Figure 13. SIHP # 50-80-03-5013 (CSH 1) irrigation ditch, view to west

Figure 14. SIHP # 50-80-03-5013 (CSH 1) irrigation ditch within CSH 2 complex, view to north

Figure 15. SIHP # 50-80-03-5014 (CSH 2) Feature A terrace, view to north

Feature A is a terrace measuring 38.4 m N/S by 11.3 m E/W that is located upslope and parallel to SIHP # 50-80-03-5013 (CSH 1) (Figure 15). The terrace is constructed of small to large basalt boulders stacked up to five courses high in between very large in situ basalt boulders. The height of the terrace varies from 0.94 m at the south end to 2.27 m at the north end. The terrace supports a level soil-filled interior consisting of several scattered large cobbles to small boulders. Artifacts observed on the surface of Feature A include four ceramic fragments that were likely pieces of a small saucer and the base of a thick early historic glass bottle.

The bottle base appears to have been deliberately flaked by someone with a clear knowledge of lithic reduction techniques (Figure 16 and Figure 17). This knowledge is evidenced by the consistency of flake and platform size, flake removal distribution, amount of flake feather terminations, and the possibility of some areas of platform preparation all visible on the bottle base "core". None of the flakes could be located in the vicinity. The bottle's manufacturing technique (Turn Mold) indicates a date range from 1865 to the 1920's, and the bottles thickness and color suggest a date prior to 1900. Feature A is interpreted as a habitation terrace based on construction, size, and the terrace's location above the water source of SIHP # 50-80-03-5013 (CSH 1).

Feature B is a terrace measuring 28.5 m N/S by 7.0 m E/W that is located upslope and parallel to SIHP # 50-80-03-5013 (CSH 1) (Figure 18). The terrace is constructed of small to large basalt cobbles and boulders stacked up to four courses high between large in situ basalt boulders. The height of the terrace varies from 0.49 m to 2.12 m. The Feature B terrace forms the eastern (upslope) retaining wall of SIHP # 50-80-03-5013 (CSH 1). Two basalt stone alignments located upslope of the main Feature B terrace appear to split the interior area into three separate portions. The southern portion measures 9.3 m N/S by 4.0 m E/W, the central portion measures 4.4 m N/S by 2.7 m E/W, and the northern portion measures 9.3 m N/S by 4.1 m E/W. The interior consists of a slightly sloping surface of soil and loose basalt boulders and cobbles. No artifacts were observed. Feature B is interpreted as an agricultural terrace based on construction (presence of partitions) and proximity an irrigation ditch SIHP # 50-80-03-5013 (CSH 1).

Feature C is a remnant terrace measuring 15.3 m N/S by 12.3 m E/W that is located down slope and adjacent to SIHP # 50-80-03-5013 (CSH 1) and south of SIHP # 50-80-03-5014 (CSH 2) Feature D (Figure 19). All that remains of this feature is an alignment of small boulders extending NE/SW to abut several large in situ natural boulders. The height of the terrace varies from 0.37 m to 1.27 m. The interior surface of the terrace is slightly sloping and consists of soil and loose basalt boulders and cobbles. Feature C extends south toward the edge of the 'Anini Stream flood plain approximately 15 m from the edge of 'Anini Stream. No artifacts were observed. Feature C is interpreted as an agricultural terrace based on construction and proximity to both the SIHP # 50-80-03-5013 (CSH 1) irrigation ditch and the flood plain of 'Anini Stream.

Feature D is a terrace measuring 14.0 m N/S by 8.0 m E/W that is located down slope and adjacent to SIHP # 50-80-03-5013 (CSH 1) (Figure 20). The terrace is constructed of small to large basalt boulders and cobbles stacked one to three courses high. The height of the terrace varies from 0.28 m to 0.51 m. The interior surface of the terrace is level and consists of soil and loose basalt boulders and cobbles. No artifacts were observed. Feature D is interpreted as an agricultural terrace based on construction and proximity to the SIHP # 50-80-03-5013 (CSH 1) irrigation ditch.

Figure 16. Flaked glass bottle at SIHP # 50-80-03-5014 (CSH 2) Feature A terrace, view to east

Figure 17. Flaked glass bottle at SIHP # 50-80-03-5014 (CSH 2) Feature A terrace, view to east

Figure 18. SIHP # 50-80-03-5014 (CSH 2) Feature B terrace, view to southeast

Figure 19. SIHP # 50-80-03-5014 (CSH 2) Feature C terrace, view to south

Figure 20. SIHP # 50-80-03-5014 (CSH 2) Feature D terrace, view to north

Figure 21. SIHP # 50-80-03-5014 (CSH 2) Feature E terrace, view to east

Feature E is a terrace measuring 8.7 m N/S by 4.2 m E/W that abuts the north end of Feature D and the down slope alignment of SIHP # 50-80-03-5013 (CSH 1) (Figure 21). The terrace is constructed of small to large basalt boulders and cobbles stacked one to three courses high to a maximum height of 0.78 m. The interior surface of the terrace consists of soil and loose basalt cobbles and boulders. No artifacts were observed. Feature E is interpreted as an agricultural terrace based on construction and proximity to the SIHP # 50-80-03-5013 (CSH 1) irrigation ditch.

Feature F is a terrace measuring 10.1 m NW/SE by 9.5 m NE/SW that is located west of Feature E (Figure 22). The terrace is constructed of small to large basalt boulders and cobbles stacked one to three courses high to a maximum height of 0.5 m. The terrace consists of three sides constructed at right angles to each other. The interior surface of the terrace consists of soil and loose basalt cobbles and is positioned at a depth lower than the existing ground surface on the south, west, and east sides. No artifacts were observed. Feature F is interpreted as an agricultural terrace based on construction and proximity to the SIHP # 50-80-03-5013 (CSH 1) irrigation ditch.

4.2.3 SIHP #: 50-80-03-5015 (CSH 3)

SITE TYPE: Terrace
FUNCTION: Agriculture
FEATURES: 1
DIMENSIONS: 21.6 m NW/SE
CONDITION: Poor
PROBABLE AGE: Pre-Contact
TAX MAP KEY: [4] 5-3-006:014

DESCRIPTION:

SIHP # 50-80-03-5015 (CSH 3) is a terrace located approximately 5.0 m west (down slope) of SIHP # 50-80-03-5013 (CSH 1) near the eastern bank of 'Anini Stream (See Figure 9 and Figure 11). The terrace measures 21.6 m long with an average width of 0.7 m. The height of the terrace varies between 0.28 m at the southeast end to 0.70 m at the northwest end. SIHP # 50-80-03-5015 (CSH 3) is constructed of one to three courses of stacked basalt large cobbles to medium boulders (Figure 23). The terrace supports a sloping surface composed of compacted clay sediment. Downslope erosion of this sediment as well as alluvial erosion and deposition by 'Anini Stream has severely degraded the historic property. No artifacts were observed at SIHP # 50-80-03-5015 (CSH 3).

4.2.4 SIHP #: 50-80-03-5016 (CSH 4)

SITE TYPE: Modified Outcrop
FUNCTION: Agriculture, Water Control
FEATURES: 1
DIMENSIONS: 4.3 m N/S x 3.6 m E/W
CONDITION: Good
PROBABLE AGE: Pre-Contact
TAX MAP KEY: [4] 5-3-006:014

Figure 22. SIHP # 50-80-03-5014 (CSH 2) Feature F terrace, view to south

Figure 23. SIHP # 50-80-03-5015 (CSH 3) terrace, view to east

DESCRIPTION:

SIHP # 50-80-03-5016 (CSH 4) is a modified outcrop located approximately 4.5 m east (upslope) of SIHP # 50-80-03-5013 (CSH 1) and approximately 15.0 m east (upslope) of the northwestern end of SIHP # 50-80-03-5015 (CSH 3) (See Figure 9 and Figure 11). The modified outcrop is composed of an east to west trending alignment and several other placed basalt boulders and cobbles. The alignment is constructed of small to large basalt boulders stacked up to three courses high in between very large in situ basalt boulders forming a rough C-shape (Figure 24 and Figure 25). This alignment measures 2.6 m long by 0.5 m wide with an average height of 0.59 m. The interior surface of the C-shape is sloping to the south and consists of loose soil, small mango trees, a centrally located medium basalt boulder, and several small cobbles. No artifacts were observed at SIHP # 50-80-03-5016 (CSH 4). The interior is too small to function as temporary habitation and was likely an agricultural planting surface. The alignment of SIHP # 50-80-03-5016 (CSH 4) likely functioned to divert water and colluvium down slope and retain soil within the interior of the modified outcrop.

4.2.5 SIHP #: 50-80-03-5017 (CSH 5)

SITE TYPE: Wall
FUNCTION: Water Control
FEATURES: 1
DIMENSIONS: Approx 42.0 m E/W
CONDITION: Good
PROBABLE AGE: Post-Contact
TAX MAP KEY: [4] 5-3-007:002, 003

DESCRIPTION:

SIHP # 50-80-03-5017 (CSH 5) is a wall located along the northern edge of the 'Anini Stream flood plain approximately 15.0 m southwest of SIHP # 50-80-03-5014 (CSH 2) Feature C (See Figure 9). The wall extends parallel to 'Anini Stream for approximately 42.0 m into thick vegetation. The easternmost portion of the wall, measuring 15.0 m long by 0.35 m wide by 0.9 m high, is constructed of three to four courses of mortared basalt boulders and cobbles (Figure 26). The base of the wall consists of medium to large boulders with large cobbles to medium boulders stacked on the upper courses. Portions of the top of the wall appear to be smoothed and leveled with concrete. A freestanding water gauge was located near the eastern end of the wall approximately 2.0 m from the edge of the stream (Figure 27). The central portion of the wall, which is obscured by thick vine growth and cat's claw (*Caesalpinia decapetala*), measures approximately 12.0 m long by 0.5 m wide with an average height of 0.45 m. The central portion is constructed of two to three courses of stacked basalt large cobbles to small boulders without any visible mortar. This ground surface to the north of this central portion has been leveled to the height of the wall with sediment and basalt cobbles and pebbles. The westernmost portion of the wall, measuring approximately 15 m long by 0.2 m wide by 0.35 m high, is almost entirely obscured by vines and tall grasses (Figure 28). This portion of the wall consists of a single coarse alignment of medium basalt cobbles to small boulders. The remnants of a tractor or vehicle steering wheel were observed adjacent to the western end of the wall (Figure 29).

Figure 24. SIHP # 50-80-03-5016 (CSH 4) modified outcrop, view to east

Figure 25. SIHP # 50-80-03-5016 (CSH 4) modified outcrop, view to west

Figure 26. SIHP # 50-80-03-5017 (CSH 5) mortared wall portion, view to north

Figure 27. Water gauge observed near SIHP # 50-80-03-5017 (CSH 5), view to northwest

Figure 28. SIHP # 50-80-03-5017 (CSH 5) single course alignment portion, view to northeast

Figure 29. Steering wheel observed near SIHP # 50-80-03-5017 (CSH 5), view to west

SIHP # 50-80-03-5017 (CSH 5) likely functioned as a water control structure based on construction and location along 'Anini Stream and the presence of a water gauge near the eastern edge of the wall.

4.2.6 SIHP #: 50-80-03-5018 (CSH 6)

SITE TYPE: Irrigation Ditch
FUNCTION: Agriculture, Water Control
FEATURES: 1
DIMENSIONS: Approx 56.4 m long
CONDITION: Poor
PROBABLE AGE: Pre-Contact
TAX MAP KEY: [4] 5-3-006:014

DESCRIPTION:

SIHP # 50-80-03-5018 (CSH 6) is an irrigation ditch that extends from the southern edge of 'Anini Stream west for approximately 56.4 m to the edge of a nearby residential property (See Figure 9). SIHP # 50-80-03-5018 (CSH 6) is located approximately 22.0 m south of SIHP # 50-80-03-5017 (CSH 5) which extends parallel to the irrigation ditch on the opposite side of 'Anini Stream. The irrigation ditch consists of a shallow depression measuring 1.45 m wide and supported by a soil berm along the down slope edge that varies in height from 0.2 m to 0.6 m (Figure 30). Colluvial and alluvial erosion and deposition have severely impacted the irrigation ditch in several areas. No down slope stone alignment was observed and no artifacts were present at SIHP # 50-80-03-5018 (CSH 6).

4.2.7 SIHP #: 50-80-03-5019 (CSH 7)

SITE TYPE: Irrigation Ditch
FUNCTION: Agriculture, Water Control
FEATURES: 1
DIMENSIONS: Approx 100 m long
CONDITION: Poor
PROBABLE AGE: Pre-Contact
TAX MAP KEY: [4] 5-3-006:014

DESCRIPTION:

SIHP # 50-80-03-5019 (CSH 7) is an irrigation ditch located at the base of a ridge south of the polo field, which is south of 'Anini Beach Road (See Figure 9). Vegetation in the area predominately consists of *hau* (*Hibiscus tiliaceous*), *hala* (*Pandanus odoratissimus*), and *koa haole* (*Leucaena leucocephala*). The ditch extends for approximately 100 m in a roughly northwest to southeast direction and consists of a shallow depression lacking any stone alignment or formal construction (Figure 31). The ditch depression measures 1.6 m wide by 0.37 m deep at the east end to 1.2 m wide by 0.15 m deep at the west end. No artifacts were observed at SIHP # 50-80-03-5019 (CSH 7).

Figure 30. SIHP # 50-80-03-5018 (CSH 6) irrigation ditch, view to north

Figure 31. SIHP # 50-80-03-5019 (CSH 7) irrigation ditch, view to east

4.2.8 SIHP #: 50-80-03-5020 (CSH 8)

SITE TYPE: Bunker
FUNCTION: Military
FEATURES: 1
DIMENSIONS: 3.38 m N/S x 2.65 m E/W
CONDITION: Excellent
PROBABLE AGE: Historic
TAX MAP KEY: [4] 5-3-006:014

DESCRIPTION:

SIHP # 50-80-03-5020 (CSH 8) is a military bunker located on top of a ridge overlooking 'Anini Beach (See Figure 9). Vegetation in the area predominately consists of strawberry guava (*Psidium cattleianum*), guava (*Psidium guajava*), java plum (*Syzygium cumini*), and bird nest fern (*Asplenium nidus*). The walls of the bunker are constructed of solid cement blocks capped with a concrete slab roof separated by long, rectangular-shaped slotted openings on the north, east, and west sides (Figure 32). The roof of the bunker has been painted camouflage and consists of rusted, bent over nails that may have support an additional structure (Figure 33). The entrance to the bunker is located on the south side surrounded by a large pit that has been excavated to gain access to the bunker (Figure 34). Steps have been excavated into the side of the pit, which is likely a recent endeavor. The bunker measures 1.4 m high at the entrance. The interior of the bunker measures 3.0 m long by 2.61 m wide with a height that varies from 1.15 m at the entrance to 1.87 m within the bunker (Figure 35). The interior walls are spattered with green paint and contain graffiti. Wood-framed screens, plywood, and fabric have been placed across the slotted openings. SIHP # 50-80-03-5020 (CSH 8) is currently being used as a homeless dwelling and contains several personal possessions including clothing, two chairs, an oil lamp, water bottles, a towel, rope, straw mats, and a large bag of dog food.

4.2.9 SIHP #: 50-80-03-5021 (CSH 9)

SITE TYPE: Cemetery
FUNCTION: Burial
FEATURES: 1
DIMENSIONS: 22.75 m N/S x 15.6 m E/W
CONDITION: Excellent
PROBABLE AGE: Historic
TAX MAP KEY: [4] 5-3-006:014

DESCRIPTION:

SIHP # 50-80-03-5021 (CSH 9) is a small private historic cemetery located on the ridge top just south of the hole 7 tee of the Princeville Golf Course (See Figure 9). The cemetery appears well-maintained with cut grass in an area measuring 22.75 m by 15.6 m (Figure 36). The cemetery contains five grave markers, three of which are upright and two are flat concrete slabs.

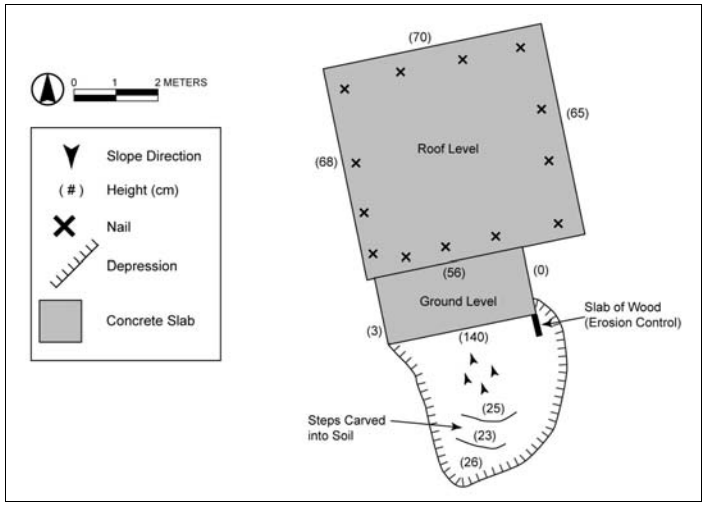

Figure 32. Plan view map showing SIHP # 50-80-03-5020 (CSH 8) military bunker

Figure 33. SIHP # 50-80-03-5020 (CSH 8) military bunker roof, view to northeast

Figure 34. SIHP # 50-80-03-5020 (CSH 8) military bunker entrance, view to northeast

Figure 35. SIHP # 50-80-03-5020 (CSH 8) military bunker interior, view to north

Figure 36. SIHP # 50-80-03-5021 (CSH 9) historic cemetery, view to north

Headstone #1 is a three tiered upright marker, the bottom tier being concrete followed by two tiers of marble (Figure 37). The headstone is approximately 0.6 m high. The inscription on the headstone reads, "BELOVED MOTHER/ELIZABETH MALEKA/PAIK/MAY 22, 1892/FEB. 18, 1963".

Headstone #2 is constructed exactly the same as Headstone #1 and measures approximately 0.6 m high (Figure 38). The inscription on the headstone reads, "BELOVED FATHER/DAVID KAONA, SR./NOV 14, 1888/JAN. 14, 1946".

Headstone #3 is a simple small concrete slab measuring 0.61 m by 0.41 m (Figure 39). It appears to have been hand inscribed while the concrete was wet. The inscription reads, "BELOVED/PHILIP PILIPO KAONA/SR/BORN 5 MAR 1911/DIED 30 DEC 1955". Four vine or branch-like designs are also decorate the slab.

Headstone #4 is constructed exactly the same as Headstones #1 and #2 and measures approximately 0.6 m high (Figure 40). The inscription on the headstone reads, "BELOVED FATHER/MAN OCK PAIK/AUG. 8, 1881/NOV 16 1945".

Headstone #5 is the only grave marker without an inscription. It is a large concrete slab measuring 1.68 m by 0.74 m and is slightly skewed due to ground settling (Figure 41). There are three cast circular holes, each measuring 0.13 m in diameter, equally spaced in a linear arrangement down the center of the slab. These holes are likely used to hold flowers.

Headstones #1-4 are arranged roughly in a straight line across the top of the ridge (E/W) with all of the inscriptions facing the ocean to the north. Headstone #% is located approximately 9.0 m down slope of the other headstones. Headstones # 1, 2, and 4 have jars or vases set in the ground in front of them to hold flowers.

4.2.10 SIHP #: 50-80-03-5022 (CSH 10)

SITE TYPE: Terrace
FUNCTION: Agriculture
FEATURES: 1
DIMENSIONS: 4.5 m NW/SE
CONDITION: Poor
PROBABLE AGE: Pre-Contact
TAX MAP KEY: [4] 5-3-006:014

DESCRIPTION:

SIHP # 50-80-03-5022 (CSH 10) is a terrace located 8.0 m east (upslope) of the eastern end of SIHP # 50-80-03-5013 (CSH 1) near its confluence with 'Anini Stream (See Figure 9 and Figure 12). The terrace measures 4.5 m long with an average width of 0.45 m (Figure 42). The height of the terrace varies between 0.17 m at the northwest end to 0.36 m at the southeast end. SIHP # 50-80-03-5022 (CSH 10) is constructed of a single course of small to medium basalt boulders. The terrace supports a level area of semi-compacted sediment and scattered cobbles. A medium-sized mango tree is located near the southeast end of the terrace within the terrace alignment. Several large natural in situ boulders are also located near the southeast end. No artifacts were observed at SIHP # 50-80-03-5022 (CSH 10).

Figure 37. SIHP # 50-80-03-5021 (CSH 9) cemetery Headstone 1, view to south

Figure 38. SIHP # 50-80-03-5021 (CSH 9) cemetery, Headstone 2, view to south

Figure 39. SIHP # 50-80-03-5021 (CSH 9) cemetery Headstone 3, view to south

Figure 40. SIHP # 50-80-03-5021 (CSH 9) cemetery Headstone 4, view to south

Figure 41. SIHP # 50-80-03-5021 (CSH 9) cemetery Headstone 5, view to west

Figure 42. SIHP # 50-80-03-5021 (CSH 10) terrace, view to northeast

4.2.11 SIHP #: 50-80-03-5023 (CSH 11)

SITE TYPE: Complex
FUNCTION: Habitation, Agriculture, Burial
FEATURES: 8
DIMENSIONS: 89.0 m N/S x 78.3 m E/W
CONDITION: Good
PROBABLE AGE: Pre-Contact
TAX MAP KEY: [4] 5-3-006:014

DESCRIPTION:

SIHP # 50-80-03-5023 (CSH 11) is a complex of six features including four terraces, two mounds, one alignment, and one leveled area. The complex is located near the base of the western tributary gulch that connects to the main gulch of 'Anini Stream between holes 15 and 16 of the Princeville Golf Course (See Figure 9). The six features are constructed on sloping to leveled areas between the ridges of the gulch approximately 20 m south of 'Anini Stream (Figure 43 and Figure 44). Vegetation in the area predominately consists of *palapalai* (*Microlopis strigosa*), *lauaʻe* (*Phymatosorus grossus*), mango (*Mangifera indica*), cats claw (*Caesalpinia decapetala*), java plum (*Syzygium cumini*), white ginger (*Hedychium coronarium*), *kukui* (*Aleurites moluccana*), and exotic grasses.

Feature A is a large level area located on the top of a small hill that appears to be the highest point within the gulch. The level area measures 15.9 m long by 9.8 m wide. A cluster of glass bottles was observed near the center of the level area (Figure 45). Vegetation on the level surface of Feature A consists of young guava trees. SIHP # 50-80-03-5023 (CSH 11) Feature A is interpreted as a pre-contact habitation area based on topography, changes in vegetation, and association with other features in the SIHP # 50-80-03-5023 (CSH 11) complex. Feature A was likely intermittently used into the historic period as evidenced by the presence of historic artifacts.

Feature B is a terrace located along the base of a small hill containing Feature A. The terrace measures 6.3 m long by 1.7 m wide by 0.96 m high and is constructed of small to medium basalt boulders (Figure 46). The boulders are stacked two to five courses high on large in situ basalt boulders. No artifacts were observed. SIHP # 50-80-03-5023 (CSH 11) Feature B is interpreted as an agricultural terrace based on construction methods, lack of artifacts or midden, and topography.

Feature C is an L-shaped terrace located on the slope of a small hill containing Feature A. The terrace measures 5.3 NE/SW by 3.5 m NW/SE and is constructed of medium basalt cobbles to small boulders stacked two to four courses high (Figure 47). The maximum height of the terrace is 0.74 m. SIHP # 50-80-03-5023 (CSH 11) Feature C is interpreted as a retaining wall constructed to stabilize the slope as an intra-site walkway that connected downslope agricultural terraces (Features B and D) with the upslope habitation area (Feature A). This interpretation is based on the position of the terrace on the slope of the hill. Feature C extends upslope to down slope instead of across slope as observed at SIHP # 50-80-03-5023 (CSH 11) Feature B, SIHP # 50-80-03-5015 (CSH 3), and SIHP # 50-80-03-5022 (CSH 10).

