION

Subsurface exploration at the site consisted of the excavation of three trenches using a rubber-tired backhoe with a three-foot-wide bucket. The trenches were located to (a) aid in establishing a "picture" of probable subsurface conditions at the site, and (b) provide access to the subsurface for possible sampling of soil and/or rock. To that extent, both the geomorphology of the site and the type and location of proposed improvements have a bearing on the location of subsurface exploration points. Our estimate of the location of each backhoe trench is shown on Plate-2 Geotechnical Map. Graphic logs, using standard United States Geological Survey, United States Corps of Engineers and United States Bureau of Reclamation nomenclature are included as Plates A-1.1 through A-1.3- Log of Test Pit. Upon completion, all pits were backfilled, tamped and wheel-rolled. The location of each test pits was also marked with a stake and flagging.

### LABORATORY TESTING

**Moisture/Density.** Field moisture content and in-place dry density were determined for each "undisturbed" sleeve sample obtained during exploration. The field moisture content was determined according to ASTM Test Method D2216-66 by obtaining one-half of the moisture sample from each end of the sleeve. The in-place wet and dry density was determined by using the wet weight of the entire sleeve.

At the same time the field moisture content and in-place dry density were determined, the soil material at each end of the sleeve was classified according to the Unified Soil Classification System and pocket penetrometer readings were taken in the cohesive samples. The results of the field moisture content and in-place dry density tests are presented on Plates A-1.1 and A-1.2-Log of Test Pit.

**Index Tests.** For purposes of this report, we have grouped grain-size distribution and Atterberg Limits under "index tests". The bulk sample taken from test pit TP-1 at a depth of two to



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three feet was also subjected to an analysis of its distribution of grain size and its Liquid Limit, Plastic Limit, and Plasticity Index were determined. The distribution of grain size was determined according to ASTM Test Method D422-63. Relative plasticity was determined according to ASTM Test Methods D423-66 and D424-59. Using these data, the soil can, among other things, be provided a positive Unified Soil Classification System group name. The tests indicate that the soil has no gravel-sized particles, 18 percent sand-sized particles, 80 percent silt-sized particles, two percent clay-sized particles, a Liquid Limit of 59, a Plastic Limit of 46 and a Plasticity Index of 13. The soil has been given a Unified Soil Classification System group name and symbol of Sandy Silt (MH). The results are summarized on Plate A-2- Relative Plasticity Data and Plate A-3- Grain Size Distribution Data.


**Direct Shear Tests.** Undisturbed samples taken from test pits TP-1 and Test Pit TP-2 at two feet were subjected to consolidated, drained direct shear tests to determine the shearing resistance of the soil. In each case, samples were allowed to stabilize in a suitable loading frame under the normal stress for the test (in this case, 500, 750 and 1000 pounds per square foot). The samples were then flooded, allowed to stabilize and then sheared at a constant rate of 0.008 inches per minute to failure. The applied normal and induced shear stresses were monitored with electronic load cells and the displacement in the normal and shear directions monitored with linear variable displacement transducers (LVDT's). The force and displacement in the direction of shear were plotted electronically. The results of the tests are summarized graphically on Plates A-4 - Shear Strength Data.

**Corrosion Tests.** Tests to determine the relative corrosivity of the on-site soil are currently being completed and will be submitted under separate cover.

With the exception of the corrosion tests, all laboratory testing was performed for us by Evans, Colbaugh & Associates, Inc. in San Marcos, California.


Log of Test Pit No. TP- 1									
Date: 09/11/10			Elevation: +60 (Map Datum)						
Logged By: DAE			Hole Size/ Type: 2x 6x 6' Backhoe						
Depth (feet)	Sample Type	Blow count	Dry Density	Moisture Content	Other Tests	USCS	Graphic Log	Description	
1								SOH. (Residual), Clayey Silt (ML), medium-brown, moderately firm, dry, to very dry.	
2	D	59	72	50	DS, AL, GS	MH		stiff at two feet	
3									
4								very stiff, at 4 feet, mottled light brown and yellow grading to highly weathered Kilauea volcanic rock at six feet.	
5									
6									
7									
8									
9									
10								Bottom at 6 feet. No water. No caving. Hole backfilled, tamped and wheel-rilled	
11									

Water level shown is at time of measurement and may be different at different times.  
Blow counts are per foot; dry density is in pounds per square foot; moisture content is percent of dry weight.

	Date: 09/12/10	Project No.: 2010-08-01	<b>PLATE A-1.1</b>
	<b>SOLAR PANEL FIELD LOG OF TEST PIT TP-1</b>		

Log of Test Pit No. TP- 2									
Date: 09/11/10			Elevation: +60 (Map Datum)						
Logged By: DAE			Hole Size/ Type: 2x 6x 6' Backhoe						
Depth (feet)	Sample Type	Blow count	Dry Density	Moisture Content	Other Tests	USCS	Graphic Log	Description	
1								SOH. (Residual), Clayey Silt (ML), medium-brown, moderately firm, dry, to very dry.	
2	D	70	28	DS	MH			stiff at two feet	
3									
4								very stiff, at 4 feet, mottled light brown and yellow grading to highly weathered Kilauea volcanic rock at six feet.	
5									
6									
7									
8									
9									
10								Bottom at 6 feet. No water. No caving. Hole backfilled, tamped and wheel-rilled	
11									

Water level shown is at time of measurement and may be different at different times.  
Blow counts are per foot; dry density is in pounds per square foot; moisture content is percent of dry weight.

	Date: 09/12/10	Project No.: 2010-08-01	<b>PLATE A-1.2</b>
	<b>SOLAR PANEL FIELD LOG OF TEST PIT TP-2</b>		




**Log of Test Pit No. TP-3**

Date: 09/11/10      Elevation: +60 (Mnp Datum)  
 Logged By: DAE      Hole Size/ Type: 2'x 6'x 6' Buckhoe

Depth (feet)	Sample Type	Flow out	Dry Density	Moisture Content	Other Tests	USCS	Kingpile Log	Description
1								SOIL (Residual), Clayey Silty (ML), medium-brown, moderately firm, dry, to very dry.
2								four inch dia. "bomb" at three feet.
3								
4								
5								
6								stiff at six feet.
7								
8								
9								
10								Bottom at 6 feet. No water. No caving. Hole backfilled, tamped and wheel-rolled
11								

Water level shown is at time of measurement, and may be different at different times.  
 Blow counts are per foot; dry density is in pounds per square foot; moisture content is percent of dry weight.



**d. a. evans inc.**

Date: 09/12/10      Project No.: 2010-08-01

**SOLAR PANEL FIELD  
LOG OF TEST PIT TP-3**

**PLATE  
A-13**