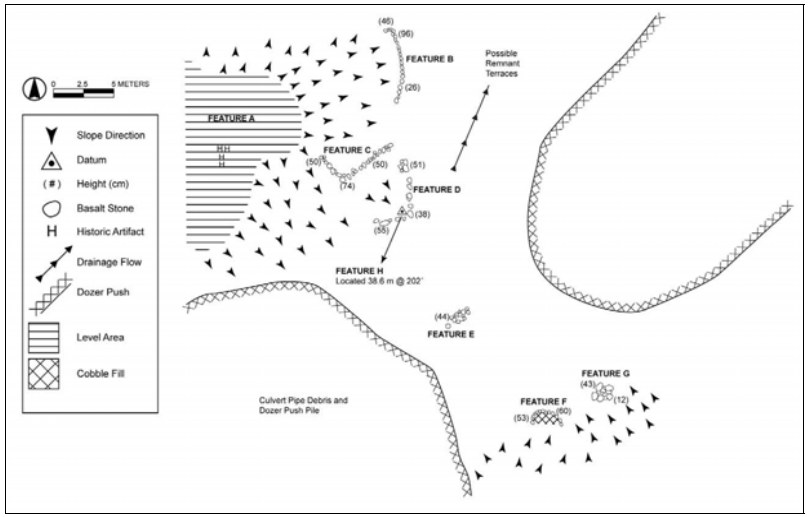

Figure 43. Plan view map showing SIHP # 50-80-03-5023 (CSH 11) Features A-G

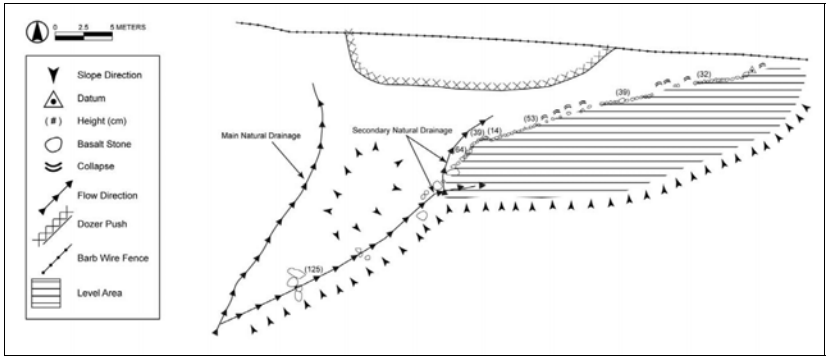

Figure 44. Plan view map showing SIHP # 50-80-03-5023 (CSH 11) Feature H

Figure 45. SIHP # 50-80-03-5023 (CSH 11) Feature A surface showing bottle scatter, view to north

Figure 46. SIHP # 50-80-03-5023 (CSH 11) Feature B terrace, view to west

Figure 47. SIHP # 50-80-03-5023 (CSH 11) Feature C terrace, view to west

Feature D is a remnant alignment located east (down slope) of Feature C at the base of a small hill. The alignment measures 4.8 m long by 0.75 m wide with a maximum height of 0.51 m (Figure 48). The alignment is constructed of a single course of medium to large basalt boulders. No artifacts were observed. SIHP # 50-80-03-5023 (CSH 11) Feature D is interpreted as an agricultural feature based on informal construction and proximity to a similar agricultural terrace (Feature B).

Feature E is a mound situated on a level surface located 9.6 m northwest of SIHP # 50-80-03-5023 (CSH 11) Feature F. The mound measures 1.7 m long by 1.0 m wide with a maximum height of 0.44 m (Figure 49). The mound is constructed of small to medium basalt boulders stacked one to three courses high. No midden or artifacts were observed. SIHP # 50-80-03- 5023 (CSH 11) Feature E is interpreted as a burial based on information from George Ka'eo, a long-time north shore resident and cowboy, via Jan Kimura, a Princeville Golf Course employee and life-long north shore resident.

Feature F is a C-shaped terrace situated on a level surface at the base of a sloping ridge approximately 3.0 m southwest of SIHP # 50-80-03-5023 (CSH 11) Feature G and 9.6 m southeast of Feature E. The terrace measures 2.7 m long by 1.3 m wide with a maximum height of 0.6 m (Figure 50). The terrace is constructed of small to medium basalt boulders stacked two to three courses high. The level interior surface of the terrace is with small to large basalt cobbles. No midden or artifacts were observed. SIHP # 50-80-03-5023 (CSH 11) Feature F is interpreted as a burial based on information from George Ka'eo, a long-time north shore resident and cowboy, via Jan Kimura, a Princeville Golf Course employee and life-long north shore resident.

Feature G is a mound situated on a level surface at the base of a sloping ridge approximately 3.0 m northeast of Feature F. The mound measures 1.7 m long by 1.7 m wide with a maximum height of 0.43 m (Figure 51). The mound is constructed of a single course of small to large boulders with medium to large cobbles filling the voids. No artifacts or midden were observed. SIHP # 50-80-03-5023 (CSH 11) Feature G is interpreted as a burial based on information from George Ka`eo, a long-time north shore resident and cowboy, via Jan Kimura, a Princeville Golf Course employee and life-long north shore resident.

Feature H is a terrace situated on a level surface at the base of a ridge approximately 38.6 m southwest of SIHP # 50-80-03-5023 (CSH 11) Feature D. The terrace measures 27.8 m long by 0.45 m wide with height that varies from 0.14 m to 0.64 m (Figure 52 and Figure 53). The terrace is constructed of small to medium basalt boulders stacked one to three courses high between large, natural in situ boulders. The level interior surface of the terrace consists of sediment and loose basalt cobbles. It is likely that the terrace was partitioned due to slight level changed within the interior surface. There is a large drainage located at the southwest end of Feature H that splits in two areas. The main drainage flows along the base of the nearby ridge to the north. The secondary drainage flows northeast toward Feature H until it splits again into two channels flowing on top and below the terrace. A possible water control dam constructed of two courses of basalt boulders and measuring 1.25 m high was observed at the western end of the secondary drainage. No artifacts or midden were observed. SIHP # 50-80-03-5023 (CSH 11) Feature H is interpreted as a wetland agricultural terrace (*lo'i*) system as evidenced by modified water flow onto the feature and level changes on the surface of the feature.

Figure 48. SIHP # 50-80-03-5023 (CSH 11) Feature D alignment, view to west

Figure 49. SIHP # 50-80-03-5023 (CSH 11) Feature E mound, view to east

Figure 50. SIHP # 50-80-03-5023 (CSH 11) Feature F terrace, view to east

Figure 51. SIHP # 50-80-03-5023 (CSH 11) Feature G mound, view to east

Figure 52. SIHP # 50-80-03-50-23 (CSH 11) Feature H terrace, view to south

Figure 53. SIHP # 50-80-03-5023 (CSH 11) Feature H terrace, view to southwest

Section 5 Summary and Interpretation

The current archaeological inventory survey investigation identified 11 historic properties within and in the immediate vicinity of the project area (see Table 3). With the exception of SIHP # 50-80-03-5017 (CSH 5), SIHP # 50-80-03-5020 (CSH 8) and SIHP # 50-80-03-5021 (CSH 9), each of the remaining eight historic properties is interpreted, in whole or in part, as related to pre-contact agricultural practices. These pre-contact-era structures consisting of soil-retaining terraces, modified outcrops, mounds, and irrigation ditches are remnants of an agricultural system that utilized diverted water from natural drainages like 'Anini Stream to irrigate crops grown in the gulch bottoms and along the coast south of 'Anini Beach Road.

The findings of this archaeological inventory survey support the predictive model based on background research. Extensive land alteration by historic agricultural activities has destroyed any previously existing pre-contact era structures within the table lands of the project area. In the areas that were not heavily unitized or disturbed during historic agricultural pursuits, pre-contact historic properties were encountered. These areas include the steep sides and narrow bottom of 'Anini Gulch. SIHP# 50-80-03-5019 (CSH 7), a remnant irrigation ditch, was the only pre-contact historic property located outside of 'Anini Gulch at the base of a ridge south of the polo fields. Military-related structures within the project area consisted of one bunker, SIHP # 50-80-03-5020 (CSH 8), located on top of a ridge overlooking 'Anini Beach. Three possible human burials (SIHP # 50-80-03-5023 Features E, F, and G) were also located within the project area.

Background research indicated the presence of two previously identified historic properties within the project area, a cemetery with approximately 20 grave plots (Cleghorn 1979a) and Ka-D10-10 an agricultural system near the mouth of 'Anini Stream (Earle 1978). Both historic properties were relocated during the current archaeological inventory survey. The cemetery (SIHP # 50-80-03-5021), presently consisting of only five marked graves was relocated on the ridge top just south of the hole 7 tee of the Princeville Golf Course. KA-D10-10, a U-shaped ditch and dam complex was relocated along the eastern edge of 'Anini Stream. For purposes of description, this agricultural system was divided into two historic properties, SIHP # 50-80-03-5013 (CSH 1) is the U-shaped irrigation ditch and SIHP # 50-80-03-5014 (CSH 2) is an associated complex of terraces that were not previously described.

Section 6 Significance Assessments

Each historic property identified by the current study was evaluated for significance according to the broad criteria established for the Hawai‘i Register of Historic Places (see discussion below and Table 3). The five criteria are:

A Associated with events that have made an important contribution to the broad patterns of our history;

B Associated with the lives of persons important in our past;

C Embodies the distinctive characteristics of a type, period, or method of construction, represents the work of a master, or possesses high artistic value;

D Have yielded, or is likely to yield information important for research on prehistory or history;

E Have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property, or due to associations with traditional beliefs, events or oral history accounts – these associations being important to the group's history and cultural identity.

SIHP # 50-80-03-5013 (CSH 1) is an irrigation ditch located along ‘Anini Stream. SIHP # 50-80-03-5013 (CSH 1) is interpreted to be associated with pre-contact agricultural cultivation. SIHP # 50-80-03-5013 (CSH 1) is assessed as significant under Criterion D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-03-5014 (CSH 2) is a complex consisting of six terraces located outside and adjacent to the northern project area boundary near ‘Anini Stream. SIHP # 50-80-03-5014 (CSH 2) is interpreted to be associated with pre-contact habitation and agricultural cultivation. SIHP # 50-80-03-5014 (CSH 2) is assessed as significant under Criterion C (embody the distinctive characteristics of a type, period or method of construction) and Criterion D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-03-5015 (CSH 3) is a terrace located along ‘Anini Stream. SIHP # 50-80-03-5015 (CSH 3) is interpreted to be associated with pre-contact agricultural cultivation. SIHP # 50-80-03-5015 (CSH 3) is assessed as significant under Criterion D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-03-5016 (CSH 4) is a modified outcrop located along ‘Anini Stream. SIHP # 50-80-03-5016 (CSH 4) is interpreted to be associated with pre-contact agricultural cultivation. SIHP # 50-80-03-5016 (CSH 4) is assessed as significant under Criterion D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

Table 3. Summary of Sites with Significance Assessments and Recommendations

SIHP # (50-80-03-)	Structure	Function	Significance	Recommendation
5013 (CSH 1)	Ditch	Pre-contact irrigation	D	Preservation, consultation wt SHPD re: breaches (note: partially outside project area per se)
5014 (CSH 2)	Terraces (6)	Pre-contact habitation & agriculture	C & D	Preservation (note: outside project area per se)
5015 (CSH 3)	Terrace (1)	Pre-contact agriculture	D	No further work
5016 (CSH 4)	Modified outcrop	Pre-contact agriculture	D	No further work
5017 (CSH 5)	Mortared wall & alignment	Post-contact water control	D	No further work (note: outside project area per se)
5018 (CSH 6)	Ditch	Pre-contact irrigation	D	No further work
5019 (CSH 7)	Ditch	Pre-contact irrigation	D	No further work
5020 (CSH 8)	Bunker	WWII military fortification	A & D	Preservation
5021 (CSH 9)	Cemetery (5 headstones)	Burial	D & E	Preservation
5022 (CSH 10)	Terrace (1)	Pre-contact agriculture	D	No further work
5023 (CSH 11)	Complex (4 terraces, 2 mounds, 1 alignment, 1 leveled area)	Pre-contact habitation, agriculture & burial	D & E	Preservation

SIHP # 50-80-03-5017 (CSH 5) is a mortared basalt wall and alignment located along ‘Anini Stream. SIHP # 50-80-03-5017 (CSH 5) is interpreted to be associated with historic water control. SIHP # 50-80-03-5017 (CSH 5) is assessed as significant under Criterion D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-03-5018 (CSH 6) is an irrigation ditch located along ‘Anini Stream. SIHP # 50-80-03-5018 (CSH 6) is interpreted to be associated with pre-contact agricultural cultivation. SIHP # 50-80-03-5018 (CSH 6) is assessed as significant under Criterion D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-03-5019 (CSH 7) is an irrigation ditch located at the base of a ridge south of ‘Anini Beach Road. SIHP # 50-80-03-5019 (CSH 7) is interpreted to be associated with pre-contact agricultural cultivation. SIHP # 50-80-03-5019 (CSH 7) is assessed as significant under Criterion D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-03-5020 (CSH 8) is a military bunker located on top of a ridge overlooking ‘Anini Beach. SIHP # 50-80-03-5020 (CSH 8) is interpreted to be associated with historic military infrastructure. SIHP # 50-80-03-5020 (CSH 8) is assessed as significant under Criterion A & D (associated with events that have made an important contribution to the broad patterns of our history and have yielded, or may be likely to yield information important in history) of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-03-5021 (CSH 9) is a cemetery consisting of 5 headstones located on the ridge top just south of the hole 7 tee of the Princeville Golf Course. SIHP # 50-80-03-5021 (CSH 9) is interpreted to be associated with historic burial practice. SIHP # 50-80-03-5021 (CSH 9) is assessed as significant under Criterion D (have yielded, or may be likely to yield information important in prehistory or history) and Criterion E (value to the native Hawaiian people or to another ethnic group due to associations with cultural practices) of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-03-5022 (CSH 10) is a terrace located along ‘Anini Stream. SIHP # 50-80-03-5022 (CSH 10) is interpreted to be associated with pre-contact agricultural cultivation. SIHP # 50-80-03-5022 (CSH 10) is assessed as significant under Criterion D (have yielded, or may be likely to yield information important in prehistory or history) of the Hawai‘i Register of Historic Places evaluation criteria.

SIHP # 50-80-03-5023 (CSH 11) is a complex consisting of four terraces, two mounds, one alignment, and one leveled area located near the base of the western tributary gulch that connects to the main gulch of ‘Anini Stream. SIHP # 50-80-03-5023 (CSH 11) is interpreted to be associated with pre-contact habitation, agricultural cultivation, and burial practice. SIHP # 50-80-03-5023 (CSH 11) is assessed as significant under Criterion D (have yielded, or may be likely to yield information important in prehistory or history) and Criterion E (value to the native Hawaiian people due to associations with cultural practices) of the Hawai‘i Register of Historic Places evaluation criteria.

Section 7 Project Effect and Mitigation Recommendations

The following project effect discussion and cultural resource management recommendations are intended to facilitate project planning and support the proposed project’s required historic preservation consultation. This discussion is based on the results of this archaeological inventory survey investigation and CSH’s communication with agents for the project proponents regarding the project’s potential impacts to the historic properties described in the Results of Fieldwork section, above.

7.1 Mitigation Recommendations

The proposed project will potentially affect historic properties recommended eligible to the Hawai‘i Register. To reduce the proposed project’s potential adverse effect on significant historic properties, the following mitigation measures are recommended (summarized in Table 3 above). The mitigation measures should be completed prior to any land disturbing activities within the project area.

1. SIHP # 50-80-03-5013 (CSH 1), irrigation ditch, was documented with a detailed written description, photographs, scale drawings, and accurately located with GPS survey equipment. The proposed project may have an adverse effect on the southern portion of the irrigation ditch (within the current project area). Preservation, in the form of avoidance and protection, is recommended for SIHP # 50-80-03-5013 (CSH 1). If breaches of the irrigation ditch are necessary for the proposed project then it is recommended that consultation with SHPD/DLNR take place to determine what, if any, mitigation may be appropriate.
2. SIHP # 50-80-03-5014 (CSH 2), terrace complex, was documented with a detailed written description, photographs, scale drawings, and accurately located with GPS survey equipment. Due to the location of SIHP # 50-80-03-5014 (CSH 2) outside of the current project area, the proposed project is likely to have no effect on the terrace complex. Preservation, in the form of avoidance and protection, is recommended for SIHP # 50-80-03-5014 (CSH 2).
3. SIHP # 50-80-03-5015 (CSH 3), terrace, was documented with a detailed written description, photographs, scale drawings, and accurately located with GPS survey equipment. The proposed project may have an adverse effect on the terrace. No further work is recommended for SIHP # 50-80-03-5015 (CSH 3). Sufficient information regarding the location, function, age, and construction methods of the terrace has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities.
4. SIHP # 50-80-03-5016 (CSH 4), modified outcrop, was documented with a detailed written description, photographs, scale drawings, and accurately located with GPS survey equipment. The proposed project may have an adverse effect on the modified outcrop. No further work is recommended for SIHP # 50-80-03-5016 (CSH 4). Sufficient information regarding the location, function, age, and construction methods of the modified outcrop

has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities.

5. SIHP # 50-80-03-5017 (CSH 5), wall, was documented with a detailed written description, photographs, and accurately located with GPS survey equipment. Due to the location of SIHP # 50-80-03-5017 (CSH 5) outside of the current project area, the proposed project is likely to have no effect on the wall. No further work is recommended for SIHP # 50-80-03-5017 (CSH 5). Sufficient information regarding the location, function, age, and construction methods of the wall has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities.
6. SIHP # 50-80-03-5018 (CSH 6), irrigation ditch, was documented with a detailed written description, photographs, and accurately located with GPS survey equipment. The proposed project may have an adverse effect on the irrigation ditch. No further work is recommended for SIHP # 50-80-03-5018 (CSH 6). Sufficient information regarding the location, function, age, and construction methods of the irrigation ditch has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities.
7. SIHP # 50-80-03-5019 (CSH 7), irrigation ditch, was documented with a detailed written description, photographs, and accurately located with GPS survey equipment. The proposed project may have an adverse effect on the irrigation ditch. No further work is recommended for SIHP # 50-80-03-5019 (CSH 7). Sufficient information regarding the location, function, age, and construction methods of the irrigation ditch has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities.
8. SIHP # 50-80-03-5020 (CSH 8), military bunker, was documented with a detailed written description, photographs, scale drawings, and accurately located with GPS survey equipment. The proposed project may have an adverse effect on the bunker, which is considered to be an excellent and exceedingly rare example of military infrastructure in the Hanalei area. Preservation is recommended for SIHP # 50-80-03-5020 (CSH 8). Sufficient information regarding the location, function, age, and construction methods of the bunker has been generated by the current inventory survey investigation and no further documentation is indicated.
9. SIHP # 50-80-03-5021 (CSH 9), historic cemetery, was documented with a detailed written description, photographs, and accurately located with GPS survey equipment. The proposed project may have an adverse effect on the cemetery. Preservation, in the form of avoidance and protection, is recommended for SIHP # 50-80-03-5021 (CSH 9).
10. SIHP # 50-80-03-5022 (CSH 10), terrace, was documented with a detailed written description, photographs, scale drawings, and accurately located with GPS survey equipment. The proposed project may have an adverse effect on the terrace. No further work is recommended for SIHP # 50-80-03-5022 (CSH 10). Sufficient information regarding the location, function, age, and construction methods of the terrace has been generated by the current inventory survey investigation to mitigate any adverse effect caused by proposed development activities.
11. SIHP # 50-80-03-5023 (CSH 11), complex, was documented with a detailed written description, photographs, scale drawings, and accurately located with GPS survey equipment. The proposed project may have an adverse effect on the complex. Preservation, in the form of avoidance and protection, is recommended for SIHP # 50-80-03-5023 (CSH 11).

Thus in summary five sites are recommended for preservation (including one actively maintained cemetery and a site with posited burials that is not actively maintained), six sites are recommended for no further work and no sites are recommended for data recovery (preservation of potential sites for data recovery being preferred).

7.2 Preservation Measures

Preservation is recommended for five sites: 1) SIHP # 50-80-03-5013 (CSH 1) a pre-contact irrigation ditch, 2) SIHP # 50-80-03-5014 (CSH 2), a pre-contact habitation & agriculture terrace complex, 3) SIHP # 50-80-03-5020 (CSH 8), a WWII military bunker, 4) SIHP # 50-80-03-5021 (CSH 9), a historic cemetery, and 5) SIHP # 50-80-03-5023 (CSH 11), a pre-contact habitation, agriculture & burial complex (see Figure 9 and Table 3). Specific preservation measures should be developed in a preservation plan for the review and approval of the State Historic Preservation Division. Only a few general points regarding preservation are made here.

SIHP # 50-80-03-5013 (CSH 1) is a pre-contact irrigation ditch. Only the southern portion of the irrigation ditch lies within the current project area. Preservation, in the form of avoidance and protection, is recommended. If breaches of the long, linear, dry, irrigation ditch are necessary for the proposed project then it appears reasonable that they be allowed. It is recommended that a preservation plan codify specifics in this regard. Buffer zones might be minimal.

SIHP # 50-80-03-5014 (CSH 2), a pre-contact habitation & agriculture terrace complex that is outside of the project area per se. Because the site is technically outside of the project area preservation measures might be limited to avoidance of any indirect project related adverse impacts.

SIHP # 50-80-03-5020 (CSH 8), a WWII military bunker, is by its very nature a site that requires little in the way of special preservation measures. Buffer zones might be minimal.

SIHP # 50-80-03-5021 (CSH 9), appears to be a well-maintained (with cut grass) Hawaiian cemetery with interments as recently as 1963. Because this is an actively maintained cemetery no burial treatment plan per se may be warranted. On the other hand, as formal outreach (legal advertising & consultation with the Kaua'i/Ni'ihau Island Burial Council) is anticipated for posited burials at site -5023 it may be appropriate to consider inclusion of outreach for this site as well. We do recommend that preservation measures be worked up in consultation with lineal descendant families of the deceased and incorporated within a preservation plan for sites on these lands. Consultation with concerned families would also address extent of the preserve and buffer zone issues.

SIHP # 50-80-03-5023 (CSH 11) is understood as a pre-contact habitation, agriculture, and burial complex. Three of the features (SIHP # 50-80-03-5023 features E, F & G) are understood as burials on the basis of anecdotal evidence. A burial treatment plan including legal advertisement and consultation with and review by the Kaua'i/Ni'ihau Island Burial Council would appear to be appropriate. While the establishment of appropriate buffers would need to take into consideration the recommendations of any lineal and/or cultural descendants and the Kaua'i/Ni'ihau Island Burial Council, consideration might be given to the fact that bulldozer disturbance lies quite close and thus a more organic-shaped preserve may be appropriate than a simple circular in radius preserve.

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APPENDIX H. CULTURAL IMPACT ASSESSMENT

Cultural Impact Assessment for the Planning Report in Support of Princeville's State Land Use Commission Motion to Revert from Urban to Agriculture, Hanalei, Kalihikai, and Kalihiwai Ahupua'a, Hanalei District, Kaua'i Island

TMK: [4] 5-3-006:001 & 014

Prepared for

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(Job Code: HANALEI 5)

July 2009

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Management Summary

Reference	Cultural Impact Assessment for the Planning Report in Support of Princeville's State Land Use Commission Motion to Revert from Urban to Agriculture, Hanalei, Kalihikai, and Kalihiwai Ahupua'a, Hanalei District, Kaua'i Island, TMK: [4] 5-3-006:001 & 014
Date	July 2009
Project Number (s)	Cultural Surveys Hawai'i Inc. (CSH) Job Code: HANALEI 5
Investigation Permit Number	Cultural Surveys Hawai'i, Inc. performed all archaeological monitoring/fieldwork for this project under state archaeological permit No.08-14 as issued by SHPD, per Hawai'i Administrative Rules (HAR) Chapter 13-13-282.
Project Location	The project area is generally is bounded by the Princeville Makai Golf Course on the west, 'Anini Road on the north, Kalihiwai *ahupua'a* on the east, and Kūhiō Highway on the south. This area is depicted on the 1996 Lihue USGS 7.5-minute topographic quadrangle (Figure 1).
Land Jurisdiction	Private, Princeville Prince Golf Course, LLC
Agencies	State of Hawai'i Department of Land and Natural Resources/State Historic Preservation Division (SHPD)
Project Description	The petition area is within the Princeville Ranch Agricultural Subdivision and proposes a low density agricultural subdivision in TMK: (4) 5-3-006: 001 & 014 por. that will incorporate approximately 400 acres of agricultural and open zoned lands
Project Acreage	For the purposes of this CIA, the APE is defined as the approximately 120-acre petition area footprint within the larger context of Hanalei, Kalihikai and Kalihiwai Ahupua'a.
Document Purpose	This Cultural Impact Assessment is to be included in the Planning Report in Support of Princeville's State Land Use Commission Motion to Revert from Urban to Agriculture, changing the area from a designation of an urban for golf course zone to an agricultural subdivision. This CIA is not part of an Environmental Assessment or and Environmental Impact Statement. CSH is conducting this CIA at the request of Group 70 International, Inc. Through document research and ongoing cultural consultation efforts, this interim report provides preliminary information pertinent to the assessment of the proposed project's impacts to cultural practices (per the State Department of Health, Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts).
Community Consultation	Hawaiian organizations, agencies and community members were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the vicinity. The organizations consulted included the State Historic Preservation Division (SHPD), the Office of Hawaiian Affairs (OHA),

	the Kaua'i-Ni'ihau Island Burial Council (KIBC), Department of Land and Natural Resources (DLNR)- Kaua'i, Kaua'i County Planning Department, Hanalei Hawaiian Civic Club, Alu Like Kūpuna Program, Kaua'i Museum, Kaua'i Historic Preservation Review Commission (KHPRC), Waipā Foundation, past and present *kuleana* land owners, and *kama'āina* (native born) and *kūpuna* (elders) of the Kalihikai Ahupua'a.
Results of Background Research	Background research for this project yielded the following results: 1. The project area is located approximately 3.5 km east of Hanalei Bay on the north shore of Kaua'i spanning portions of the *ahupua'a* of Hanalei, Kalihikai, and Kalihiwai. Predominant coastal features located adjacent to the project area include 'Anini Beach, Honono Point, Honu Point, and Kalihikai Beach. Natural drainages within the project area include 'Anini Stream to the west and Honu, Kalihikai, and Koali Stream to the east. 2. Hanalei is the largest *ahupua'a* in the *moku* of Halele'a. During the centuries before Euro-American contact, Hanalei had long afforded possibilities for intensive agricultural and cultural development by *Kanaka Maoli* (native born). The large alluvial flat on both sides of Hanalei River has been farmed extensively for taro for centuries. Kalihikai is a small *ahupua'a* that "had quite extensive *lo'i* areas near the sea. There were *lo'i* back along main streams and side streams", although the valley is shallow (Handy and Handy 1972:421). 3. Vegetation within the project area includes mango (*Mangifera indica*), *ti* (*Cordyline fruticosa*), *noni* (*Morinda citrifolia*), *laua'e* (*Phymatosorus grossus*), cat's claw (*Caesalpinia decapetala*), *hau* (*Hibiscus tiliaceous*), *hala* (*Pandanus odoratissimus*), *koa haole* (*Leucaena leucocephala*), *palapalai* (*Microlopis strigosa*), java plum (*Syzygium cumini*), white ginger (*Hedychium coronarium*), *kukui* (*Aleurites moluccana*), and exotic grasses. 4. Prior to western Contact, the hill areas of the three *ahupua'a* under study may well have been part of the lands open to all *ahupua'a* residents to use for gathering. Economically valuable plants have been identified in association with archaeological remains on the lower slopes (25 to 125-foot elevation) of the valley ridge; these are associated with dry land or *kula* lands to supplement the crops growing in the adjoining terraces (i.e. *kukui, hala, hau*) (Cleghorn 1979; Schilt 1980). The pandanus groves of the upper slopes of the

	valley wall would have been another resource for residents of Hanalei Ahupua'a, who would not have to travel so far *mauka* (inland) to find the *hala* needed for weaving items such as mats. 5. The Archaeological Inventory Survey (AIS) companion study (Yucha and Hammatt 2008) to the current CIA, which includes a larger project area, has been completed. Although a total of 11 historic properties consisting of a total of 23 total features were identified within or near the larger 400-acre (approximate) Princeville Agricultural Subdivision project, no historic properties were identified within the approximately 120-acre petition area. Eleven sites were found, nine of which are pre-Contact and two of which are historic within or near the larger 400-acre (approximate) Princeville Agricultural Subdivision project. The pre-Contact sites include: three irrigation ditches, an agricultural complex consisting of six terraces, two agricultural terraces, a modified outcrop, a wall, and a complex of eight features including four terraces, two mounds, one alignment and a leveled area; three of the features have been initially interpreted as burials. 6. Few *iliina* (burials) have been documented (e.g. Jourdane 1996, McMahan 1999, Dega 2003) near the project area and each of the burials was recovered in beach sand. No burials have been documented in the project area. 7. The *heiau* within the closest proximity to the project area is Po'okū Heiau, Bennett's (1931) Site 139. It is approximately 400.0 m south of the project's southern boundary (appears as Pooku on Figure 7). A total of five *heiau* were recorded in Hanalei ahupua'a, three in Kalihiwai, and one in Kalihikai. 8. There are many *mo'olelo* about Hanalei including the story of Lonoikamakahiki, Kawelo and the giant Kauahoa of Hanalei and the legend of the lovers Pa'alua and Kawelu. Many *'ōlelo no'eau*, traditional sayings or proverbs, associated with Hanalei have references to the rains and winds. 9. The middle 19th century brought great changes to the three *ahupua'a* under study, including private and public land ownership laws known as the Māhele (literally, 'to divide' or 'to section'). The Kuleana Act of 1850 allowed *maka'āinana* (native tenants), in principle, to own land parcels they were actively cultivating and/or where they were residing. As a result of the Māhele, Land Commission Awards (LCA) were claimed in five distinct clusters within Hanalei Ahupua'a; the shoreline, the Mahaana (taro fields adjacent to Waioli

	Ahupua'a), Puapuaboi-Limanui (the bottom lands of the Hanalei River), 'Anini (on the coast northeast of Hanalei Bay), and Kīloa (inland and adjacent to Limanui). Almost all of the Hanalei Ahupua'a LCAs were lowland locations far from the current project area, with the exception of those at 'Anini, which are located along the northwest edge of the project area (Figure 9 and see Figure 2). In Kalihikai the situation is reversed – almost all of the LCAs lie within the project area (See Figure 2). Table 1, lists all of the LCAs in the vicinity of the current project area. 10. More recently, severe hurricanes – Iwa in 1982 and 'Iniki in 1992 - have demonstrated the precariousness of human development within the Halele'a environment, just as natural disasters thwarted the efforts of the newly-arrived nineteenth century entrepreneurs. However, the endurance of taro through the changes documented above - and its flourishing today – indicates the crop's importance to the continuation of the cultural landscape.
Results of Community Consultation	CSH attempted to contact 35 people for the purposes of this CIA; 14 people responded; of those 14, five *kūpuna* and/or *kama'āina* were interviewed for more in-depth contributions. 1. The project area and environs including streams, shoreline, and wetlands has a long history of use by *Kanaka Maoli*, and other *kama'āina* groups for a variety of cultural and subsistence activities including fishing, gathering of *limu* (seaweed, algae), farming of taro, various vegetables and fruits including watercress, swamp cabbage, *hō'io (Diplazium sandwichianum)*, and bananas. One respondent, granddaughter of the last *konohiki he'e* (octopus resource manager) in Kalihikai-Kalihiwai, noted that the shoreline *makai* (towards the sea) of the project area was the only *konohiki he'e* in the islands. 2. There are two specific, but related concerns regarding fresh and ocean waters below the project site. One is the level of pollution in the waters. The second is that resources which were once plentiful, such as *he'e* (octopus), *limu* (seaweed) such as *waewae'iole, (Codim edule)* and stream resources such as *'o'opu* (goby) and *hihiwai* (snail, *Neretina granosa)* are now rare. Many interviewees described the shoreline as flourishing in the old days. The majority of community consultants interviewed for the report identify the polluted runoff from septic systems along the shoreline and development further *mauka*, including the golf course, as the primary reason for

	decreased marine resources. Previous interruption of waterways and overfishing are also identified as contributing factors. Two of the respondents wanted assurance that measures would be taken to control runoff from homes located in the project area both during and after construction. 3. Current subsistence practices in the project area include pig hunting. One community respondent hunts in the area weekly. He will find a different hunting area should he no longer be able to access the project area. However, several contacts attribute an excess of wild pigs in the area to the reason a particular variety of taro, the *'āhē*, prized for its *lū'au* (young taro tops), can no longer be found near project area. OHA requested that current subsistence practices be given consideration in project development. 4. A four out of five community contacts interviewed for this report voiced concerns about increasing property taxes in the 'Anini Beach area. Interviewees have observed how wealthier individuals purchase surrounding properties, and *kama'āina* families are forced to sell their land because they can no longer afford the rising property taxes. This change in demographics has affected the cultural landscape makai of the project area. According to the respondents, only one of the original *kama'āina* families, the Lannings, still live in the area. For two of the respondents who still own kuleana interests near the project area, a further increase in property taxes would make retaining these lands difficult. 5. Kaleo Paik from SHPD expressed concern that the proposed project will be used "for 'gentleman farmers' to build their luxury homes at the expense of losing productive land for actual viable agricultural purposes. Viable agricultural businesses cannot function on small acreages but need larger parcels in which to make any endeavor economically feasible." She also asks if the land will be used for bonafide farmers with crops that will help stimulate the island's economy. 1. Although none of the respondents knew of any burials in the project area, a number mentioned the disrespect that 'Anini Vistas showed in dealing with burials found there. Several respondents wanted assurance that any burials found at the project site will be treated respectfully and that proper SHPD procedure be followed.
Recommendations	For several of the participants in this CIA there is concern that the

	proposed development may negatively impact Hawaiian resources and practices and beliefs. Generally, there is concern about further loss of a Hawaiian sense of place. A good faith effort to address the following recommendations may help mitigate potentially adverse effects on cultural, historic and natural resources and associated practices as result of the Princeville Ranch Agricultural Subdivision: 1. CSH recommends that project proponents pursue proactive consultation with community members and cultural and lineal descendants with connections to the project area and the lands below the project site, in the 'Anini Beach area. Consultation should address the concerns expressed in this report which include affects on stream and shoreline resources and water quality from construction runoff and infrastructure (e.g., waste management), rising property tax, and access for subsistence practices (i.e. pig hunting). 2. Although it is unlikely that there are burial sites (*iwi kūpuna*) as well as significant cultural and historic properties in the project area; CSH recommends that should ancestral remains be found, cultural and lineal descendants of the area be consulted in regard to burial treatment plans and the remains should be treated respectfully. Also that the personnel involved in development activities in the project area be informed of the possibility of inadvertent cultural finds, including human remains. Should cultural or burial sites be identified during ground disturbance, all work should immediately cease, and the appropriate agencies notified pursuant to applicable law.

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Section 1 Introduction

1.1 Project Background

At the request of Group 70 International, Inc., CSH prepared this Cultural Impact Assessment (CIA) for the approximately 400-acre project area footprint (TMK [4] 5-3-006:001 & 014) of the Princeville Ranch Agricultural Subdivision situated in Hanalei, Kalihikai and Kalihiwai Ahupua'a, Hanalei District, Kaua'i Island (Figures 1, 2, and 3). The project area is located on agricultural and open-zoned land, bounded by the Princeville Makai Golf Course on the west, 'Anini Road on the north, Kalihiwai *ahupua'a* on the east, and Kūhiō Highway on the south.

The area of focus is the County Land Usage Commission (LUC) petition area which is part of a larger project, the planned Princeville Agricultural Subdivision. The petition area is a 120 acre site makai of the Kūhiō Highway which includes 1 full agricultural lot, portions of 4 other lots and 17 potential house sites (see attached aerial photograph and USGS map of the petition area). This petition area is part of a larger 400 acre Agricultural subdivision plan which is part of the Princeville Ranch Preservation Plan. The proposed project includes a low-density agriculture subdivision in TMK (4) 5-3-006; 001 & 014 por., which will incorporate approximately 400 acres of agriculture and open-zoned land. Associated with this plan is an additional 6,000 acres, 4,000 of which will be maintained in conservation and 2,000 of which will be maintained as long-term grazing land as part of the agriculture use.

1.2 Document Purpose

This Cultural Impact Assessment is to be included in the Planning Report in Support of Princeville's State Land Use Commission Motion to Revert from Urban to Agriculture, changing the area from a designation of an urban for golf course zone to an agricultural subdivision. This CIA is not part of an Environmental Assessment or and Environmental Impact Statement. CSH is conducting this CIA at the request of Group 70 International, Inc. Through document research and ongoing cultural consultation efforts, this interim report provides preliminary information pertinent to the assessment of the proposed project's impacts to cultural practices (per the State Department of Health, Office of Environmental Quality Control's Guidelines for Assessing Cultural Impacts).

1.3 Archaeological Work at the Project Area

Two previous archaeological inventory surveys (AIS) have been conducted within the project area (Earle 1978, Cleghorn 1979a).

CSH conducted an archaeological inventory survey as a component of the current project and a companion report (Yucha and Hammatt 2008) is being prepared. Eleven sites were found, nine of which are pre-Contact and two of which are historic. The pre-Contact sites include: three irrigation ditches, an agricultural complex consisting of six terraces, two agricultural terraces, a modified outcrop, a wall, and a complex of eight features including four terraces, two mounds,

one alignment and a leveled area; three of the features have been initially interpreted as burials. Two historic sites were identified: a military bunker and the small private cemetery previously identified by Earle 1978 and Cleghorn 1979a.

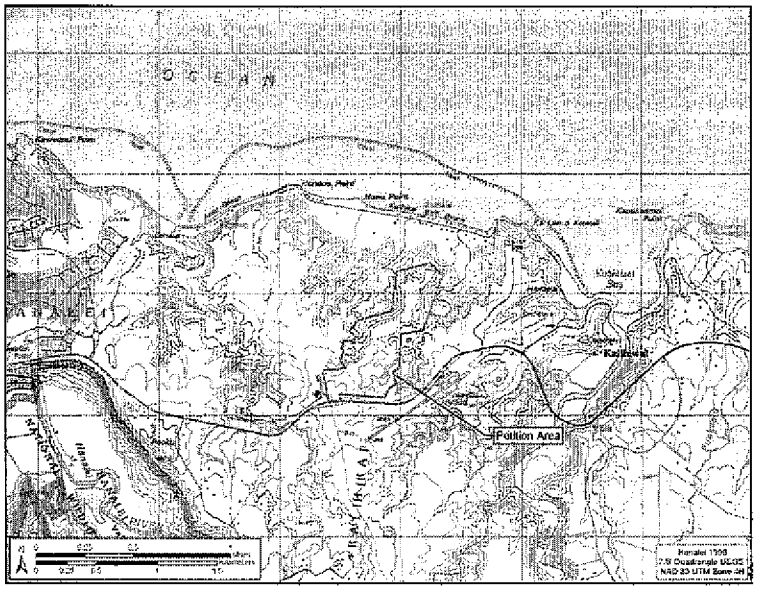

Figure 1. Portion of 1996 USGS 7.5-Minute Series Topographic Map, Hanalei Quadrangle showing the project area

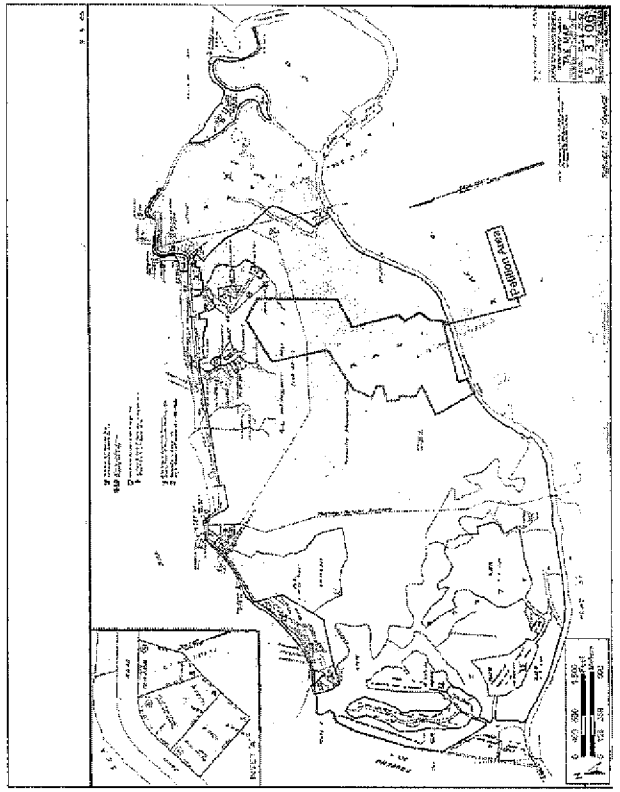

Figure 2. Overlay of Tax Map Key 5-3-006, showing project area location

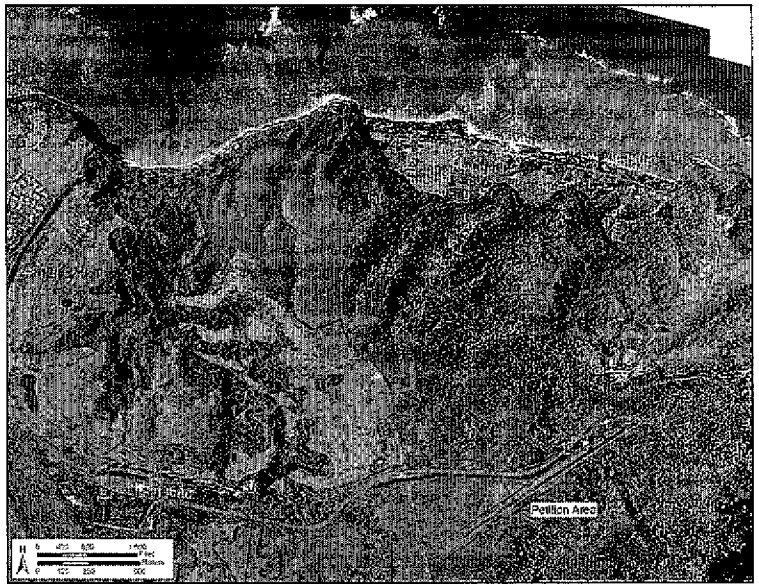

Figure 3. Aerial photograph showing the location of the project corridor (source: USGS Orthoimagery 2005)

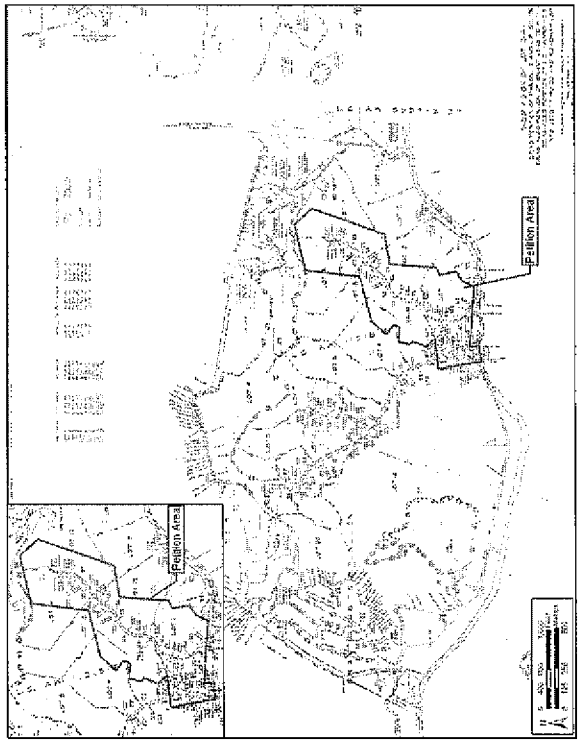

Figure 4. Surveyors map showing proposed development within the current project area

1.4 Scope of Work

The scope of work for this CIA includes:

1. Examination of cultural and historical resources, including Land Commission documents, historic maps, and previous research reports, with the specific purpose of identifying traditional Hawaiian activities including gathering of plant, animal, and other resources or agricultural pursuits as may be indicated in the historic record.
2. Review of previous archaeological work at and near the subject parcel that may be relevant to reconstructions of traditional land use activities; and to the identification and description of cultural resources, practices, and beliefs associated with the parcel.
3. Consultation and interviews with knowledgeable parties regarding traditional cultural practices at or near the parcel; present uses of the parcel; and/or other (non-Hawaiian) practices, uses, or traditions associated with the parcel.
4. Preparation of a report summarizing the results of these research activities.

1.5 Environmental Setting

1.5.1 Natural Environment

The project area is located approximately 3.5 km east of Hanalei Bay on the north shore of Kaua'i spanning portions of the *ahupua'a* of Hanalei, Kalihikai, and Kalihiwai. Predominant coastal features located adjacent to the project area include 'Anini Beach, Honono Point, Honu Point, and Kalihikai Beach. Natural drainages within the project area include 'Anini Stream to the west and Honu, Kalihikai, and Koali Stream to the east. The *makai* portion of the project area is generally level extending from essentially sea level south to abut steep ridges and stream valleys that cut into the relatively level table lands in the central and southern portions of the project area.

According to the U.S Department of Agriculture (USDA) soil survey (Foote et al. 1972) the sediments within the project area consist of strips of Beaches (BS) and Mokuleia Fine Sandy Loam (Mr) at the northern, coastal edge, with Mokuleia Clay Loam (Mta) along with small areas of Hanalei Silty Clay 0 to 2 Percent slopes (HnA) and Hanalei Silty Clay Deep Water Table 0 to 6 Percent (HrB), backed by Rough Broken Land (rRR) and Rough mountainous Land (rRT). Upland soils consist of Makapili Silty Clay (MeB) and Pooku Silty Clay (PmB) on the plateaus and Hanamaulu Silty Clay (HsC), Makapili Silty Clay 8 to15 percent slopes (MeC), Makapili Silty Clay 15 to 25 percent slopes (MeD), and Makapili Silty Clay 25 to 40 percent slopes (MeE) in the valleys and gulches (Figure 5). Soils of the Mokuleia Series are described as "well-drained soils along the coastal plains on the islands of Oahu and Kauai... formed in recent alluvium deposited over coral sand" (Foote et al. 1972). Soils of the Hanalei Series are described as "somewhat poorly to poorly drained soils developed in alluvium derived from basic igneous rock" (Foote et al. 1972). Soils of the Makapili Series are described as "well-drained soils on uplands on the island of Kauai... developed in material weathered from basic igneous rock"

(Foote et al. 1972). Soils of the Pooku Series are described as "well-drained soils on uplands on the island of Kauai... developed in material weathered from basic igneous rock" (Foote et al. 1972). Soils of the Hanamaulu Series are described as "well-drained soils on stream terraces and steep terrace breaks on the island of Kauai... developed in alluvium washed from upland soils" (Foote et al. 1972).

The project area receives approximately 1500 to 2000 mm (59 to 79 in) of rain per year falling mostly in the winter months (Giambelluca et al. 1986). Vegetation within the project area includes mango (*Mangifera indica*), *ti* (*Cordyline fruticosa*), *noni* (*Morinda citrifolia*), *laua'e* (*Phymatosorus grossus*), cat's claw (*Caesalpinia decapetala*), *hau* (*Hibiscus tiliaceous*), *hala* (*Pandanus odoratissimus*), *koa haole* (*Leucaena leucocephala*), *palapalai* (*Microlopis strigosa*), java plum (*Syzygium cumini*), white ginger (*Hedychium coronarium*), *kukui* (*Aleurites moluccana*), and exotic grasses.

1.5.2 Built Environment

Most of the project area remains relatively undeveloped; construction and development activities have been concentrated in the southern and western portions of the project area, near Kūhiō Highway. These include the Princeville Prince Golf Course, Princeville Restaurant and Bar, and Princeville Spa.

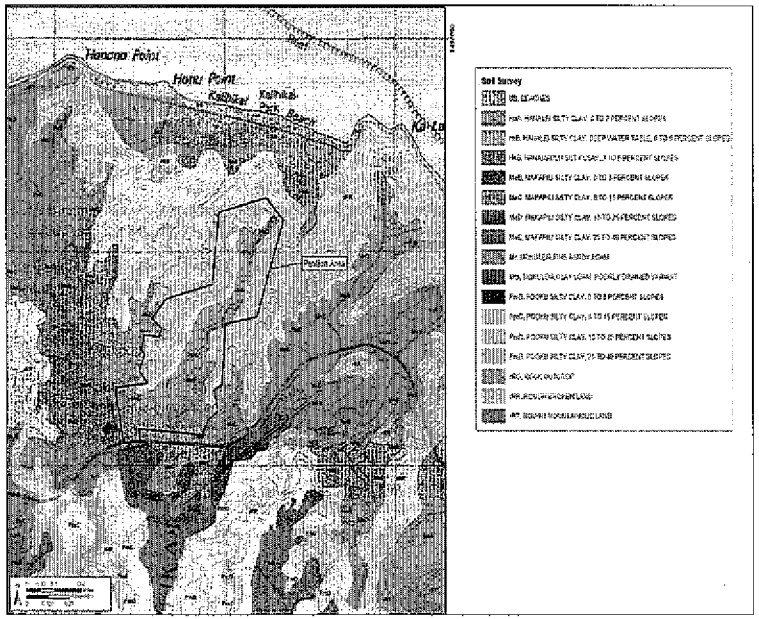

Figure 5. Overlay of Soil Survey of the State of Hawai'i (Sato et al. 1973), indicating soil types within project area

Section 2 Methods

Historical documents, maps and existing archaeological information pertaining to the sites in the vicinity of this project were researched at the CSH library. Information on Land Commission Awards was accessed through Waihona 'Āina Corporation's Māhele Data Base (www.waihona.com). The State Historic Preservation Division, Office of Hawaiian Affairs, Kaua'i-Ni'ihau Island Burial Council, and community and cultural organizations in Kaua'i were contacted in order to identify potentially knowledgeable individuals with cultural expertise and/or knowledge of the project area and the surrounding vicinity. The names for potential community contacts were also provided by colleagues at CSH and from the authors' familiarity with people who live in or around the project area. The cultural specialists conducting research on this assessment employed snowball and judgment sampling methods, an informed consent process and semi-structured interviews according to standard ethnographic methods (as suggested by Bernard 2005). Some of the prospective community contacts were not available to be interviewed as part of this project. A discussion of the consultation process can be found in Section 6 on Community Consultations. Please refer to Table 2, Section 6 for a complete list of individuals and organizations contacted.

Section 3 Traditional Background

3.1 Overview

This section focuses on the traditional background of coastal and near-coastal portions of Hanalei, Kalihiwai, and Kalihikai Ahupua'a in the *moku* (traditional district) of Halele'a (Figure 6). The subject project area is located east of the town of Hanalei, and just south of Kaua'i's north coast.

3.2 Place Names

Translations presented without attribution in this subsection are from Pukui et. al (1974), unless indicated otherwise.

Hale-le'a: The traditional name for the *moku* (district) that the *ahupua'a* of Hanalei, Kalihikai and Kalihiwai lie within. Literally translates as, "house of happiness." Chants speak of Hale-le'a as the most beautiful place in Hawai'i.

Hanalei: The name literally means "crescent bay." Wichman (1998:108) traces the name to "wreath making" and "lei valley" relating, "The wreaths are the rainbows that appear in the upper valley from the constant rain showers."

Kalihikai: Kalihi literally means "the edge" thus, "seaward Kalihikai."

Kalihiwai: Kalihi literally means "the edge" thus, "Kalihi [with a] stream."

Princeville was "[n]amed in honor of a visit there in 1860 of Kamehameha IV and Queen Emma and their son, the prince Ka Haku o Hawai'i."

'Anini: The name literally means "dwarfish, stunted." Wichman (1998:110) suggests that it is named after *'anini*, a small tree or perhaps Wānini "pouring water." The beach and stream are in northeast Hanalei Ahupua'a, and the project area.

Wānini: The name literally means "pouring water" and is an alternate for 'Anini (Wichman 1998:110).

Haehae-ka-manu-a-Kāne is a peak near Wai'ale'ale; Lit. "tear the bird, Kāne'alohi, for the *'alohi-ke-'ale-mai-nei-ka-wai* water is rippling" (Wichman 1998:109).

The boundary between **Kalihiwai** and **Kalihikai** is marked by:

Ke-awa'ihi marks the ocean boundary of the two *ahupua'a*; Lit. "peeled kava plant" the alternate name is Ke-'awaihi, Lit. "sacred kava plant." This headland has a small beach with a fringe reef (Wichman 1995a:2).

Pu'u-meheu: Covered with pandanus trees and grass in ancient times, the boundary runs up the plain to 870 ft. that provides a view of the plains; Lit. "hill of the trade wind" (Wichman 1995b:4).

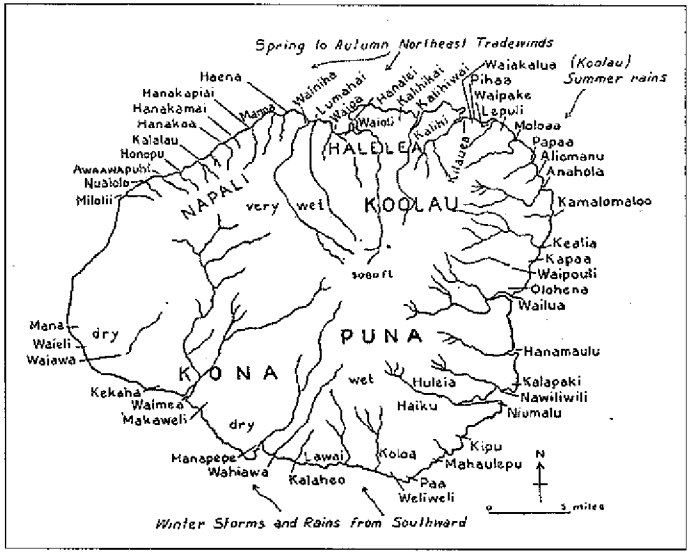

Figure 6. Moku (traditional districts) and *ahupua'a* of Kaua'i; Hanalei Kalihikai and Kalihiwai are within Halele'a (Handy 1940:59)

Pu'u-'ohe-nui is the hill *makai* of Pu'u-meheu; Lit. "hill where the large 'ohe plant grows." The alternate name is Pū-'ohe-nui, Lit. "large nose flute" (Wichman 1995b:4).

Ka-paka, Lit: rain drop, is the highest point in Kalihiwai and the site of a *heiau* (See section 3.6) at the boundary of Hanalei, Kalihikai and Kalihiwai *ahupua'a*.

The boundary between **Hanalei** and **Kalihikai** is marked by:

Ka-wā, Lit: the great noise, is the broad ridge *mauka* of Kamo'olehua (Wichman 1995a:2).

Kamo'olehua, Lit: the red lizard or the ridge where a lehua tree grows, is a ridge that slopes down to the highway from Hāli'i (Wichman 1995a:2).

Hāli'i, Lit: covering, similar to a sheet or bedspread, is a boundary marker that is *makai* of Kakahewa and *mauka* of Kalachohono (Wichman 1995a:2).

Hīhīmanu, Lit: Beautiful, also various sting rays (*Dasyatidae*) and eagle rays (*Actobatus narinari*), is a peak in the Hanalei district, *mauka* of the project area.

Kakahewa, Lit: hit by mistake, is the boundary marker on a broad kula plain between Pu'u'eokau and Nakoahaili (Wichman 1995a:2).

Pu'u'eokau, Lit: season full of food, is the peak of the ridge and a boundary marker between Kalaehohono and Kakahewa (Wichman 1995a:2).

Nā-koa-haili, Lit: ghostly warriors, is the boundary marker between Kamo'olehua and Kakahewa (Wichman 1995a:2).

Kaumuakōlea, Lit: oven belonging to the golden plover, is a boundary marker between Kapuhaili and Kapū'alio'anini, and the location that was used by Native Hawaiians as the starting point for races to the beach (Wichman 1995a:3).

Kapuhaili, Lit: ghostly trumpet, is a boundary marker between Kapuakekua and Kaumuakōlea (Wichman 1995a:3).

Kapū'alio'anini, Lit: warrior of 'Anini, is mauka of Kaumuakōlea; it is a narrow ridge between two gulches (Wichman 1995a:3).

Kapū'aliokaohi, Lit: warrior at the gathering, is at the top of Kapū'alio'anini Ridge (Wichman 1995a:3).

3.3 Mo'olelo Associated with Specific Place Names

According to a prose note of the Kalākaua text of the Kumulipo, a Hawaiian cosmogonic genealogical chant, the Ka'ū chief Ka'ī'imamao was banished by the people of Ka'ū for committing some unnamed "evil deeds." He was referred to as "Wākea" and wandered the "wilds of Kahihikolo [upland bush country] at **Kalihikai**, **Kalihiwai**, and **Hanalei**", and lost his mind (Beckwith 1951:8-9). There are, however, few references to Kalihikai and Kalihiwai in *mo'olelo*. Wichman (1995b:1) tells us that, "No legends, folktales, or anecdotes of **Kalihiwai** have been written down." One mention of the *ahupua'a* does appear in Rice's (1923:38) collection of legends; a cave called Wa-ka-ulua was dug by the Menehune near **Kalihiwai**. The cave "became a well-known spot for catching ulua" (*Carangidae*) (Rice 1923:38). The first historic mention of the *ahupua'a* is in 1809 and is related to Kīhei who constructed a *heiau* (see discussion of Heiau, section 3.6 below) and settled in the area.

No legends associated with **Kalihikai** were found and Wichman (1995a:1) questions "why Kalihiwai was a separate political unit" since bird feathers were the most prized Makahiki offering and Kalihiwai does not have highlands with an environment to sustain mountain birds. However, Wichman (1995a:1) notes that "the place names along the border with Hanalei seem to commemorate a race in ancient times."

Many *'ōlelo no'eau*, traditional sayings or proverbs, associated with **Hanalei** have references to the rains and winds.

3.3.1 The Rains

One *'ōlelo no'eau* is simply:

Ka ua loku o Hanalei "The pouring rain of Hanalei" (Pukui 1983:170).

Another is:

Lu'ulu'u Hanalei i ka ua nui; kaumaha i ka noe o Alaka'i – "Heavily weighted is Hanalei in the pouring rain; laden down by the mist of Alaka'i'" (Pukui 1983:170). Pukui (1983:170) explains the poetic meaning, "An expression used in dirges and chants of woe to express the burden of sadness, the heaviness of grief, and tears pouring freely like rain. Rains and fogs of other localities may also be used."

Five named rains are reported for Hanalei:

Ka-ua-loku-o-Hanalei	"soaking rain of Hanalei" (Wichman 1998:108)
Hehi-pua-hala	"Stepping upon pandanus flowers," is a rain associated with Po'okū (Wichman 1998:108)
Lena	"'Yellow', a yellow-tinted rain, suggests the phenomenon of rain falling in the sunshine" (Wichman 1998:108-109)
Ka-ua-hā'ao	"'Gentle rain,' fell over Hīhīmanu, so called because its showers follow one another like members of a chief's retinue that came in procession in sections or divisions" (Wichman 1998:109).
Kū-'ula-o-'Anini	"'Red Kū of 'Anini', A rain favored by fishermen" (Wichman 1998:109).

3.3.2 The Winds

In the Legend of Kuapaka'a (Fornander 1919 Vol. V Part I:96-97), the Luha is named as the wind of Hanalei.

The winds reported for Hanalei by Wichman (1998:109) include:

Hau-ka'e'e-o-Hanalei-iki	"dried up dews of Hanalei-iki"
Hau-mū	"silent dew" a "life-giving wind"
Hau-'ōma'o	"green dew" a "life-giving wind"
Līhau-o-Lanihuli	"Gentle cool rain of Lanihuli," when it blew "fishermen considered it a lucky omen and went to river or sea."
Lū-hau-o-Hanalei-uka	"Scattered dews of upland Hanalei" a "life-giving wind"
'Ō-lau-niu-o-Pu'u Pōā	Coconut leaf piercing wind of Pu'u Pōā a "not so kind wind"

Pae-hahi-o-ka-iholena	"Row of trampled iholena banana trees" a "not so kind wind"

3.3.3 The Story of Lonoikamakahiki

The ruling chief Lonoikamakahiki and Kaikilani chant similar chants about various places in Hawai'i nei including a reference to the rains of Hanalei:

O Hanalei kumu a ka ua	Hanalei, the source of the rains
I amo a haahaa	Made low from carrying such a burden

Kapaihiahilina also chants of his wanderings at Hanalei with Lonoikamakahiki also focusing on the rains:

My companion of the tall pandanus...	*He hoa i ka nahele lauhala lōloa,*
[That extend] from Kīlauea to Kalihi,	*Mai Kīlauea o Kalihi la,*
The pandanus that had been pecked by birds,	*O ka hala i 'āina kepa ia e ka manu,*
[The Pandanus] of Po'okū in Hanalei	*O Po'okū i Hanalei-la*
Thus did we two wander along, my companion,	*Hala ia mao a ka ua, e ke hoa-e*
Through the heavy and wind-blown rain,	*He ua ka'e'e, ua makani,*
The ceaseless and general rain.	*Ua ho'okinakina e puni e ka ua.*
We drank of the 'awa of Koukou,	*Inu aku i ka 'awa o Koukou*
The fragrant leaved 'awa of Māmalahoa.	*I ka 'awa lau hinano o Māmalahoa*
Say, my companion!	*E ke hoa-e!*
A companion, a friend of Lono, a man,	*He hoa, he ka'upu e Lono, he kanaka*
A companion of the deafening rains.	*He hoa la ho'i no ka ua, pā'ia;*
As the rain traveled in the uplands at	*Hele ka ua mauka o*
Hanalei iki,	*Hanalei-iki*
To Hanaleinui	*A Hanalei-nui*
One rain was from the highlands,	*Mauka mai kekāhi ua*
One rain was from the lowlands,	*Makai mai kekāhi ua*
One rain was from the east,	*Ma na'e mai kekāhi ua*
One rain was from the west,	*Malalo mai kekāhi ua*
Along the pandanus cape of Pu'upaoa.	*Ma ka lae hala o Pu'upaoa*
It was there the rain fell on the sand,	*Ilaila ka ua ho'owalea i ke one*
The sand, food of the kīna'u,	*I ke one 'ai a ke kīna'u,*

The kīna'u that ate of the ripe pandanus	*Ke kīna'u 'ai hala palu*
at Hanalei	*I Hanalei*

There is a reminiscence of when Lonoikamakahiki "ate of the ripe flowers of the pandanus of Po'okū" (*a 'ai i ka pua pala o ka hala o Po'okū*) (Fornander 1919 Vol IV, Part II, 360-361).

3.3.4 Kawelo and Hanalei

In the "Legend of Kawelo," (Fornander 1919 Vol V Part I: 576-577) the Kaua'i hero was brought up with a certain kinsman, the giant Kauahoa of Hanalei who would become the most noted warrior of the ruling chief 'Aikanaka. In a sidebar, while fishing from a canoe for *uhu* (parrotfish) at Ka'ena O'ahu, Kawelo caught the demi-god Uhumāka'ika'i in his net and was towed to near Hanalei where his companion, Ma'akuakeke, asked for that land. Kawelo returns to Kaua'i to fight against the ruling chief 'Aikanaka and the great warrior Kauahoa. The fighting breaks out at Wailua. Aloha for Kauahoa arose within Kawelo and he tries to avoid a fight with a kinsman (*hoahānau*) from his childhood days by trying to win over Kauahoa with a flowery chant referring to Kauahoa repeatedly as "the pride of Hanalei (*ka u'i o Hanalei*). There are several references to Hanalei: "swollen and enlarged is the moss of Hanalei" (*Pehu kaha ka limu o Hanalei*) "Hanalei, the cold land, the wet land, the land where the end is" (*Hanalei 'āina anuanu, 'āina koekoe, aina i ka pea i noho ai*), and "Hanalei the land of rain" ('*O Hanalei 'āina ua*). Kawelo appears to evoke images of the Hanalei landscape:

For the anger of Honokoa is reviling,	*Maewa ana ka ukiukiu o Honokoa*
At the cliff of Kalehuawehe	*I ka pali o Kalehuawehe*
Where the lama and wiliwili bloom,	*Pua ka lama me ka wiliwili*
Where the rain sweeps on the outside	*O ka ua lele ma waho*
of Mamalahoa	*O Mamalahoa*
Kauahoa the stalwart youth of Hanalei	*O Kauahoa o ka meeui o Hanalei*
(Fornander 1919 Vol V Part I: 56-57)	

Kauahoa rebuffs his overtures of peace and Kawelo then turned to one of his wives, Kanewahineikiaoha and chants:

Say, Kanewahineikiaoha	*E Kanewahineikiaoha e;*
your pīkoi (tripping club) throw it up	*Ko pīkoi hoolei ia i luna*
At Helelua, at Helelua	*I Helelua, i Helelua*
At the ridge-pole of Hanalei,	*I kaupoku o Hanalei la.*
Arise thou, Hanalei	*E ala e Hanalei e*
Until Kauahoa thou hast killed,	*A make o Kauahoa ia oe,*
When Hanalei thou shalt possess,	*Ai ae ia Hanalei,*

And the mats of Ni'ihau thou shalt wear, *Aahu ae i ka pawehe o Ni'ihau,*

And the birds of Kaula thou shalt eat *Ai la oe i ka manu o Kaula*

(Fornander 1919 Vol V Part I: 56-57)

In another story of Kawelo (Fornander 1919 Vol V Part III:694-707), Kauahoa is actually the elder brother of Kawelo, born of the same parents, but was adopted by Haulili the great one of Hanalei (*Haulii, ka mea nui o Hanalei*) Kauahoa comes from Hanalei and is referred to as "The champion of Hanalei' (*Ke kamaeu o Hanalei*).

In Pukui's (1951:117-118, 122) account, following the killing of Kauahoa, Kawelo lived with his wife in Hanalei "quietly fishing and planting".

Wichman relates the following:

> Hanalei was the home of Kauahoa, a warrior who lived about 1690. He was the last of the great giant kupua warriors, noted for his strength, size, and because he was handsome. He was born on the same day and in the same place as the future ruling chief, 'Aikanaka, and his cousin Kaweloleimakua. In the war between these two, 'Aikanaka did not immediately call upon Kauahoa, who angrily sat in the headwaters of the Hanalei River and dammed up the water for so long that the fish gasped in the dry bottom....Kauahoa is often referred to as Kame'eu'io Hanalei, "handsome hero of Hanalei," and this name was given to a headland in his memory (Wichman 1998:111).

3.3.5 Legend of the Lovers Pa'alua and Kawelu

In the Legend of the lovers Pa'alua and Kawelu (Thrum 1923:139), Pa'alua regales the daughter of the ruling chief of O'ahu with accounts of "the charms of his home in the vale of Hanalei" - by inference also the home of his father, the ruling chief of Kaua'i. He makes specific reference to the *kamani (Calophyllum inophyllum)* and *olonā (Touchardia latifolia)* that grow in the valley of Hanalei (Thrum 1923:140). In Pukui's account (1951:175) Kawelu exclaims, "O Pa'alua, take me to Hanalei." They become the rulers of Kaua'i and Ni'ihau.

3.4 Subsistence and Settlement

The abundance of fresh water attracted settlers to the *moku* of Halele'a. Native grasses and trees including *hala, milo* and *kou* trees covered the plains. Earle (1978:163) relates that "only the prime areas of alluvial soils were farmed intensively aboriginally." No evidence of pre-Contact villages have been found in Halele'a; rather, homes were scattered around the *moku* (Wilcox 1981:141).

During the centuries before Euro-American Contact, the land and waters of Hanalei have long afforded possibilities for intensive agricultural and cultural development by *Kanaka Maoli* . The large alluvial flat on both sides of Hanalei River has been farmed extensively for taro for centuries. E.S. Craighill and Elizabeth Handy present the *ahupua'a* resources that pre-Contact Hawaiians utilized and amplified:

> Hanalei is unique on Kauai in having a broad river flowing into a magnificent level seaward area...The flats in which rice was planted by the Chinese had been the taro *lo'i* of the Hawaiians, amply irrigated by ditches from the Hanalei River. Sugar cane and ranching at different times have taken over most of the land where taro was originally grown. And yet in recent years some taro was still grown there and there was a *poi* mill....
>
> Because of an abundance of foods of all sorts, Hanalei was, and still is, one of the most attractive dwelling places in the islands. In addition to its rich lands and water resources, and its beautiful beach, it was close enough to the rich deep-sea fishing grounds off the Nāpali coast to supply its people with plenty of fish. (Handy and Handy 1972:420-421)

Kalihikai is a small *ahupua'a* that "had quite extensive *lo'i* areas near the sea. There were *lo'i* back along main streams and side streams," although the valley is shallow (Handy and Handy 1972:421). The lands are described as "a rolling plain that has been gouged by small streamlets which, for the most part, drain away into the neighboring *ahupua'a* of Kalihiwai and Hanalei. The plain drops over low hills broken by four little gulches onto a flat strip of land. It was here that the lo'i, irrigated field ponds, were dug and taro grown, and the people lived" (Wichman 1995a:1).

Kalihiwai also had *lo'i* areas near the sea in the "shallow valley" that opened to the ocean. In 1848, *noni* and orange trees were known to have been cultivated, although by 1850, cattle and hogs had begun trampling the groves (Wichman 1995b:1).

Prior to western Contact, the hill areas of the three *ahupua'a* under study may well have been used for gathering as part of the land open to all *ahupua'a* members. Economically viable plants have been identified in association with archaeological remains on the lower slopes (25 to 125-foot elevation) of the valley ridge; these have been associated with dry land or *kula* lands to supplement the crops growing in the adjoining terraces (Cleghorn 1979; Schilt 1980). The pandanus groves of the upper slopes of the valley wall would have been another resource for residents of Hanalei Ahupua'a who would not have to travel so far *mauka* to find the *hala* needed for their mats, etc. The three *ahupua'a* all had irrigation systems in place in the 1850s to distribute stream and rain water to the extensive *lo'i* fields.

Handy (1940:171) assumed that yams were cultivated throughout inland Halele'a. Coconuts were grown in select coastal areas of Kaua'i, including Hanalei (Handy 1940:193). Hanalei was a planting area for *wauke* for *kapa* or bark cloth (Handy 1940:198). *Wauke* is also known as paper mulberry, (*Broussonetia papyrifera*) and is an important canoe plant transported to Hawai'i, as are sweet potatoes, which Handy noted were planted in the "narrow coastal strip between the hillsides and the sea at Kalihi-kai and Anini" since they are "ideal for this type of planting (Handy 1940:153).

The topography and post-Contact land use patterns of the eastern portion of Hanalei Ahupua'a, which lies within the project area, is more similar to those of Kalihikai and Kalihiwai *ahupua'a* than to the rest of Hanalei. Its location on the uplands, north and east above the river

valley, sets the project area apart from the irrigated lowlands associated with the agricultural pursuits of both pre- and post-Contact periods. Māhele records (see below) indicate the presence of traditional agriculture and house lots in the project area along the coast and lowlands near 'Anini Stream and the three smaller streams in Kalihikai Ahupua'a.

Numerous accounts attest to extensive *hala* or pandanus groves in the uplands of Hanalei, Kalihikai and Kalihiwai in the early nineteenth century (Alexander 1991; Lydgate 1991; King 1991; Bird 1890). William DeWitt Alexander (1991:124) describes these groves during a trip around the island in 1849, "Five more miles of riding through woods of *hala*, brought us to the tip of the hill that overlooks Hanalei Valley..." William T. Brigham visited Kaua'i in 1865 and also commented on the extensive pandanus, "Vast numbers of pandanus cover the hillsides and grow so luxuriantly as to furnish an admirable shelter from the rain" (Lydgate 1991:139).

3.5 Ilina (Burials)

Few *ilina* (burials) have been documented (e.g. Dega 2003, Jourdane 1996, McMahan 1999,) near the project area and each of the burials was recovered in beach sand. No burials have been documented in the project area. It is possible that undocumented burials may be located within or near the subject proposed project.

3.6 Heiau

The *heiau* (Pre-Christian shrine, high place of worship) within the closest proximity to the project area is Po'okū Heiau, Bennett's (1931) Site 139. It is approximately 400 m south of the project's southern boundary (appears as Po'okū on Figure 7) and described below. A total of five *heiau* were recorded in Hanalei *ahupua'a*, three in Kalihiwai, and one in Kalihikai.

3.6.1 Hanalei Heiau

Po'okū *heiau*, Bennett's (1931) Site 139, in east Hanalei is a *luakini*, unenclosed *heiau*, that measures approximately two acres. The sides are terraced from the central platform. "Crow's Nest" is a local and modern name for the hill on which it stands" (Thrum 1904:42). By the late 1920s, only a few stones remained of the *heiau* (Bennett 1931:134).

Although very little is known about Po'okū Heiau, there is some evidence this *heiau* played an important role in the pre-Contact period of Hanalei. Besides being physically situated on the eastern boundary of Hanalei Valley, the *heiau* was constructed in a strategic location for fortification. Bennett discusses the benefits of using hills to construct *heiau*, "Hilltops are favorable sites for making an imposing structure with the minimum labor" (Bennett 1931:33). Po'okū Heiau was constructed on an old volcanic vent and has the highest elevation of all landmarks nearest the road, giving one a commanding view of the Hanalei Valley as well as a good view of the adjacent Kalihikai Ahupua'a uplands. Ching's work on Po'okū Heiau in 1974 presented the story of a local informant describing the site being used as a fort during a threat of warfare from a neighboring chief:

> The small river stones found on this heiau date back to a time when the chief of Wainiha Valley threatened to make war on the chief of Hanalei. The people of Hanalei formed a long line, extending from Po'oku to Hanalei River. Directly below Po'oku is a shallow rapids, it is from this rapids that stones were collected and passed along this human chain, up the hill to Po'oku. The stones were ammunition for the men of Hanalei, who used them in their slings, to ward off attack. (Ching 1974)

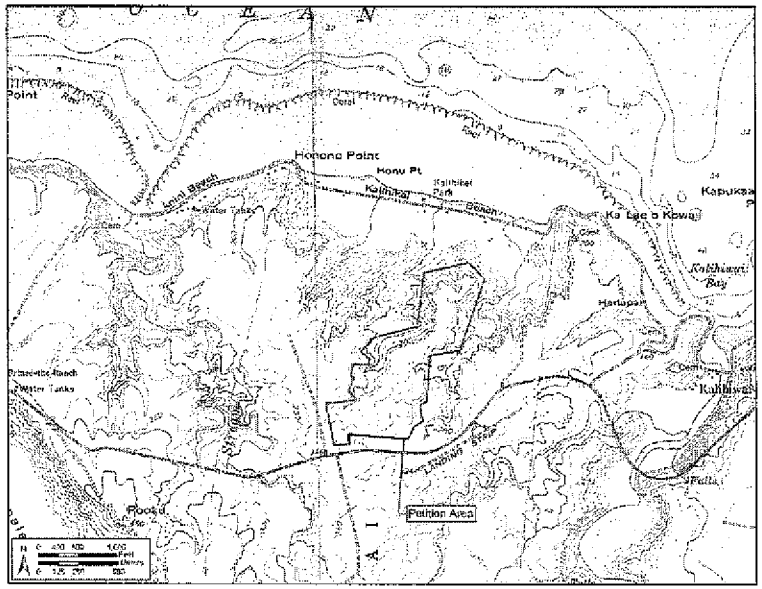

Figure 7. Portion of 1963 USGS topographic map showing location of "Pooku" heiau south of the project area

Kapaka *heiau*, Bennett's (1931:134) Site 140, is on the peak that bears its name and is where Hanalei, Kalihikai and Kalihiwai *ahupua'a* meet. "There was a peculiarly shaped rock with hollows in it at this place" (Wichman 1995a:5). Thrum (1904:42) described it as a, "paved open platform heiau, without walls; stones set edgewise traversing through. Kane its deity. Said to have had connection with Kapinao at Waikalua in its workings." Bennett (1931) relates, "This site has had many stones removed, or covered over with vegetation. The river stones seem to cover the top of the hill for a diameter of about 75 feet. The extent of the *heiau* could not be accurately determined. The stones set edgewise traversing through could not be found."

Bennett's Site 141 is:

> Heiau and house sites, at Kalama-iki, an old village on the river flats, four miles up Hanalei Valley. There is a stone structure 18 by 20 feet with walls all around 2.5 feet wide and 2 feet high. In front is a paved section extending 5 feet, like a lanai, to a drop of 4 feet of the river terrace. The river is 50 feet out in front. Both river stones and rough rocks were used, but no coral was seen. The wall was chinked with smaller stones in front. Taro terraces and house sites are on the plains along the river (Bennett 1931:134).

Ka'apoku Heiau, Bennett's Site 142 is "inland from Site 141 in Hanalei Valley. This small shrine consists of a paved platform 18 by 20 feet made of rough stones. A village was across the stream" (1931:134).

Bennett's Site 143 consisted of:

> Ditch and house sites, across the river from Site 142 in Hanalei Valley. Site also includes taro terraces and a ditch that runs from 0.5 mile or so up the stream to water this plain. The water comes through a big rock which is conveniently cracked. The legend runs that Pele sent lightning to split the rock so that the people could get the water down to the fields. Upstream from here a large, overhanging rock forms a natural shelter. It has been built up along the front a bit. The house sites of the solidly paved type, as well as those merely outlined with stones, are found. (Bennett 1931:134-35)

3.6.2 Kalihiwai Heiau

Kalahini *heiau*, Bennett's Site 134, is "on the east side of Kalihiwai valley on the bluff shoreward of the government road just before it turns down into the valley" (1931:134).

Thrum (1907:43 cited in Bennett 1931:134) states: "Of pookanka class. Foundations only remain, indicating it as of large size." Nothing but a few stones in the cane fields marked the site pointed out for this heiau, and as the situation was a poor one, it is possible that the location is not correct."

Kaunonoli *heiau* was "destroyed years ago after use as a cattle pen" (Thrum 1904:42). This is Bennett's Site 135, which is located "on the east bluff of Kalihiwai valley on a little mound, near a bend in the Puukumu stream.....No rocks now remain" (1931:134).

Kaihalulu in Kalihiwai is "a small high walled heiau of pookanaka class dedicated to Kane and Kanaloa. Destroyed years ago to build a mill" (Thrum 1904:42). This is Bennett's Site 136, which is located "on the hill just inland from the government road where it turns to go down into Kalihiwai valley on the eastern side.....The site as pointed out has a fine view of the valley" (1931:134).

Kīhei is "a small heiau built by a chief of same name" (Thrum 1904:42). Bennett (1931:134) describes Site 137 "on the east side of Kalihiwai valley just below a waterfall." Kīhei built the last *heiau* on Kaua'i in Kalihiwai as a memorial to his good fortune. In 1809, Kīhei was sent by Kamehameha to meet with Kaumuali'i, the king of Kaua'i. Efforts to invade Kaua'i had failed, so Kamehameha made an attempt at diplomacy to gain the island. Kaumuali'i welcomed Kīhei with many gifts. When Kīhei decided to remain in Kaua'i, Kaumuali'i designated him as the *konohiki* of Kalihiwai. When he died, Kīhei was placed in his canoe and buried beneath the *heiau* floor (Wichman 1998:107).

3.6.3 Kalihikai Heiau

The only *heiau* in Kalihikai is Maheu *heiau* on the top of Pu'u-maheu. Site 138, "is a paved platform 8 feet by 21 feet" ..... with "a fine view of the valley and country all around. River stone as well as local rock is used in its paving" (Bennett 1931:134).

Section 4 Historical Background

4.1 Overview

The first recorded use of the uplands of Hanalei and Kalihikai by a non-Hawaiian was in 1831, when the British Consul of the Sandwich Islands, Richard Charlton, was awarded the use of land to feed his livestock at "Hanalei," Kaua'i by the Governor of Kaua'i, Kaikio'ewa (Wilcox 1991). This land use agreement set a precedent for all historic land use in this area thereafter in that *ahupua'a* boundaries were not recognized. In the agreement, no land boundaries were specified and apparently there was no limit to the range of the cattle. The only stipulation other than the conditions of exchange was that the cattle be kept from cultivated lands. Wilcox (1991:7) describes the cattle ranging over the slopes, between Hanalei and Kalihiwai. This plateau land would be a favorable place to have the cattle as the topography is fairly uniform, descending gradually *mauka-makai* and the uplands are generally removed from the cultivated lands found in gulches and alluvial lands associated with more abundant water resources at lower elevations. Besides failing to fulfill his contract with Kaikio'ewa, Charlton also failed to keep the livestock from encroaching upon cultivated lands. Earle (1978:149) reports on the mid nineteenth century "decline of kula farming due to the destruction of gardens by newly introduced cattle" in the region.

In 1845, a French consul of the Sandwich Islands, Captain Jules Dudoit, purchased the lease of the Hanalei uplands from Charlton (Damon 1931) and continued the cattle operation upon the same Hanalei-Kalihikai uplands. The sale of cattle and salt beef in Honolulu and to whalers was supplemented with the production of milk. A visitor in 1850 commented on the "1800 head of fine cattle" on Mr. Dudoit's estate (Damon 1931:335). This was a tremendous growth over the 100 head of cattle estimated in 1840 and is a logical explanation for the destruction of *kula* lands reported above, and the native landscape in general.

At the termination of the lease in 1851, the Dudoit's moved to the Ko'olau District and it is uncertain whether cattle ranching continued in the uplands of Hanalei and Kalihikai. There is some mention of sheep in Hanalei although their grazing lands are not identified (Damon 1931). in 1853, Robert Crichton Wyllie, who served for many years as Minister of Foreign Affairs, began acquiring lands in the Hanalei Valley. He began by purchasing the same portion of Hanalei that Charlton had leased. By the time he had acquired the *ahupua'a* of Kalihikai and Kalihiwai in 1862 and consolidated his lands into the Princeville Plantation, sugar cane cultivation had become his primary agricultural pursuit. Although no sugar cane cultivation was recorded in the project area during William Brigham's 1865 visit to Kaua'i, Brigham did make mention of the pandanus and the grasslands of the Hanalei uplands (Lydgate 1991). An account of a ride from Mr. Wyllie's Lanihuli House up to Po'okū Heiau is recorded by Brigham in 1865:

> The view on all sides was very fine, and as we rode up the ridge next morning over the smooth grassy fields, the almost uncomfortable volcanic presence disappeared, and the land seemed free from Pele's undesirable authority...We rode up the ridge some distance to a mound or small hill which in ancient times was kapu and none but the kahunas who dwelt there, or the chiefs, could come onto it

> on pain of death. On its summit was a pavement, where human sacrifices were offered, and from which the poor victims had a view which even to their eyes must have made them loth to leave the beautiful earth under pleasanter circumstances. (Lydgate 1991: 137)

The earliest record of sugar cane cultivation occurring in the uplands appears on a map of Hanalei from 1885. The map depicts the old Charlton Farm, the road that runs near Po'okū Heiau and sugarcane growing on the east side of 'Anini Gulch (east of the project area). By the end of the nineteenth century, however, cane cultivation in the uplands was abandoned (Wilcox 1991). The uplands were converted back to pasturelands after the new owner, Albert S. Wilcox purchased the Princeville Plantation in 1899 (Wilcox 1991: 19).

Lands of the Princeville Plantation were sold again in 1916, this time to the Lihue Plantation (Damon 1931). Lihue Plantation was not interested in growing cane, their interest lay less in the lands than in "... the very valuable water rights which accompany them and to which seven miles of open ditches and tunneling under the mountains have given free access. This taps the upper sources of the Hanalei River, the largest stream on any of the islands, and was not begun until 1923" (Damon 1931:918). The cattle ranch operated by Wilcox was maintained by Lihue Plantation until 1969 when Princeville was sold to Consolidated Oil and Gas Corporation of Colorado. Approximately 900 acres of the Princeville Plantation lands in the Hanalei Valley floor were purchased by the Federal Government in the 1970s with the intention of creating a National Wildlife Refuge. The remainder of the Princeville Plantation in the uplands was converted into a resort-residential community with hotels, condominiums, restaurants and golf courses.

4.2 Early Historic Period

The nineteenth century would see the Hawaiian-evolved landscaped transformed by the interventions of newly-arrived Euro-American missionaries, entrepreneurs, settlers and adventurers.

4.2.1 The Russian Enterprise at Hanalei

Early in the 19th century, a short-lived scheme to establish the Russian Empire in the Hawaiian Islands would unfold on Kaua'i. During a gale in the early morning hours of January 31, 1815, the *Behring* - a 210-ton three-master owned by the Russian-American Company - was beached at Waimea Bay on the south coast of Kaua'i. The *Behring* was loaded with seal skins destined for the company's headquarters at Sitka, the capital of Russian America. Kaumuali'i, the king of Kaua'i, took possession of the vessel and its cargo, maintaining that anything brought to land upon Kaua'i became the king's property.

Alexander Andreievich Baranov, the Russian-American Company's manager at Sitka, chose Georg Anton Schäffer, a German adventurer, to lead a mission to recover the cargo. Schäffer arrived on the island of Hawai'i in November of 1815, but it was not until May 1816 that he sailed for Kaua'i aboard the company's 300-ton vessel, the *Otkrytie*, supported by an armed crew. Arms, however, were not needed; Schäffer found Kaumuali'i willing to return the Behring's cargo and eager for an alliance with the Russian Empire.

Over the next few months, a busy Schäffer established the Russian presence on Kaua'i, intending to make the island a launching point for control of the entire Hawaiian chain. In September of 1816, Schäffer began construction at Waimea Bay of a lava-rock walled fort to be named after the Russian Empress Elizabeth. He then gave orders for the creation of two earthen-work forts at Hanalei: one named after the Russian General Barclay de Tolly, the other - constructed on a plateau overlooking Hanalei Bay (on the grounds of the present Princeville Hotel) – named after the Emperor Alexander. At the same time, Kaumuali'i deeded Hanalei to Schäffer who renamed the *ahupua'a* "Schäfferthal".

By the spring of 1817 Kaumuali'i had lost confidence in Schäffer. Hearing a false report that Russia and the United States were at war, Kaumuali'i became anxious that he had allied himself with the weaker of the two powers in the Pacific. On the morning of May 8, 1817 Kaumuali'i, accompanied by "a thousand men" (according to Schäffer) at Waimea, ordered the Russian emissary and his compatriots off the island immediately. Aboard two company ships, they fled to Hanalei where Schäffer intended to make a stand; he wrote in his journal:

> I took possession of the island of Kauai in the name of His Majesty, the Great Emperor of Russia Alexander Pavlovich, ordered the Russian flag raised on Fort Alexander, fired three canon shots, and declared myself chief of Hanalei Valley. (in Pierce 1965:202-203)

But Schäffer and the others soon realized their predicament was hopeless. In June 1817 they sailed away from Hanalei Bay and concluded the Russian venture on Kaua'i.

4.2.2 Fort Barclay and Russian Enterprise at the Coast

Little is known of the "lost" Russian Fort Barclay and other Russian infrastructure constructed at the coast. On November 15, 1816 Schäffer records that "until now I have worked energetically on Forts Alexander and Barclay. Platov [Ka'umuali'i's deputy, a Kaua'i chief also known as Obana Tupigea that Schäffer named after a Russian hero] ...works daily with his Indians on constructions of the fortifications" (quoted in Pierce 1965:186). On November 25, 1816 Schäffer wrote to Alexander Baranov that "I now have almost ready here one fortress of stone [Fort Elizabeth in Waimea] and two fortifications of earth, with palisades." [in reference to forts Alexander and Barclay at Hanalei] (cited in Pierce 1965:82). On April 1, 1817 Schäffer reported "I visited the fortifications and found Forts Alexander and Barclay both nearly finished" (quoted in Pierce 1965:198). Pierce provides the following:

> Sheffer accepted the province of Hanalei and started to build two fortresses there, one [Fort Barclay] on the right side of the river Hanalei at the mouth of the harbor and another [Fort Elizabeth] on the same side of the river but much higher, at the harbor itself. Both fortresses were built of earth; however both remained unfinished. The work was being done by promyshlenniks [hunter/trappers working for the Russian American Company], with the aid of the inhabitants of the province, without any aid from the king. (Peirce 1965:128)

Mills (2002:26) comments that:

> These two forts [Fort Alexander and Fort Barclay], built primarily with Russian-American company labor, had low earthen work walls, possibly with palisades.

Samuel Whitney (1838:50) referred to one or both of them as a "slight breastwork," where a few cannon were mounted.

In addition to Fort Barclay it appears that there was other Russian infrastructure at the coast as referred to in a letter from George Young (and four other Russians) to Schäffer dated December 29, 1816 reporting the murder of an Aleut working as a watchman for the Russians and the arson of a "winery" at Hanalei excerpted below:

> The boat with your messenger Fedor Leshchinskii was ready, as was the boat loaded with chalk and clay. Mr. George Young was then on the beach about to send off a letter to you. The natives left their houses and went somewhere near our buildings, which include a winery, by the lake, with [___] and masses of calabashes. They took two butts of wine and a large quantity of roots used in making alcohol. We, Mr. Young, myself, and Bologov, decided that we needed a watchman so no one, whether an Aleut, a Russian, or a kanaka, would dare to steal or rob [us of] anything. We thought we could avoid trouble that way, but just as we handed the sealed envelope to Leshchinskii, suddenly we heard a gunshot from the guard posted in the kanaka [___]. We –Captain Young, myself, Bologov, and Leshchinskii – rushed from the room. We found two men from Mr. Young's boat whom we sent to inquire as to the cause of the shooting. We followed them ourselves and started to run along the shore; before we had covered half of the distance we met the returning men, who told us that the watchman was dead. As soon as we heard that, we saw the building burning on all sides, although there was not one Sandwich Islander to be seen. In ten minutes this unusual fire was over. The grass was burned out and we could see the dead body. Using water brought from the lake in calabashes, Mr. Young, I and the others put out the rest of the fire. We examined the body of the dead man in the presence of a large crowd. We found the cause of death – a large wound in the chest and two more in [__]. We brought the body to the house... (cited in Pierce 1965:83-84)

The geography referred to is less than certain, but it appears that there was a company house quite close to the mouth of Hanalei Stream and that a different structure, the "winery, by the lake" (evidently a thatched structure), was to the north near the present marsh. The assertion that the fire was put out "using water brought from the lake" suggests the "winery" was closer to the lake than to either the coast or the Hanalei River. Notably there is no reference to Fort Barclay in the account.

4.2.3 The 1820s

Into the early 1820s, the Russian episode in Hanalei was apparently past remembrance. Rev. Hiram Bingham, describing a visit to Hanalei in 1821 with Kaumuali'i and King Liholiho, makes no mention of the former Russian presence but gives details of the on-going Hawaiian culture:

> The people in their original state treated us with such as they had. One ascended a coca-nut tree and threw down a nut. Another tore off with his teeth, the thick, fibrous husk, then cracked the shell with a stone, to give us a drink. The head man gave us a course dinner. A pig, baked with heated stones covered in the ground, was set before us on a large, shallow, wooden tray. Kalo, baked in the same manner, and beaten, was laid on large green leaves instead of plates, on the ground...Water was given us in a tumbler consisting of the neck of a gourd-shell, and bananas, ripe, rich, and yellow, were put into our hands singly. (Bingham 1847:143)

Three years later - 1824 - Bingham witnessed at Hanalei an example of the concerted human effort that could still be evoked by the *ali'i*. The brig *Pride of Hawaii*, owned by Liholiho, ran aground in Hanalei Bay. Bingham proclaimed the effort by a great crowd of Hawaiians to salvage the disabled yacht "one of the best specimens of the physical force of the people, which I ever had opportunity to observe for more than twenty years among them--indeed the most striking which I ever saw made by unaided human muscles" (Bingham 1847:221).

> The chief Kiaimakani of Waipouli passed up and down through the different ranks, and from place to place, repeatedly sung out with prolonged notes, and trumpet tongue... 'be quiet - shut up the voice.' To which the people responded.., 'say nothing,' as a continuance of the prohibition to which they were ready to assent when they should come to the tug. Between the trumpet notes, the old chieftain, with the natural tones and inflections, instructed them to grasp the ropes firmly, rise together at the signal, and leaning inland, to look and draw straight forward, without looking backwards toward the vessel. They being thus marshaled and instructed, remained quiet for some minutes, upon their hams. (Bingham 1847:221)

The salvage efforts ultimately failed and the brig was lost. The grounding of the *Pride of Hawaii* at Hanalei Bay in 1824 would suggest the perils of navigation by western ships within the bay and the rest of the northern Kaua'i coast where wind and sea conditions made impossible any secure anchorage. During subsequent decades of the nineteenth century, as increasing numbers of traders, ranchers and settlers moved into Hanalei, the bay could serve only as one "among the many outposts (in the Hawaiian Islands) supplying provisions to the whaling fleet" (Thomas 1983:23). "Hanalei was visited by an occasional whaler and by inter-island ships, since there was some cargo to be carried out, but it was a dangerous harbor, especially when winter winds and rain blew down from the north" (Joesting 1984:141).

4.2.4 1830s to 1850s

The first recorded use of the uplands of Hanalei and Kalihikai by a non-Hawaiian was in 1831, when the British Consul of the Sandwich Islands, Richard Charlton, was awarded the use of land to feed his livestock at "Hanalei," Kaua'i by the Governor of Kaua'i, Kaikio'ewa (Wilcox 1991).

> In 1831 (Charlton) leased from Kaikioewa (Governor of Kaua'i) a stretch of land at Hanalei to be used as a cattle ranch. Its extent was not defined by any boundaries, it being generally termed Hanalei, and the cattle were allowed to range without absolute limit, except that they were not to encroach on the cultivated lands adjacent...The lease was for some twenty years from August 27, 1831. (Wilcox 1991:6-7)

Wilcox (1991:7) describes the cattle ranging over the slopes and plateau land between Hanalei and Kalihiwai. The topography is fairly uniform, descending gradually *mauka-makai* with the uplands generally removed from the cultivated lands in gulches and alluvial lands associated with more abundant water resources at lower elevations. Besides failing to fulfill his contract with Kaikio'ewa, Charlton also allowed the livestock to encroach on cultivated lands. Earle (1978:149) reports on the mid nineteenth century "decline of kula farming due to the destruction of gardens by newly introduced cattle" in the region.

According to Wilcox, in 1834, the same Governor Kaikio'ewa granted Hanalei land to Joel Deadman for sugar cane cultivation. Deadman later testified in 1844 at the time of the Māhele, revealing the instability of the early land ventures at Hanalei and the informality of the land transactions. Kaikio'ewa "... agreed to cause [the Hanalei land] to be cultivated & planted with sugar cane and [to] find the materials for a mill &c and labor." In exchange, Kaikio'ewa was to be paid "one half of the sugar & Molasses produced". "Deadman"... remained there 6 months at considerable loss & expense and had even work made for the mill" but the plantation never materialized. Deadman further testified that Kaikio'ewa "was taken sick & soon after went to Oahu [but] on his last visit to Hanalei before he left Kauai he told me that if he did not look after [the land] himself the natives would not do anything properly, so he gave it up, but he told me then and repeatedly afterwards both at Kauai & Oahu to keep the land, that it was my own." In 1842, Deadman sold the land to Dr. T.C.B. Rooke, father of the future Queen Emma (Wilcox 1991: 7).

Other enterprising attempts included silk making and coffee plantations. Charles Titcomb, an American sailor, developed a silk plantation in Hanalei during the 1830s. By the early 1840s, his plantation comprised four varieties of mulberry trees that were reported to produce excellent silk (Wilcox 1991:7). Titcomb had also established a plantation at Kōloa.

Charles Titcomb's silk plantation at Koloa was devastated in 1840 by a "drought...bringing in its train insect pests, aphids and spiders" and by heavy winds, "trade and kona, whipping off the mulberry leaves" (Kuykendall 1938:183). The Hanalei plantation escaped this disaster but "finally encountered financial and other troubles" and the silk-making enterprise was abandoned in 1844; Titcomb is reported to have lost $15,000 in the venture on Kaua'i (Kuykendall 1938:183).

According to Kuykendall (1938), despite his losses, Titcomb was able to replant his Hanalei fields in coffee with seed procured from Kona. Coffee cultivation was first introduced to Hanalei in 1842 when John Bernard and Godfrey Rhodes began the Hanalei Coffee Plantation on two parcels of land leased from the Government – "one on the east side of the Hanalei River containing ninety acres and one on the west side containing sixty acres" (Wilcox 1991:8) - with "plants and seeds...secured from Governor Boki's land in Manoa Valley [on O'ahu]" (Wilcox

1991:9). Although O'ahu and Hawai'i islands had cultivated coffee, Hanalei's new fields represented the "first extensive coffee plantations" in the Hawaiian islands (Kuykendall 1938:316), and in 1844 the two Hanalei plantations comprised "upward of 100,000 trees" (Wilcox 1991:9).

Near mid-century, coffee dominated the Hanalei landscape: "a great part of the whole valley, at least to the extent of 1,000 acres, was under cultivation in coffee at this time" (Wilcox 1991:10). William DeWitt Alexander, son of the former Waioli missionary William P. Alexander, described his visit to Hanalei in 1849, after a six year absence. His first view of the valley is of the "majestic Hanalei River winding its way through coffee plantations, & the graceful curve of the bay, bordered with houses, & groves" (Alexander 1991:125). He later visited the two coffee plantations:

> Capt. Rhodes has a fine coffee plantation. It contains upwards of 100 acres. It is in very fine cultivation. He had also banana, & orange trees, & a very fine grove of bamboo. I was much interested in observing the operation of the coffee mill. As in a sugar mill, a mule turns a perpendicular post. To the top of this is fitted a large horizontal cog wheel. This sets in motion a fly wheel which is connected to the rest of the machinery by bands. There are 3 or 4 mills which perform different stages of the operations. The noise which they made was most deafening. (Alexander 1991:127-128)

The Titcomb coffee plantation is characterized as "flourishing" though "not as large as Mr. Rhodes', nor is the coffee as luxuriant" (Alexander 1991:128). After John Bernard, Godfrey Rhodes' partner, died at sea off Hanalei Bay in 1845, Rhodes and other investors continued the coffee operation. The company was renamed Rhodes & Co. Coffee Plantation, and comprised 750 of the 1,000 acres of Hanalei land under coffee cultivation in 1846 (Wilcox 1991:9-10).

4.2.5 Halele'a District Census

In 1834-1835, missionaries conducted a census of Halele'a. A total of 1,505 Hawaiians - adults and children - were then living in the *moku* of Halele'a (Schmitt 1973:26). Hanalei, with a population of 522, was the most densely populated *ahupua'a* in the district. The count in Kalihiwai was 190, and 99 in Kalihikai (Earle 1978:161). Figure 8 shows Kaua'i's population in 1853. Halele'a's population was concentrated within the coastal plain due to the prevalence of alluvial soils and proximity to ocean resources. The population appears to have double between the 1834 and the 1853 census.

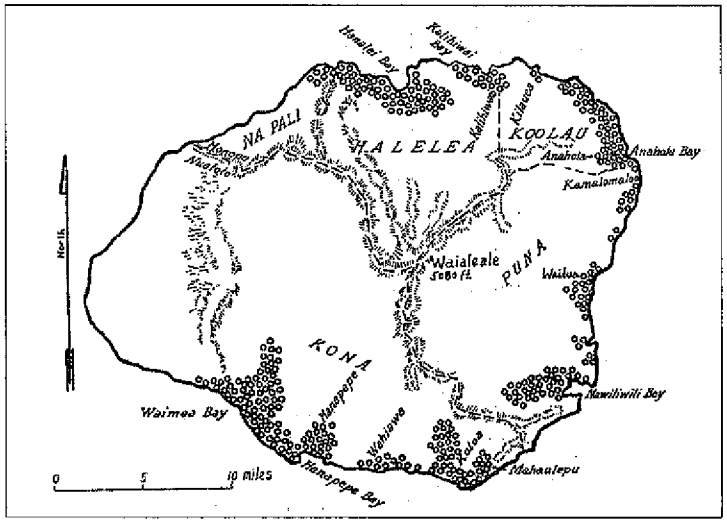

Figure 8. 1853 (Coulter 1931) population density estimates; each symbol represents 50 people

4.3 Middle to Late 19th Century

Confirmation of abundance within Hanalei beyond the agricultural is given in a document of the latter nineteenth century. On July 14, 1873, Kealohanui - a *Kanaka Maoli* living in Hanalei "since I was very little" - testified before the Commission of Boundaries for the Island of Kaua'i on the boundaries of the *ahupua'a*. As transcribed in the commission's proceedings, notable among the place names and landmarks along the western boundary of the *ahupua'a* that Kealohanui recalled are:

Kaunaapi	residing place of chiefs Kauanohi and Hula house
Kauntuaholea	a starting place for races to the beach
Kapaka	stone place of worship (Heau [sic])

Apparently, the memory of places associated with the formerly rich cultural life within the *ahupua'a* was sustained well into the nineteenth century.

Elsie H. Wilcox, a descendant of missionaries to Kaua'i, writing in 1917, further characterize Hawaiian settlement in the project area vicinity into the early decades of the nineteenth century:

> The settlement then extended along the beach, where the climate was drier and where fishing was available, and the grass-thatched houses were set in the midst of gardens of fruit-trees, vegetables and flowers. Bananas, breadfruit, coffee, sugar-cane, cocoanuts, sweet-potatoes, yams, squashes, pia and taro were cultivated, and chickens and pigs raised. On account of the sandy soil and lack of water "makai", most of the taro-patches were further up the valley, the farmer going up daily to "mahiai" and returning at night to his home on the beach. The banks of both rivers were lined with taro-patches which, following the water-courses, extended far up into the valleys. Terraced remains of these patches are still to be seen far above present habitations, their extent indicating a goodly population at that time. The stretch of land between the two rivers [Hanalei River, west of the project area and Kalihiwai River, east of the project area], now used as rice-land (i.e. 1917), was then an undrained swamp, not available for cultivation. (Wilcox 1991:5)

4.3.1 The Māhele

The middle 19th century brought great changes to the three *ahupua'a* under study, including private and public land ownership laws known as the Māhele (literally, 'to divide' or 'to section'). The Kuleana Act of 1850 allowed *maka'āinana*, in principle, to own land parcels at which they were currently and actively cultivating and/or residing.

As a result of the Māhele, Land Commission Awards (LCA) were claimed in five distinct clusters within Hanalei Ahupua'a; the shoreline, the Mahaana (taro fields adjacent to Waioli Ahupua'a), Puapuahoi-Limanui (the bottom lands of the Hanalei River), 'Anini (on the coast northeast of Hanalei Bay), and Kīloa (inland and adjacent to Limanui). Almost all of the Hanalei Ahupua'a LCAs were lowland locations far from the current project area, with the exception of those at 'Anini, which are located along the northwest edge of the project area (Figure 9 and see Figure 2). In Kalihikai the situation is reversed – almost all of the LCAs lie within the project area (See Figure 2). Table 1, below, lists all of the LCAs in the vicinity of the current project area.

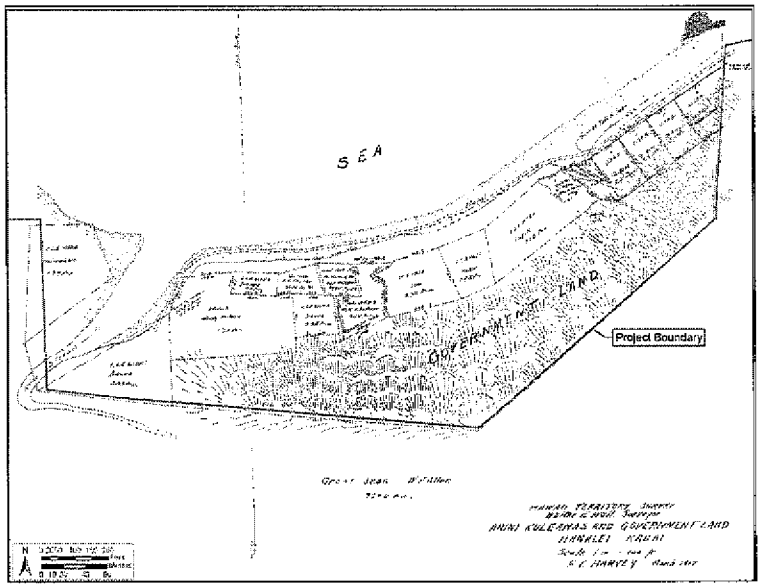

Figure 9. 1907 W.E. Wall Map showing LCAs in the vicinity of the current project area

Table 1. Land Commission Awards in and within the vicinity of the project area

LCA No.	Awardee	Contents
Hanalei Ahupua'a		
7671	Keahi	No. 1 is a house lot, 6 *lo'i* and a pasture.
8224	Ikua	No. 1 is a house lot and 1 *lo'i*. No. 2 is 9 small *lo'i*.
9956	Lua	No. 1 is a house lot, 1 large *lo'i* and 5 or 6 small *lo'i* and a small pasture.

LCA No.	Awardee	Contents
10328	Nainoaakua	No. 1 is 2 large *lo'i*, 3 small *lo'i*, a pasture and a house lot.
10720	Pukiki	No. 1 is a pond, five small *lo'i*, a pasture & a house lot
Kalihikai Ahupua'a		
7585	Kamiona	No. 1 is a house lot in "Niula." No. 2 is 3 *lo'i* in *'ili* "Kahihei."
8266	Ikua	No. 1 is a house lot in "Kaluhapa." No. 2 is 10 *lo'i* in *'ili* "Kaiki." No. 3 is 2 *lo'i* in *'ili* "Kaluhapa."
9129	Kapuhae	No. 1 is 2 *lo'i* & *kula* adjacent. No. 2 is 1 *lo'i* in *'ili* "Papaula."
11215	Aarona Keliihonui	Kalihikai Ahupua'a (2362 acres)
11244	Hulihia	No. 1 is 1 large & several small *lo'i* in "Kuiki" No. 2 [is] 4 *lo'i* in "Kouiki."
11245	Mose	No. 1 is a house lot in "Kaiki." No. 2 is 3 *lo'i* in "Kapapala." No. 3 is 1 taro patch in "Koholaiki."
11246	Puhi	No. 1 is a house lot in "Kaiki." No. 2 is 3 *lo'i*.
11247	Kekoa	No. 1 is a house lot in ili "Kapapala." No. 2 is 3 taro patches in same *ili*.
11248	Keolanui	No. 1 is a house lot in *'ili* "Kapapala."

LCA No.	Awardee	Contents
		No. 2 is 3 *lo'i* in "Kaiki." No. 3 is *kula* having orange tree in Kapalai.
11249	Kaunakahi	No. 1 is a house lot in "Kaiki." No. 2 is 3 *lo'i*.
11250	Kahakamoku	No. 1 is 6 *lo'i* & a house lot in "Niula." No. 2 is 3 *lo'i*
11253	Kuanaio	No. 1 is a house lot & 2 *lo'i* in "Nuila." No. 2 is 3 *lo'i* in "Nuila." No. 3 is *kula* & 1 orange tree in Kaluakanaka.
11254	Naea	No. 1 is a house lot in Niula. No. 2 is 6 *lo'i*.
11255	Ezera	No. 1 is a house lot in *'ili* "Kapapala." No. 2 is 3 *lo'i* in "Kaholaiki." No. 3 [is] one *lo'i*.
Kalihiwai Ahupua'a		
8559B:39	William C. Lunalilo	No details

4.4 1850s to 1900

According to records of the Royal Hawaiian Agricultural Society - organized in 1850 - in Honolulu, "for the twelve months from July, 1850, to June, 1851...Hanalei exported (to Honolulu) 21,298 pounds of coffee, 39 barrels of Irish potatoes, and 20 head of cattle, at a total value of $2,744.08" (Damon 1931:334). Coffee cultivation continued to dominate Hanalei, apparently established firmly within the landscape. However, the plantation owners were apprehensive: they foresaw an eventual lack of manpower in their fields as production increased and Hawaiian workers increasingly expressed their discontent with plantation life: "Mr. Rhodes stated (in an 1851 report) that laborers were demanding one dollar a day...and that some had refused to work even at four dollars a day" (Damon 1931:351). The California gold mines lured many Hawaiian laborers away from the island. The Agricultural Society's plan to import "Chinese coolie laborers under contracts based on the indentures used in employing seamen"

was welcomed by Hanalei planters (Damon 1931:351). In 1852 the first Chinese laborers arrived at Hanalei to work on the coffee plantations. By the following year the Chinese were fully integrated in the labor system; Rhodes' 1853 report to the Agricultural Society on Hanalei noted:

> Mr. Titcomb's Coffee Plantation is in fine order, and he expects a large crop, of perhaps 80 to 100 M. lbs. He has lately cleared more land for planting: his plantation is compact, and well managed. I believe he is satisfied with his coolies. He has a number of natives engaged, but has difficulty in making them fulfill their agreements. Our own plantation is thriving, although a number of years must elapse before it re-attains the prosperous state it was in 1849 and 1850, when our natives all left us, smitten with the California fever. I am very well satisfied with the coolies, and much prefer them as laborers. (Damon 1931:352-353)

According to Damon (1931), although the labor force was secure, natural forces wreaked havoc on the plantations. In 1847, a torrential rain flooded the valley, severely damaging the coffee trees. In 1851 and 1852 the Hawaiian Islands suffered a severe drought and the subsequent blight ravaged coffee trees at Hanalei and on all the islands. The plantations were able to continue producing for a few more years but, by the end of the 1850s, the Hanalei plantations were devastated; a visitor in 1860 contrasted the current situation with the flourishing scene of three years earlier:

> The coffee blight has entirely covered the two Hanalei plantations which in the spring of 1857 we saw in full and successful culture, yielding 200,000 pounds of excellent coffee. It was sad to witness the contrast. Then scores of women and children were busy picking the ripe berries, and depositing their gatherings at night at the overseer's office, but now all was silent. Not a gatherer was abroad, and we saw laborers bringing in coffee trees upon their shoulders, to heat the fires under the sugar boilers of Mr. Titcomb. (Damon 1931:351)

The "sugar boilers of Mr. Titcomb" the visitor noted were evidence of an unflagging resilience; for Titcomb, who had earlier converted his fields from silk to coffee, turned his energies to sugar growing during the latter 1850s.

Godfrey Rhodes, the other Hanalei coffee grower, sold his coffee plantation on Sept. 13, 1855. The Crown lands leased by Rhodes Coffee Plantation were purchased for $1,300 in 1853 and 1855 Rhodes sold out his interest in the plantation for $8,000 (Wilcox 1991:13). The man who purchased the land and plantation was Robert Crichton Wyllie, the Hawaiian Kingdom's Minister of Foreign Affairs.

Wyllie, a Scotsman who made his fortune as a merchant in South America, arrived in the Hawaiian Islands in 1844. Though Wyllie had not intended to settle in Hawai'i, in 1845 he accepted an appointment by King Kamehameha III as Minister of Foreign Affairs and served in that office until his death twenty years later.

As Foreign Minister, Wyllie's great ambition was the recognition of the Hawaiian Kingdom as a sovereign nation by the world's powers, which had been secured in 1843. But a more personal aspiration also captivated Wyllie: to build a manor for himself at Hanalei quite as magnificent as any he had known in Scotland. So in 1853 he began acquiring tracts of Hanalei land - beginning with the Rhodes Coffee Plantation - that within a few years would comprise an estate and plantation. Wyllie attempted to save the coffee plantation:

> For ten years (Wyllie) doggedly fought against [the] blight which gradually withered the trees. Finally facing reality, he pulled out the dead trees and planted a new crop, sugar. (Hackler 1982:66)

Where, half a century earlier, By 1862, Wyllie had "constructed an extensive sugar factory and other buildings at the eastern end of the Valley, along the river, importing much of the machinery from Scotland" (1000 Friends...1987:32) and in 1863 he bought Titcomb's lands, only one piece among the extensive land purchases Wyllie made during the early 1860s:

> On Feb. 5, 1863, Mr. Titcomb sold out to Mr. Wyllie...In all, four pieces of land passed to Wyllie, 750 acres at Emmasville, 1 acre at the landing, Kanoa Pond, 10 A., and Kukia on the opposite side of the river. Wyllie had before this, on April 17, 1862, bought the Ahupuaa of Kalihikai, this being the property of A. Keliiahonui, grandfather of Levi Halelea, given to Keliiahonui by an old alii. On Oct. 5, 1862, Wyllie bought at public auction from J.W. Austin and Chas. Kanaina (Guardians of W.C. Lunaliio) the Ahupuaa of Kalihiwai. (Wilcox 1991:14)

According to Wilcox (1991), Wyllie's land purchases and substantial investment in the development of his sugar operation reflected the brilliant future he envisioned for his estate. He intended to name as heir to his lands the young "Prince of Hawaii" (*Ku Haku o Hawai'i*), Albert Edward Kauikeaouli Leiopapa a Kamehameha, who had been born in 1858, the son of King Kamehameha IV and Queen Emma. It was after a visit by the royal family to Hanalei in 1860 that Wyllie named the estate "Princeville." He resolved to petition the king to proclaim the estate the "Barony of Princeville" - making it a fit legacy for the prince - but his plans were undone in 1862 when Albert died at the age of four. Wyllie himself died three years later. The estate and plantation were deeply in debt and in 1867 Wyllie's lands were auctioned off in 1867, sold for $40,051.50 to Elisha Hunt Allen who, like Wyllie, was an official of the Hawaiian government.

The Princeville Plantation continued in operation - in 1872 "the average crop was 400 tons, capacity of the mill, 1,000 tons" (Wilcox 1991:18) - under changing ownership until the 1890s (Figure 10). By the last decade of the nineteenth century, the difficulties of growing sugar cane at Hanalei were insurmountable:

> ...the cane had never done well in that cool, wet climate. Much of it rotted in the lower fields; the upper fields were, it is said, not plowed deeply enough and at times there was not water enough to flume the cane down to the mill. (Wilcox 1991:18-19)

The company failed; the last crop was harvested in 1893. By 1899, Albert S. Wilcox had secured control of the entire plantation, "The lower lands were rented out to Chinese rice-planters, and the upper lands between Hanalei and Kalihiwai were planted to imported grasses and turned into a cattle-ranch" (Wilcox 1991:19). Wilcox would later, in 1916, sell the land to Lihue Plantation Company and W.F. Sanborn (Wilcox 1991:19).

William Alexander had viewed the Hanalei valley dominated by coffee plantations, a visitor in the 1890s would come upon an entirely transformed landscape.

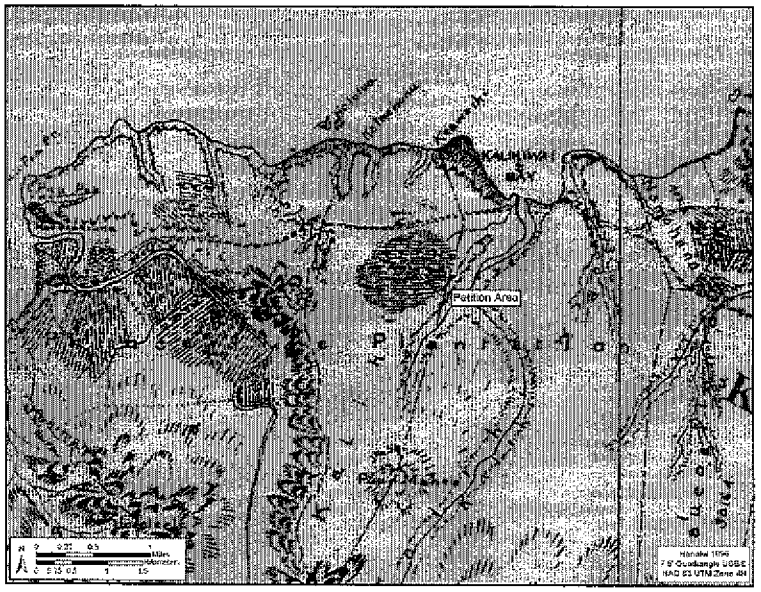

Figure 10. 1878 W.D. Alexander map showing the Princeville Plantation within the current project area

Eric A. Knudsen, recounting a trip around Kaua'i in 1895, presents the view of Hanalei as his party approached from Kalihiwai Ahupua'a:

> We...were glad when we reached the great valley of Hanalei. The road in those early days almost dived straight down to the bridge. It was steep and in wet weather very slippery...
>
> About half way down, the valley began to open up. Rice fields and taro patches covered the flat bottom lands as far as the eye could see...the view to our right, the winding river with a barge loaded with rice slowly drifting down on its placid surface, and beyond the great sweep of sandy beach, were a truly inspiring sight. (Knudsen 1991:153)

Knudsen's account reveals significant features of the Hanalei landscape during the last years of the nineteenth century. The bridge which now spanned the Hanalei River from the government road was a recent development. Until the 1880s, as noted in a tourist guide of that decade, there was no bridge over the river but there was a "ferry opposite the Princeville Plantation, where passengers, cattle, teams, etc., can pass the river free of charge, the ferry being supported by the Government and the Princeville Plantation, jointly" (1000 Friends...1987:58-59).

4.5 1900 to the Present

During the first decade of the twentieth century, rice-farming by the Chinese continued to be the focus of large-scale economic activity in Hanalei.

Two significant structures, which still exist, were constructed at Hanalei in 1912: the pier at the mouth of Hanalei River and the bridge spanning the river. The pier is described, in an application for placement on the National Register of Historic Places, as a "wooden deck...built during a period of economic prosperity in the area, primarily the result of a thriving rice industry" which "replaced an earlier shorter pier and primarily was employed for the shipment of rice."

While the new pier reflected the current flourishing rice-based economy of the valley, the construction of the bridge - replacing the wood bridge Eric Knudsen had crossed in 1895 - would provide an impetus to further change within Hanalei. The bridge is described, in an application for placement on the National Register of Historic Places, as a "106-foot, single span, steel through-truss (Pratt Truss) bridge built on reinforced concrete abutments, with a 17-foot roadway deck made of timber planks." The application also notes that the construction of such substantial steel structures, replacing older, flimsier timber bridges "helped stimulate the economic and social growth of the then relatively isolated North Shore" of Kaua'i. The facilitated access in and out of the valley may have accelerated the development of vacation houses along the Hanalei beach to take advantage of the pleasant breezes and spectacular water views.

The 1914 W.E. Wall map (Figure 11) shows Grant 4846 to W.F. Allen (879 acres) in the western portion of the project area. W.F. Allen is listed as a colonel and member of the Royal Order of King Kealakekua; his title was Secretary and Treasurer (Nicholson 1881:283). Thrum's (1891:161) 1890 report also lists Allen as a member of the Privy Council of State. The Report of the Governor of Hawaii (1902:54) lists the subject property as granted on October 6, 1904 and is also shown on the 1907 W.E. Wall map (see Figure 9). Research did not provide any additional information regarding W.F. Allen and based on historical documentation, the land was originally government land, and likely granted to Allen for his services to the Crown. Allen likely leased the property for various enterprises.

A 1916 article in the "Garden Island" characterized Hanalei's attractions by the second decade of the twentieth century:

> Hanalei has been a popular and populous community of late, a sort of suburb of Lihue since there were many Lihue people summering there, the various beach houses being full to overflowing. Morning, noon, and night the wharf has been alive with enthusiastic but "green" fishermen, mostly of a tender age, and the

> sands dappled with figures in proper costume and the waters flecked with tumbling swimmers who mostly couldn't swim. (In 1000 Friends...1987:63)

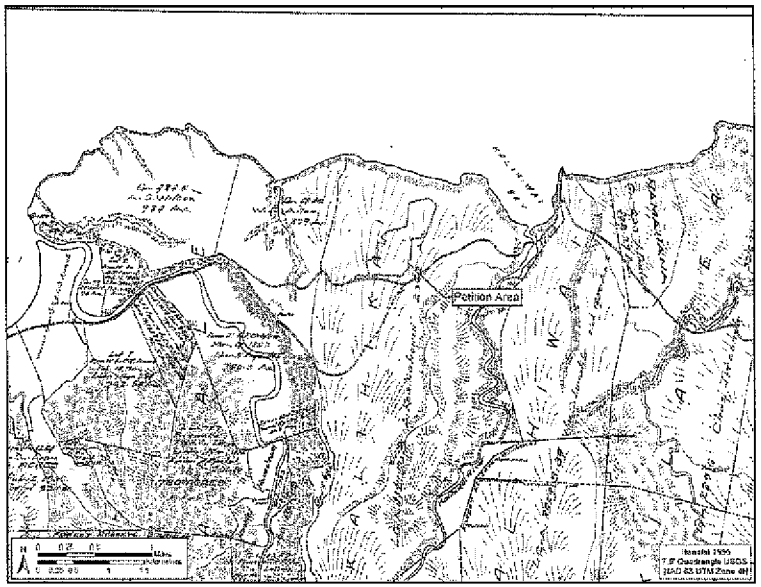

Figure 11. Portion of 1914 W.E. Wall map of Waioli and Hanalei Government Tract

Clearly foreshadowed is the future development of Hanalei and Princeville as a resort destination. Figure 12 shows Hanalei Bay and the project area vicinity prior to modern development.

Rice farming declined sharply throughout the Hawaiian Islands after the first decades of the twentieth century as lower-priced rice grown in California inundated the market. Total acreage in the islands dropped from a high of 9,425 acres in 1909 to 1,130 acres in 1935. By the end of the 1930s, the rice industry had ceased entirely on the islands of Hawai'i, Maui and Moloka'i (Coulter and Chun 1937:62). The rice farming that survived at Hanalei was of a different

character. Already in the preceding decades, Chinese rice planters at Hanalei and elsewhere had begun selling their fields to immigrant Japanese rice growers:

> In 1916, 16% of the rice lands in the then Territory of Hawai'i were controlled by Japanese growers. By 1932, a survey indicated that 62 percent of the Hawaii-grown rice was being cultivated by Japanese. At first the Japanese sold their paddy to Chinese owned rice mills, then, gradually, they took over the mills too (Coulter and Chun 1937:62).

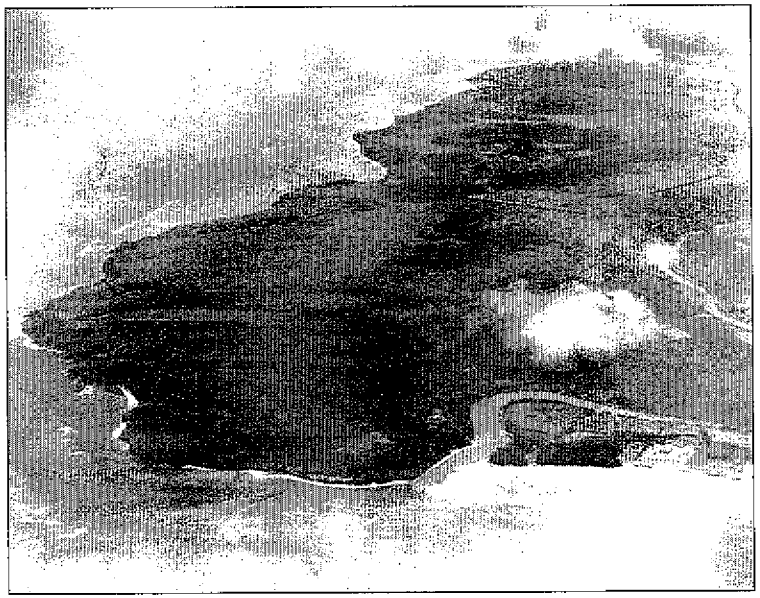

Figure 12. 1924 aerial photograph of Hanalei Bay and coastline; project area is in the upper half of the photo (Glick 1980:59)

As increasing numbers of Japanese moved into Hanalei to reside and work the rice fields, the original Chinese rice-growers moved to other commercial pursuits. For example, the Haraguchi family began leasing rice land at Hanalei from the Man Sing family and subsequently purchased the Man Sing mill in 1924. The family cultivated 75 acres in the valley. When the original Man

Sing mill was destroyed by fire in 1930, the Haraguchi family built the still extant mill that is presently listed on the National Register of Historic Places. The documentation for the mill's placement on the Register notes that the Japanese rice growers replaced the Chinese variety of rice with shorter grain rice that the Japanese preferred.

In the 1930s, the Agricultural Extension Service of the University of Hawaii began a program to increase rice production at Hanalei, resulting in a brief "resurgence in rice cultivation;" acreage in Hanalei increased from "759 in 1933 to 1058 in 1934," and by 1936 Hanalei "produced over two-thirds of all rice in Hawaii, almost all of it for consumption within the Territory" (1000 Friends...1987:117-118). It is this rice-dominated Hanalei landscape that E.S. Craighill Handy, in his 1940 study of planting areas throughout the Hawaiian Islands, describes as it appeared in the 1930s. Handy's account is especially valuable, and merits citation at length, as he notes both present usages, based on his field observations, and former usages, based on information from native informants:

> The swampy land below the hills at the west end of Hanalei next to Waioli is unused. The land between the highway and the bay on the west side of the river, much of which used to be terraces, is now given over to pasture and home sites. The land named Paele in the great bend of the river east of the bay, which used to be in rice or taro, is now used for pasture. The broad area inland from the river, named Kahanawai, is now planted with rice, except for the flats adjoining the base of the hill. According to Sheriff Lota, this area was only partly developed in terraces in ancient times. In the 1880's, the land just above the highway was planted in sugar cane, which gradually extended far up Hanalei Valley. Subsequently much of this land, which had not previously been in terraces, was cut up by the Chinese into paddy fields. It was only in the flats of Hanalei Valley proper that terraces were continuous in the old days. At present, rice paddies are continuous for 1.3 miles from the highway bridge where the Hanalei River turns east; another sizable rice patch lies four tenths of a mile beyond, the land between being neglected. Beyond this farthest rice plantation the Hawaiian homesteads commence. A few Hawaiians and other homesteaders plant a little taro for home consumption. It is said that there are numerous areas of abandoned small terraces farther in the interior. In lower eastern Hanalei, Mr. Sanborn is successfully growing taro in flats that have been used for rice for over 30 years. (Handy 1940:72)

Handy's description suggests that by 1930s, Hanalei Valley comprised a patchwork of mutating idle and active agricultural fields and pastures which reflected the vagaries of decades of shifting economic pressures.

While Handy asserts that taro farming survived in the 1930s only as a subsistence crop for a "few Hawaiians and other homesteaders" other sources suggest that the taro-growing area at Hanalei was somewhat more expansive: a U.S. Department of Commerce census of agriculture of 1939 recorded 108 acres in taro at Hanalei, comprising fully one-fifth of the total 529 acres in taro throughout Hawai'i (1000 Friends...1987:118).

According to National Register of Historic Places documentation on the Haraguchi rice mill, by the "early 1950s there were about 50 growers cultivating 170 acres of rice on Kauai" with Hanalei holding 90 of those acres, a precipitous drop from the 1058 acres recorded in 1934. Clearly, rice farming at Hanalei was no longer viable, once again frustrated by inexpensive rice imported into the Territory. The last rice mill, run by the Haraguchi family, ceased operating by the early 1960s.

As the Japanese farmers phased out rice production in the 1950s and 60s, they converted their fields to taro *lo'i*. By the late 1980s, taro-growing, that once dominated the traditional Hawaiian landscape, was firmly re-established within Hanalei, and farmed in two areas of the valley:

> ...195 active taro *lo'i* cover 140 acres within the Hanalei National Wildlife Refuge. These terraces range in size from 40 feet by 70 feet, to 220 feet by 400 feet, although taro *lo'i* are characteristically not regular in shape. The smallest taro patch recorded within the refuge was one-twentieth of an acre, while the largest was over two acres in size...
>
> Currently (in 1987), there are 201 active taro patches covering 93 acres mauka of Kuhio Highway, across from Hanalei town...These range in size from 30 by 90 feet, to 160 by 130 feet. The smallest taro patch within this area is one-fifteenth of an acre, while the largest is one-half an acre in size (1000 Friends...1987:27-28).

As taro-farming secured its place in Hanalei during the second half of this century, contemporary developments, entrepreneurial and governmental, within the *ahupua'a* would further re-define the character of Hanalei. Beginning in the 1960s, the Princeville area began its evolution - which continues at present - as a major resort and condominium complex. At the same time:

> ...the Federal government became a partner in shaping land use in the Hanalei Valley...by working with the Princeville Development Corporation to acquire land for the U.S. Fish and Wildlife waterbird refuge. The refuge has a supportive policy of continued taro production and the maintenance of the irrigation system and existing houses and farm outbuildings. (1000 Friends...1987:10)

The Hanalei National Wildlife Refuge was established in 1972 to provide feeding and nesting areas for endangered Hawaiian water birds, including the coot, stilt, gallinule and duck. It encompasses 917 acres of Hanalei Valley, including 70 acres of ponds, 600 acres of forest, and mountain areas, and in 1993, 125 acres of commercial taro fields (United States Fish and Wildlife Service 2009).

More recently, severe hurricanes –Iwa in 1982 and 'Iniki in 1992 - have demonstrated the precariousness of human development within the Halele'a environment, just as natural disasters thwarted the efforts of the newly-arrived nineteenth century entrepreneurs. However, the endurance of taro through the changes documented above - and its flourishing today - may preserve the memory of the pre-Contact Hanalei with its *heiau*, hula house, and starting places for races to the beach.

Section 5 Archaeological Research

5.1 Overview

The two main purposes of this section are: (1) to establish a general context for the project area by providing an overview summary of relevant archaeological evidence for Hanalei, Kalihikai and Kalihiwai Ahupua'a; and (2) to provide a detailed discussion of the archaeological evidence within and immediately adjacent to the project area. This review shows there are potentially archaeological sites and features in and around the subject project area reflecting a long period of pre-Contact settlement.

5.2 Early Archaeological Surveys

The first comprehensive study of the archaeology of Kaua'i was undertaken by Wendell C. Bennett (1931) based on field work accomplished in 1928-29. Bennett recorded five sites in Hanalei Ahupua'a, three in Kalihiwai, and one in Kalihikai as discussed in section 3.6. Po'okū Heiau, Site 139 is approximately 400.0 m south of the project area's southern boundary.

5.3 Modern Archaeological Surveys

Previously identified historic properties within the current project area consist of a World War II-era defensive post (Cleghorn 1979a) and Ka-D10-10 an agricultural system near the mouth of 'Anini Stream (Earle 1978). Pre-Contact agricultural sites, a historic cemetery, and historic military sites were found during the fieldwork for the companion report (Yucha and Hammatt 2008) to the current CIA. Archaeological studies conducted within the project area are presented below followed by archaeological studies conducted within the vicinity of the project area and relevant to the current study. See Yucha and Hammatt 2008 for additional information.

5.3.1 Princeville AIS (Cleghorn 1979a)

In 1979, Department of Anthropology, Bishop Museum, conducted an archaeological reconnaissance survey of approximately 620 acres of Princeville land, the majority of which is located within the current project area (Cleghorn 1979a). Only one historic property (SIHP# 50-30-03-1702), an upright boulder and adjacent semicircular excavation, was located within the study area. SIHP# 50-30-03-1702 was suggested to be a World War II-era defensive post (Cleghorn 1979a). No further archaeological work was recommended for the study area.

Additionally, three historic properties (a historic cemetery, a series of five agricultural systems, and Po'okū Heiau), were identified outside of the approximately 620-acre study area.

Cleghorn describes the historic cemetery as follows:

> The cemetery covers an area approximately 10 by 10 meters and contains at least 20 grave plots. Three of the plots are marked with headstones dated 1945, 1946, and 1963. One grave plot is marked by an uninscribed concrete capstone, and two others by alignments of stones, each measuring c. 1.5 meters in length. The

remainder are simply marked by a can or a jar set into the ground to serve as flower containers (Cleghorn 1979a:4).

The historic cemetery is likely located within the current project area.

5.3.2 Halele'a District Survey (Earle 1978)

Site Ka-D10-10, previously identified by Earle (1978) consists of an irrigation system east of 'Anini Stream. A contour ditch is the only feature remaining within the site. The ditch "formed a U-shaped line around the ridge." Water was diverted from the stream and channeled at the base of the ridge. The ditch lining consisted of large sub angular basalt. The pond fields are no longer extant but once ran almost to the shoreline. A 1950s tsunami destroyed the pond fields (Earle 1978:100-101).

5.3.3 Princeville Final Subdivision Project (Yucha and Hammatt 2008)

CSH conducted an archaeological inventory survey of the proposed project area this CIA is based upon. A total of 11 historic properties consisting of a total of 23 total features were identified within or near the approximately 400-acre Princeville Agricultural Subdivision project area. A total of ten of these historic properties are located along the northern (*makai*) boundary of the project area with the majority (7) located along 'Anini Stream. These sites included:

> Two irrigation ditches SIHP # 50-80-03- and SIHP # 50-80-03- (CSH 1 and CSH 6), two single terraces SIHP # 50-80-03- and SIHP # 50-80-03- (CSH 3 and CSH 10), a modified outcrop SIHP # 50-80-03- (CSH 4), a partially mortared wall SIHP # 50-80-03- (CSH 5), and a complex of adjacent terraces SIHP # 50-80-03- (CSH 2). A historic-era cemetery SIHP # 50-80-03- (CSH 9) consisting of five headstones was observed on a ridge top in the northwestern corner of the project area approximately 158.0 m west of 'Anini Stream. SIHP # 50-80-03- (CSH 2), SIHP # 50-80-03- (CSH 5), and portions of SIHP # 50-80-03- (CSH 1) are located outside of the current project area boundary.
>
> Additional historic properties located within the project area include a military bunker SIHP # 50-80-03- (CSH 8), a remnant irrigation ditch SIHP # 50-80-03- (CSH 7), and a complex SIHP # 50-80-03- (CSH 11) consisting of 4 terraces, 2 mounds, 1 alignment, and 1 leveled area. The SIHP # 50-80-03- (CSH 8), military bunker, is located along the northern boundary of the project area approximately 167.0 m south of Honono Point. SIHP # 50-80-03- (CSH 7), remnant irrigation ditch, is located at the base of a ridge south of the polo field along 'Anini Road. The SIHP # 50-80-03- (CSH 11) complex is located at the base of the western tributary gulch of 'Anini Stream (Yucha and Hammatt 2008:47).

5.3.4 'Anini County Park Inadvertent Burial Find (Jourdane 1996)

In 1996, SHPD/DLNR conducted the recovery of inadvertently discovered human remains at 'Anini County Park, SIHP# 50-30-03-1984 (Jourdane 1996). Burial remains "consisted of a few

cranial parts, leg, foot and hand bones" (Jourdane 1996:1). The burial remains were considered to represent one individual. Burial reinterment was recommended.

5.3.5 'Anini Vista Subdivision AIS (McGerty and Spear 1999)

In 1999, SCS conducted an archaeological inventory survey at Lot 3 within the 'Anini Vista Subdivision (McGerty and Spear 1999). A total of nine shovel test probes were excavated within the study area. No significant historic properties were identified during excavation. No further archaeological work was recommended for the study area.

5.3.6 'Anini Road Inadvertent Burial Find (McMahon 1999)

In 1999, SHPD/DLNR documented the inadvertent discovery of human remains along 'Anini Road (McMahon 1999). Burial remains consisted of "...broken fragments of the jaw, skull and some toe phalanxes" (McMahon 1999:1). The burial remains were designated SIHP# 50-80-03-0645. Additionally, a single-piece fishhook, a basalt stone flake, and midden were discovered within previously excavated footings. Monitoring was recommended for any future excavations within the study area.

5.3.7 'Anini Beach Monitoring (Dega 2003)

In 2003, SCS conducted monitoring for a property along 'Anini Beach (Dega 2003). Disarticulated human remains consisting of "...the proximal end of two tibiae, a portion of the femur shaft, and the distal portion of a humerus" were discovered within the study area and designated SIHP# 50-30-03-2080 (Dega 2003:8). Additionally, faunal (dog) remains and historic glass and ceramic artifacts were encountered. Monitoring was recommended for any future excavations within the study area.

5.3.8 Kūhiō Highway Monitoring (Fong et al. 2006)

In 2006, CSH conducted monitoring for an approximately 10-mile portion of Kūhiō Highway (Fong et al. 2006). No significant historic properties were identified during excavation. Monitoring was recommended for any future excavations within the study area due to the potential of encountering cultural deposits and human burials.

5.3.9 Summary of Previous Archaeological Studies

Previous archaeological studies in and within the vicinity of the current project area are summarized in Table 3 and indicated on Figure 21.

Source	Location	Nature of Study	Findings
Bennett (1931)	Hanalei Ahupua'a	Archaeological survey	Site 139 - Po'okū Heiau
Earle (1978)	Halele'a District	Dissertation Research	44 agricultural systems within Halele'a District Ka-D10-10 within larger project area.
Cleghorn (1979a)	Hanalei and Kalihikai *ahupua'a*	Archaeological Reconnaissance Survey	SIHP# 50-30-03-1702
Cleghorn (1979b)	Hanalei Wildlife Refuge	Archaeological Survey	SIHP# 50-30-03-1007 to -1016
Hammatt (1980)	Portions of the Kaua'i Belt Road, Kalihiwai to Princeville, Kaua'i.	Archaeological Reconnaissance Survey	No significant finds
Schilt (1980)	Hanalei Wildlife Refuge	Archaeological Investigation	SIHP# 50-30-03-1017 to -1027
Kikuchi (1981)	Hanalei Wildlife Refuge	Archaeological Investigation	SIHP# 50-30-03-604
Athens (1983)	Hanalei Wildlife Refuge	Archaeological Investigation	Subsurface excavations at SIHP# 50-30-03-1007
Kikuchi (1988a)	Princeville Corporation's Nursery Staging and Light Equipment Storage Area.	Archaeological Investigation	No significant finds
Kikuchi (1988b)	Church of the Pacific	Archaeological Investigation	No significant finds
Quebral and Cleghorn (1990)	Kūhiō Highway Improvements Project and TMK 5-03-06: 14	Archaeological and Historical Survey	No significant finds

Bordner (1991)	Hanalei Garden Farms	Archaeological Reconnaissance Survey	No significant finds
Raymond and Burnside (1991)	Hanalei Wildlife Refuge	Subsurface Excavation	SIHP# 50-30-03-991
McMahon (1993)	Po'okū Heiau	Archaeological Field Inspection	Nearby nursery determined to have adversely affected Po'okū Heiau
Shapiro (1993)	Hanalei Wildlife Refuge	Archaeological Inventory Survey	SIHP# 50-30-03-0726 to -0741, -0408, and -9385
Spear and Chaffee (1994)	Hanalei Wildlife Refuge	Data Recovery	Subsurface excavations at SIHP# 50-30-03-1007. One new feature recorded
Bordner (1994)	Hanalei Garden Farms	Archaeological Reconnaissance Survey	No significant finds
McIntosh and Cleghorn (1994)	Hanalei Wildlife Refuge	Archaeological Monitoring	No significant finds
Jourdane (1996)	Princeville	Recovery of Inadvertently Discovered Human Remains	SIHP# 50-30-03-1984 (human burial remains)
McGerty and Spear (1999)	Lot 3, 'Anini Vista Subdivision	Archaeological Inventory Survey	No significant finds
McMahon (1999)	'Anini Road	Recovery of Inadvertently Discovered Human Remains	SIHP# 50-80-03-0645 (human burial remains)
Hammatt et al. (2000)	5- acre Parcel of the Proposed Hanalei Valley Scenic Stop, Kūhiō Highway	Archaeological Inventory Survey	No significant finds

Dega (2003)	'Anini Road (TMK: 5-3-04:36)	Archaeological Monitoring Report	SIHP# 50-80-03-2080 (human burial remains)
Fong et al. (2006)	A 10-Mile stretch of Kūhiō Highway,	Archaeological Monitoring Report	No significant finds
Yucha and Hammatt (2008)	Princeville Ag Subdivision	Archaeological Inventory Survey	11 sites identified

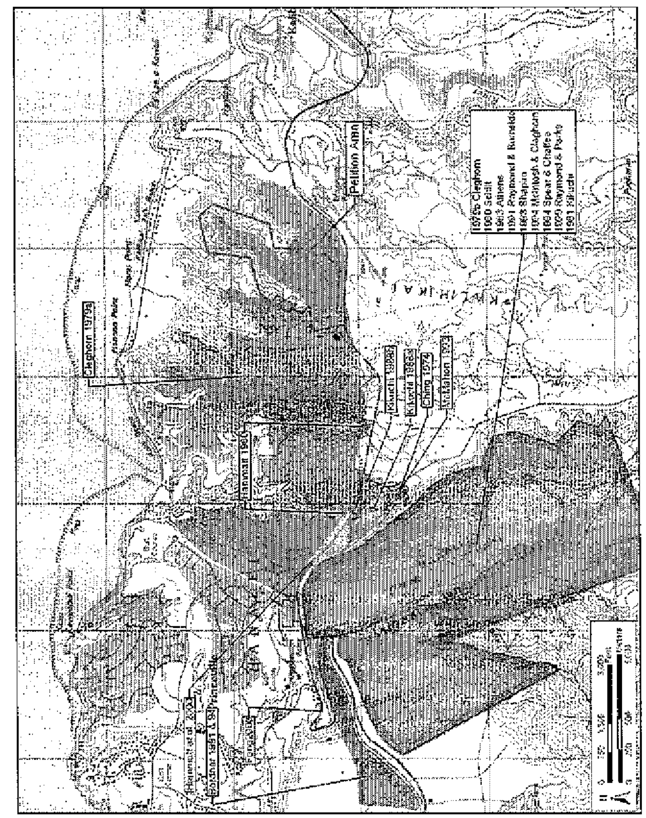

Figure 13. USGS 7.5-minute 1996 Līhu'e Quadrangle Map showing previous archaeological studies conducted in and within the vicinity of the current project area

Section 6 Community Consultation

6.1 Overview

For this CIA, CSH contacted and consulted with Hawaiian cultural organizations, government agencies, and individuals who might have knowledge of and/or concerns about cultural resources and practices specifically related to the project area. For this project, CSH has used letter, e-mail, telephone and in person contact. In the majority of cases, letters with a detailed description of the proposed action, including project acreage and description provided by Group 70 International, along with a map and aerial photograph of the project area were mailed with the following text:

> At the request of Group 70 International, Inc., Cultural Surveys Hawai'i Inc. (CSH) is conducting a Cultural Impact Assessment (CIA) for a section of the proposed Princeville Ranch Agriculture Subdivision Project located in the Kalihiwai and Kalihikai Ahupua'a in the Hanalei District on the Island of Kaua'i.
>
> The area of focus is the County Land Usage Commission (LUC) petition area which is part of a larger project, the planned Princeville Agricultural Subdivision. The petition area is a 120 acre site *makai* of the Kūhiō Highway which includes 1 full agricultural lot, portions of 4 other lots and 17 potential house sites (see attached aerial photograph and USGS map of the petition area). This petition area is part of a larger 400 acre Agricultural subdivision plan which is part of the Princeville Ranch Preservation Plan. The proposed project includes a low-density agriculture subdivision in TMK (4) 5-3-006; 001 & 014 por., which will incorporate approximately 400 acres of agriculture and open-zoned land. Associated with this plan is an additional 6,000 acres, 4,000 of which will be maintained in conservation and 2,000-acres of which will be maintained as long-term grazing land as part of the agriculture use.
>
> This CIA is to be included in the Planning Report in Support of Princeville's State Land Use Commission Motion to Revert from Urban to Agriculture, changing the area from a designation of an urban for golf course zone to an agricultural subdivision. This CIA is *not* part of an Environmental Assessment (EA) or an Environmental Impact Statement (EIS).
>
> The purpose of this cultural study is to assess potential impacts to cultural practices as a result of proposed development in the Hanalei District. We are seeking your *kōkua* and guidance regarding the following aspects of our study:
>
> - **General history and present and past land use of the project area.**
> - **Knowledge of cultural sites which may be impacted by future development of the project area - for example, historic sites, archaeological sites, and burials.**

> - **Knowledge of gathering practices in the project area, both past and ongoing.**
> - **Cultural associations of the project area, such as legends and traditional uses.**
> - **Referrals of *kūpuna* or elders and *kama'āina* who might be willing to share their cultural knowledge of the project area and the surrounding *ahupua'a* lands.**
> - Any other cultural concerns the community might have related to Hawaiian cultural practices within or in the vicinity of the project area.

Several (one - five) attempts were made by mail, e-mail and telephone to contact individuals, organizations, and agencies apposite to the CIA for Kalihikai, Kalihikai and Hanalei Ahupua'a. The results of all consultations are presented in Table 2.

Table 2. Community Consultation Table

Name	Affiliation, Background	Comments
Aipoalani, C. Kunane	Chairman Kaua'i-Ni'ihau Island Burial Council	CSH sent project letters and figures to Mr. Aipoalani on April 29, 2009 and later emailed letter and figures on May 9, 2009.
Andrade, Carlos	*Kama'āina* of Hā'ena and Hawaiian Studies Professor at University of Hawai'i Mānoa	CSH met with Mr. Andrade at the Center for Hawaiian Studies on May 9, 2009. Mr. Andrade expressed concern regarding a stream located near the eastern boundary of the project area but was unsure how it was being used by *kama'āina* of the area. He suggested that CSH speak with the John Kruse, David and Linda Sproat, Julio and Val Inanod, Kevin Paik, Presley Wann and Maka'ala Ka'aumoana.
Ayau, Halealoha	Hui Mālama O Nā Kūpuna O Hawai'i Nei	CSH emailed project letter and figures to Mr. Halealoha on April 29, 2009. A follow-up email was sent July 17, 2009. Mr. Ayau forwarded CSH's letter to applicable parties.
Carswell, Donn	Po'okū Stables- Princeville	CSH contacted Mr. Carswell via

	Ranch	telephone on June 9, 2009. On June 12, 2009 Mr. Carswell agreed to participate in the study but was unavailable for an interview.
Cayan, Phyllis "Coochie"	State Historic Preservation Division (O'ahu Office)	See Section 6.1.1 and Appendix A.
Chuan, Ray	Kaua'i Friends of the Environment	CSH sent project letter and figures on April 29, 2009 and July 13, 2009.
Crowell, Dee	Kaua'i Burial Council Resort Group	In a June 1, 2009 email, Mr. Crowell recommended CSH speak with Donn "Curly" Carswell.
Drake, Lyah	Outreach Coordinator, Kaua'i Museum	CSH mailed project letter and figures on April 29, 2009 and later emailed letter and figures on June 8, 2009.
Forrest, Kainoa Chandler	President, Hanalei Hawaiian Civic Club	CSH mailed project and letter figures on April 20, 2009.
Fu, Edwin	*Kama'āina* of Hanalei	CSH left a voice message for Mr. Fu on June 8, 2009. Project letter and figures were sent July 13, 2009.
Furfaro, Ema	*Kama'āina* of Princeville	Ema Furfaro's family is originally from Hā'ena but moved to Princeville two years after the 1957 tsunami. Mrs. Furfaro was not aware of any cultural sites in the area but recommended CSH speak with Edward Fu, Sam Woodward, Harry Paik, Val Inanod, and Lorraine Lanning, all kama'āina of the Kalihikai or Kalihiwai area.
Haraguchi, Rodney	Kaua'i Taro Growers Association	CSH sent letter and figures on April 29, 2009 and on July 13, 2009.
Hashimoto, Thomas and Wanda	Family of Hanalei taro farmers	CSH sent letter and figures on May 9, 2009 and on July 13, 2009.

Inanod, Val	*Kama'āina* family from the area	CSH left a message for Mr. Inanod on June 11, 2009 and July 3, 2009.
Kaluahine, Stanley	Former manager of Princeville Homeowners Association and *Kama'āina* of Princeville area.	See Section 7.2.
Kaohi, Lionel	Hawaiian Civic Club of Kaumuali'i	CSH sent letter and figures on April 29, 2009. CSH sent a follow-up email on May 8, 2009.
Ka'aumoana, Maka'ala	Hanalei Heritage River, *Kama'āina* of Kalihiwai	CSH contacted Ms. Ka'aumoana on April 13, 2009 via telephone. CSH sent a follow-up email on June 16, 2009. Ms. Ka'aumoana was not available for an interview during the community consultation period.
Kauka, Sabra	Nā Pali Coast 'Ohana	CSH mailed letter and figures on May 27, 2009 and July 13, 2009.
Kekua, Kehaulani	Director of Kaua'i Culture and Heritage Center	CSH sent letter and figures on April 29, 2009. CSH sent a follow-up email on May 8, 2009.
Kimura, Jan	*Kama'āina* of Princeville area.	See Section 7.1.
Kobayashi, Suzanne	*Kama'āina* family	CSH sent project letter and figures on May 9, 2009.
Kruse, John	Kaua'i-Ni'ihau Island Burial Council	CSH spoke with Mr. Kruse on June 10, 2008. Mr. Kruse recommended CSH speak with Donn Carswell and David, Linda, and Stacy Sproat.
Lovell-Obatake, Cheryl	Kaua'i Resident	CSH sent project letter and figures on April 29, 2009 and July 13, 2009.
McMahon, Nancy	Kaua'i Archaeologist, State Historic Preservation Division	Ms. McMahon suggested CSH speak with Barbara Say.
Mijares, Scott	Save Kaua'i	CSH contacted Mr. Mijares by email on May 4, 2009.
Nāmu'o, Clyde	Office of Hawaiian Affairs	See Section 6.1.2. and Appendix B.

Sproat, Stacy	Waipā Foundation	CSH mailed letter and figures on April 29, 2009 and followed up by email on June 8, 2009.
Sproat, David and Linda	*Kama'āina* family of Kalihiwai	See Section 7.4.
Oi, Tommy	Department of Land and Natural Resources- Kaua'i	CSH sent letter and figures on April 29, 2008 and followed up by email on May 8, 2009.
Paik, Kaleo	State Historic Preservation Division	Ms. Paik referred CSH to the Hashimoto, Kobayashi, Inanod and Kelekoma families, all of whom have lived in the Hanalei area for generations. See Section 6.1.1 for her statement about the proposed project.
Paik, Kevin	*Kama'āina* family of Kalihikai	CSH spoke with Mr. Paik on June 18, 2009 and emailed project letter and figures later that day.
Tsuchiya, Rick	Kaua'i Historic Preservation Review Commission	See Section 6.1.3 and Appendix C.
Trembath, Healani	Alu Like Kūpuna Program	CSH contacted Ms. Trembath by email on May 27, 2009 and July 12, 2009.
Wann, Presley	Kaua'i-Ni'ihau Island Burial Council	CSH contacted Mr. Wann by email on June 16, 2009 and July 12, 2009.
Woodward, Sam	*Kama'āina* of 'Anini	See Section 7.3.

6.2 State Historic Preservation Division (SHPD)

6.2.1 Response from Phyllis "Coochie" Cayan

CSH contacted Phyllis "Coochie" Cayan, History and Culture Branch Chief of SHPD, on April 29, 2009. In a written response sent to CSH June 23, 2009, (see Appendix A), Ms. Cayan expressed concern that although the project area has been used for ranching for an extended period of time, there is a possibility that some cultural resources have not been destroyed by cattle and that ground work may uncover ancient or historic burials or burial sites. She also required assurance that significant features (i.e., upright boulder, Po'okū Heiau, agricultural terraces and water usage) in the general area will not be impacted by development. Ms. Cayan also referred CSH to the Kaua'i Museum, Kaua'i-Ni'ihau Island Burial Council members John

Kruse, Aunty Barbara Say and Chairman C. Kunane Aipoalani. She encouraged CSH to "talk-story" with or to get referrals from these people regarding traditional and cultural practices in the area.

6.2.2 Response from Linda Kaleo Paik

CSH contacted Linda Kaleo Paik of SHPD on April 29, 2009. In a written response sent to CSH on June 23, 2009, Ms. Paik expresses concern with the loss of agricultural land for luxury homes. She also states that the *ahupua'a's* watershed resources may be impacted by the runoff from the development. She encourages the project proponent to practice good cultural stewardship of the land and to develop the land thinking of the generations to come. The following is her written statement:

> I have reviewed your request for comment on the proposed Princeville Agricultural Lots. I have a concern in regards to this particular area which would break up a large portion of land for farm lots. I have seen this type of development which on the onset appears to be viable and "good use" for the area but a closer inspection may prove otherwise.
>
> The area is currently zoned for urban use with the intent use being a golf course. The request is to change the zoning from this use to agriculture. Here again it sounds like a prudent use for the land. However, in reality, will this be the intended use or will it be for "gentleman farmers" to build their luxury homes at the expense of losing productive land for actual viable agricultural purposes. Viable agricultural businesses cannot function on small acreages but need larger parcels in which to make any endeavor economically feasible. Also, will the land be used for bonafide farmers with crops that will help stimulate the island's economy? It seems that the reality and the "feel good" intentions of this project are poles apart.
>
> Our environment is dependent upon us making decisions that foster good stewardship and not let landowners wants to dictation our decisions. Our lands are not investments chips to be cashed in for gain. With landownership must come the kuleana of stewardship. Stewardship means, in its simplest form, to take into account the whole area including surrounding lands when determining use. There is a need for watershed areas and the continued encroachment upon these watershed areas directly impacts what happens to the lands from the mountain to the sea. While under construction and the wait for the excavated lands to rebuild, there is a real problem of soil runoff that will adversely affect the sea and all life in and around the runoff. The problems that can and will occur from narrow thinkers will plague the environment for generations to come.
>
> Before a development such as this is considered, all impacts should be scrutinized and weighed against the greater good of the island, the environment and the need for more urbanization rather than the narrow lens of development. As humans, our life span is miniscule but the damage that we do is forever.

6.3 Office of Hawaiian Affairs (OHA)

CSH contacted Clyde Nāmu'o, Administrator of the Office of Hawaiian Affairs, on April 29, 2009. In a written response sent to CSH on June 17, 2009 (see Appendix B), Mr. Nāmu'o had no comments relating specifically to the project but requested assurance that an archaeological inventory be submitted and approved to the Department of Land and Natural Resources- Historic Preservation Division, and that consideration be afforded to individuals accessing the project area for traditional, customary or subsistence purposes.

6.4 Kaua'i Historic Preservation Review Commission

CSH contacted the Kauai Historic Preservation Review Commission coordinator Rick Tsuchiya on April 29, 2009 and again on June 8, 2009. The KHPRC met on July 14, 2009 and offered the following standard recommendations on CIAs:

- That the applicant consult with the State Historic Preservation Division (and Burial Council), the Department of Hawaii Homelands and the Office of Hawaiian Affairs;
- That a community input program (eg. Flyers, notices, meeting with community association, newspaper, canoe clubs, civic clubs, etc.) be initiated by the applicant to obtain information on cultural practices or resources in the project area;
- That individual KHPRC members contact CSH directly with the names of kupuna in the area who may participate in the consultation process;
- That reference checks be undertaken at the Kauai Historical Society, Kauai Museum, State Archives, Bishop Museum, Libraries, Place Names resource documents, and LCA's.

In a separate letter (Appendix C), the KHPRC also recommends that community meetings in Princeville and Hanalei be considered. They also refer CSH to Henry Gomes, the Fu family, the Conants, the Yokotakes, the Sproat family and other North shore families.

Section 7 Kama'āina "Talk Story" Interviews

Kama'āina and *kūpuna* with knowledge of Hanalei and Kalihikai Ahupua'a and the proposed project area were contacted for participation in this assessment. The approach of CSH to cultural impact studies affords these community contacts an opportunity to review transcriptions and/or interview notes and to make any corrections, deletions or additions to the substance of their testimony.

Presented below are brief backgrounds of each participant, followed by their comments and concerns about the proposed project area.

7.1 Jan Kimura

CSH interviewed Mr. Jan Kimura on June 12, 2009. Mr. Kimura was born and raised in Kilauea at one of the old plantation camps. He has worked for the Princeville Golf Course for 17 years and is a member of the Kaua'i Planning Commission. Prior to working at the golf course he worked for Princeville Ranch giving trail rides and tending to the cattle. CSH met Mr. Kimura at the Princeville Golf Course and he took the CSH researchers on a site visit.

7.1.1 Habitation

At the project site, Mr. Kimura pointed out an area where the *hau* brush was being cleared. He says that people had lived in the valley of the project area, but because the *hau* bush is too thick he hasn't been down to the area himself. Presently, he believes it is in this area that a family with *kuleana* land may be clearing for farming purposes. He says they may be using the water from the stream mentioned below.

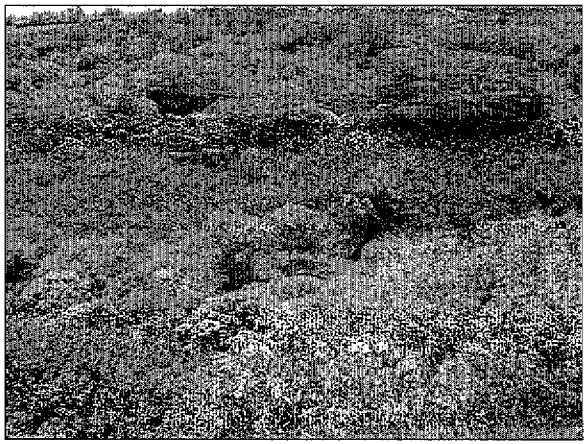

Figure 14. Recent clearing in *hau* bush (CSH)

Figure 15. View from project area (CSH)

Figure 16. Stream below the project area draining into the ocean (CSH)

7.1.2 Trails

Mr. Kimura is familiar with a number of trails in the project area and uses them when hunting. One trail he pointed out goes down from the bluffs to area where the stream drains into the ocean.

7.1.3 Plant Resources and Gathering

When asked about the plant resources in the area, Mr. Kimura mentions mango, *liliko'i* (*Passiflora edulis*), and wild white taro. This particular variety of taro was best for *lū'au* (leaves of the taro). However, the taro in the area has been dug up by wild pigs in the area.

7.1.4 Hunting

Mr. Kimura hunts pigs in the project area every Sunday. He also mentions that pheasant hunting occurs to the west of the project area.

7.1.5 Impacts

When asked how the proposed project will affect his hunting, he says that it would have to stop completely and that he will need to go other places to hunt. However, he views hunting as a "privilege" and understands he will need to stop hunting completely when the homes are built.

7.2 Stanley Kaluahine

CSH interviewed Mr. Stanley Kaluahine on June 12, 2009 in the dining room of the Maka'iwa Hotel. Mr. Kaluahine was born in Kilauea in 1931 and was raised in the Kalihiwai area. His mother was from 'Anini. His family currently owns property near 'Anini Beach. His father was a fishermen and a road foreman for the Territory of Hawai'i. His grandmother told him that they were descended from *ali'i* (chiefs) and designated him as a *kahuna* (priest). She shared all types of knowledge with him, including *lā'au lapa'au*. As a *kahu* (guardian), he can see and hear things that others can't. He served thirty years in the United States Marine Corps and has traveled around the world, including two terms in Vietnam. He returned to Hawai'i in 1982 and worked as the general manager for the Homeowner's Association for ten years before retiring. He is currently a member of the Rotary Club. His ministry aids local families to find homes and jobs. He currently lives in Anahola. He agrees with development in general, saying it is progress, and that young Hawaiians should be a part of the process. However, he has seen many changes to the area in his lifetime. He says that when he returned to Hawai'i after serving in the Marine Corps, there was "nothing left. There used to be pine trees, but there was only *'ōpala* (trash) left."

7.2.1 Gathering

During his childhood, he hunted pigs with his father and his brother in and near the project area. They would climb a trail and would hunt with dogs. He also recalls picking young guava leaves in the project area. He says that chewing the guava leaves cleans the tongue. He explained that the tongue is an indicator of one's health and cleaning the tongue cleans the body. He also remembers picking mangoes in the project area.

7.2.2 View Planes

He states that he probably will not be able to see the proposed development from his family's property, in the *makai* area of 'Anini Beach.

7.2.3 Ocean Resources

He and his father would fish from Hā'ena down to Kōloa. He remembers looking out from a hill to check if there were fish there. Although his father gave the responsibility of fishing to his brother, he still recalls fishing makai of the project area. He says there are *'oama* (young of the goatfish) there and that people still fish today.

Referring to another problem stemming from the development of Princeville --- the polluted ocean and water system--- Mr. Kaluahine reports that since the golf course was built, the ocean and streams have been polluted. There was once *limu kohu* (*Asparagopsis taxiformis*) and

wawae'iole. However, now there is no *limu*. He has observed how development has decreased marine resources.

7.2.4 Burials

He also shared that while building the neighboring 'Anini Vista properties, the developers moved his family's bones from the area, which was shocking and disrespectful. He adds that there are no *'iwi kūpuna* that he knows of, in the current project area. He adds that the 'Anini Vista properties "look nice" and wouldn't mind if the proposed project looked like the 'Anini Vista properties.

7.2.5 Project Concerns

He shares concern with the existing infrastructure, especially the roads and traffic. He said that it takes an hour to get through the traffic congestion in Kapa'a. He says that Kaua'i is growing so quickly.

He also expresses concern with the property tax in Princeville. He said that most of the *kama'āina* families no longer live in Princeville due to the high property tax.

Visiting the project area, he feels there is "nothing wrong" with the site for the proposed project. He cites examples of other projects in the Hanalei area, which have become controversial, such as Joe Brescia's property. He foresees no problems with the current project.

7.3 Sam Woodward

CSH interviewed Mr. Sam Woodward at the Princeville Airport on June 12, 2009. Mr. Woodward was born in Honolulu, but moved to Kaua'i at age five. His grandfather owned property in Kalihikai. Mr. Woodward still owns part of his grandfather's property, but the lot is currently empty. He moved from the Kalihikai area around 1969 to work on a plantation and now lives in Kilauea. His family remained living in Kalihikai until the 1970's. He served two years in the United States Army and currently works for Princeville Estates.

7.3.1 Habitation

Mr. Woodward says he has seen many changes in the Princeville area. He remembers there were few houses in the Kalihikai area (approximately eight). Many of the old-time Hawaiian families who once owned these homes and surrounding taro fields have sold them. Mr. Woodward explains that these *kama'āina* were no longer able to afford the property taxes, which have increased as a result of wealthier outsiders moving in and raising the monetary value of surrounding lands.

7.3.2 Agriculture

His grandfather's land was used to grow kalo for poi. However, his grandfather sold the land and the new owner built homes on the property. The family also grew taro all the way to the back of Kalihikai. They used the water that came from a ditch that started in Kalihiwai to feed the taro. He also recalls a Japanese family growing rice and vegetables at one time, but they sold their property and aren't there anymore. Mr. Woodward does not know of anyone currently

growing taro. He recalls wild taro growing down in the makai (towards the sea) area. He recalls taking stem to use for lū'au (young taro tops) leaf, however, the taro is not there anymore. He does know that "way up in the back" of Kalihikai there are some families farming.

7.3.3 Gathering

When asked if he ever entered the project area, he says that he used to "climb all over the mountain as a kid," and pick and eat mountain apples and pineapples. He also recalls sliding down the hills in the project area with a *ti* leaf. Further down *makai*, he recalls a lot of *hau* bush, which he and his friends used to make bonfires.

7.3.4 Ocean Resources

Mr. Woodward and his friends have fished for *manini*, *weke*, *uhu*, *kole* and *kala*. He also remembers picking *limu 'ele'ele*, which is the fine green type of *limu* and *waewaei'ole*. He says there is hardly any *limu* there now. He attributes to these changes to the cesspools in the new homes down by 'Anini Beach. When asked if anyone is still fishing or gathering *limu*, he said that people may still be catching squid at night.

7.3.5 Stream Resources

Mr. Kaluahine also spoke about a stream, which is not as it was before. He remembers catching *'ōpae* (in the stream. In the 1970's, specifically 1974-1975, he began to notice differences in the stream. The golf course was built and began diverting water. When asked where the outlet for the stream was, he describes it as being near a lady's home with ducks. He says at one time 'Anini had five streams but because of the water diversion, most of them have dried up. He described a cave with spring water in it, on the other side of the hill towards the airport. He is unsure if the cave is still there.

7.3.6 Hunting

He says there are a lot of wild pigs in the area. However, hunting is illegal because the project area is private property.

7.3.7 Burials

Mr. Kaluahine does not know of any *iwi kūpuna* in the project area, but he says there are plenty of bones along the shoreline and in the beach park.

7.3.8 Project Concerns

Regarding concerns about the proposed project, Mr. Woodward does not have any objections to the project proponents as long as they build it as agricultural land. He recommends that the developer should prevent any runoff from making its way into the streams and ocean. He says that there are two streams on either side of the valley and runoff would cause a jam of the streams. He also says that he hopes that the developers will create a setback along the borders of the project area. About development in general in the Princeville area, Mr. Woodward says that "things are moving too fast" and it hard to "absorb all of it." He says that he has been here all his

life, and things are quickly changing. He no longer sees the open spaces he remembers from his youth.

7.4 David and Linda Sproat

CSH met with David and Linda Sproat on July 1, 2009 at their *'ohana* home in Kalihiwai. They have properties in the Kalihiwai and Kalihikai Ahupua'a including some in the valley below the project area, which have been passed through their families for many years. Mrs. Sproat, whose family has been in the area since the year 1200, was a third generation teacher at Kilauea Elementary. Mr. Sproat was instrumental in founding the Hawaiian Hanalei Farmer's Association, which was the precursor to the Waipā Foundation. Both Mr. and Mrs. Sproat continue to sit on the Waipā Foundation board. They are also active and involved in many other community and island initiatives.

They have seen many changes to the place during their lifetime including rising property tax and a loss of stream and ocean resources. As residents who have lived in the area for generations and generations, they have developed in depth knowledge of the land and its resources, and have observed first hand how development has impacted those resources.

7.4.1 Agriculture and Gathering of Plant Resources

The Sproats raised apple bananas and vegetables on their properties neighboring the project area from the 1980s until the early 1990s. For a short period of time they also kept their cattle *makai* of the project area. They recall Mitchee Fukuda farming there as well.

There was much to be gathered in the area including watercress, swamp cabbage (*ung choi*) and *'āhē* taro. The watercress had been planted by someone long ago and had flourished on its own. *'Āhē* taro was also once plentiful in the area and was prized for its *lū'au* because the leaves were so tender and did not cause the itchiness that can be caused by *lū'au* that has not been cleaned well. Although Mrs. Sproat is unsure if swamp cabbage and watercress are still available in the valley, she is certain that *'āhē* taro is no longer available because wild pigs have uprooted them.

7.4.2 Ocean Resources

Mrs. Sproat's grandfather and father were fishermen and they were the *konohiki* for *he'e* until the early 1960s. The *kapu* (prohibition) on *he'e* was from Koali to the end of 'Anini Beach Park. She remembers fishing with her father. Their family had the only *konohiki he'e* rights in the islands. People of the area were able to catch any fish except for *he'e*. Wintertime is usually the best time for gathering *he'e*. Her family was so adept and knowledgeable about this resource that they would not even need to spear the *he'e* but would either gather the *he'e* by hand or tickle the *he'e* with a pole and the *he'e* would climb up the pole. The *he'e* was then slid off the pole into the canoe. If they gathered too much *he'e* they would leave them in a wire box on the reef and go back to collect the *he'e* when needed. Mrs. Sproat remembers a time when the *he'e* were missing from the box. In order to find the culprit her grandpa put a *kauila* (dragon moray eel) in the box. A few days later they saw a man with his arm bandaged up from hand to elbow. When they

asked him what happened, he said, "he had an accident." They had found the *he'e* snatcher! Mrs. Sproat recounts another story of a time when the government agency in charge of regulating fishing consulted her grandfather on the proper size to gather *he'e*. He recommended that *he'e* not be collected under two pounds because that was an indication that they had gone through two birthing cycles. DLNR discarded his advice and set the limit at one pound.

Like other long time *kama'āina* of Kalihikai and Kalihiwai, the Sproats remember the plentiful *waewae'iole* once found on the reef.

7.4.3 Stream Resources

Mr. and Mrs. Sproat explained that the streams have changed near the project area. Gary Fisher, a new landowner, had bought a part of the *kuleana* land, rearranged the stream while he was building his house. As a result, Mrs. Lorraine Lanning's home flooded. Mrs. Lanning's family has lived in the valley below the project area for many generations and it had never flooded before.

Hihiwai were once plentiful in the streams before the water was interrupted. *Hihiwai* need fast flowing water to survive. They are being seen more now in Kalihiwai Stream.

'O'opu are gathered in the streams. The most succulent is a variety called *nākea*. *Nākea* have suckers on the bottom of their bodies that allow them to make it far upstream. They come down stream once a year. The first flood of the season brings the males down stream and then the females follow later, full of eggs. They lay the eggs in the brackish water. The *hinana* (baby *'o'opu*) go out to sea and return to the stream later in their lifecycle. If you're at the stream mouth at just the right moment you may be able to see clouds of *hinana* coming back to the fresh waters. This happens around April or May.

The Sproats express concern that the water runoff from the proposed project will negatively affect the health of the stream, especially the streams below the left side of the project area facing *mauka*. They are also concerned that the water runoff from the proposed project may affect the homes *makai*, as they are in a lower elevation.

7.4.4 Burials

Mr. and Mrs. Sproat both request the proper treatment of burials if any are discovered, and cited occasions when developers not treating the burials respectfully. For example, Mrs. Sproat's family is buried on the hillside across from 'Anini Vistas. Below the Vistas in Kalihikai, a developer moved gravestones of a *kama'āina* family's burial plot in order to build his home. Mrs. Sproat could see that he moved the stones because they were not lined up the way they once were.

7.4.5 Project Concerns

The Sproats are primarily concerned with the increase in property taxes and further degradation of ocean and stream resources that may be associated with the project.

The Sproats' property taxes will likely increase as a result of the project. For many years, the Sproats have farmed in the area and in the valley below the project area. They received a number of properties from family members through out the Kalihikai and Kalihiwai Ahupua'a. These lands have been passed down from generation to generation for at least the past two hundred years. Mrs. Sproat's grandmother received the land in Kalihikai from her relative Mary Flint, who was born and raised on the Kalihikai property. Mrs. Flint's husband was the caretaker of the Kīlauea lighthouse, Mrs. Sproat's grandmother had been paying property taxes since 1945. The Sproats' have witnessed how *kama'āina* families who also had *kuleana* lands have been forced to sell because they could no longer afford to pay the property taxes. They also say that the *kuleana* homes along 'Anini Road were not part of the original *kuleana*, but were exchanged from properties up *mauka* in the late 1980s and 1990s.

Property taxes increase as a direct result of high-income homes being developed in the area and the inflated price of land that only the very wealthy can afford. (For example, actor Ben Stiller is now a neighbor of the Sproats.) For the Sproats, property taxes have increased with the development of 'Anini Vistas and continue to rise when surrounding properties repeatedly change ownership, typically involving people who do not live in the residences full time.

The Sproats shared one story, which was particularly poignant and relates to how a place's cultural landscape can be altered by uninformed tenants. The Sproat family was making *imu* (underground oven) at their Kalihiwai *makai* home for a party. They followed procedure and called the fire department before hand, giving them the heads up that they would be making *imu* (which can be smoky). Later in the day a neighbor down the road called the fire department and complained that they were burning rubbish. When told by the fire department that everything was okay and that the family was just making an *imu*, the neighbor (who was from Australia) became irate and said that she knew there were no *emu* (bird native to Australia) in Hawai'i and was certain they were burning rubbish because of the smell.

As was indicated by talking with the Sproats, the reef *makai* of the project area was once flourishing and productive. Pollution from cesspools, golf course runoff, and over-fishing have all contributed to its current poor health and lack of productivity. The Sproats believe reimplementation of the *konohiki* system would help to control problems like over-fishing. Because of the use of cesspools, the houses that sit along 'Anini Road are leeching sewage into the ocean waters. Their eldest daughter had pregnancy complications that were linked to her daily swims along the shore. The Sproats want assurance that *mauka* homes will not be leaching sewage in to ocean and stream waters like the *makai* homes, fronting 'Anini beach.

Section 8 Cultural Landscape of the Project Area

8.1 Overview

This section examines cultural beliefs, resources and practices identified within or in proximity to the project area in the broader context of the encompassing Kalihikai, Kalihiwai and Hanalei Ahupua'a landscape. Excerpts from talk story sessions are incorporated throughout this section where applicable

8.2 Hawaiian Habitation and Agriculture

Māhele records indicate the presence of traditional agriculture and house lots in the project area along the coast and lowlands near 'Anini Stream and the three smaller streams in Kalihikai Ahupua'a. Elsie H. Wilcox, a descendant of missionaries to Kaua'i, writing in 1917, further characterizes Hawaiian settlement in the project area vicinity into the early decades of the nineteenth century:

> The settlement then extended along the beach, where the climate was drier and where fishing was available, and the grass-thatched houses were set in the midst of gardens of fruit-trees, vegetables and flowers. Bananas, breadfruit, coffee, sugar-cane, cocoanuts, sweet-potatoes, yams, squashes, pia and taro were cultivated, and chickens and pigs raised. On account of the sandy soil and lack of water "makai", most of the taro-patches were further up the valley, the farmer going up daily to "mahiai" and returning at night to his home on the beach. The banks of both rivers were lined with taro-patches which, following the water-courses, extended far up into the valleys. Terraced remains of these patches are still to be seen far above present habitations, their extent indicating a goodly population at that time. The stretch of land between the two rivers [Hanalei River, west of the project area and Kalihiwai River, east of the project area], now used as rice-land (i.e. 1917), was then an undrained swamp, not available for cultivation. (Wilcox 1991:5)

Kalihikai is a small *ahupua'a* that "had quite extensive *lo'i* areas near the sea. There were *lo'i* back along main streams and side streams", although the valley is shallow (Handy and Handy 1972:421). The lands are described as "a rolling plain that has been gouged by small streamlets which, for the most part, drain away into the neighboring *ahupua'a* of Kalihiwai and Hanalei. The plain drops over low hills broken by four little gulches onto a flat strip of land. It was here that the *lo'i*, irrigated field ponds, were dug and taro grown, and the people lived" (Wichman 1995a:1).

Although the demographics of the project area and surrounding lands have changed in recent years as a result of increasing land values, the fertility inherent in the land continues to be remembered by *kama'āina*. Many of the *kama'āina* interviewed for this report recall when the lands below the project site were cultivated with *kalo*, rice, banana, watercress, and other fruits and vegetables. During his childhood Sam Woodward recalled only about eight homes below the

project site, but noted that there were extensive *lo'i kalo* and other crops. David and Linda Sproat as well as Mr. Woodward's *'ohana* have all farmed in the area. Mr. Woodward's grandfather cultivated *kalo* all the way to the back of the valley. They used the water that came from a ditch that started in Kalihiwai to irrigate their *lo'i*. He also recalls a Japanese family growing rice and vegetables at one time, but like many other families who lived in the area, they sold their property and aren't there anymore.

8.3 Gathering of Plant Resources

All five of the community consultants interviewed for the project remember a certain variety of taro, *'āhē*, which grew wild in the project area. *'Āhē* was not harvested for its corm but was prized for its tender leaves. Mr. Kimura and Mr. Woodward made specific reference to the *ke'oke'o* (white) variety. Watercress, swamp cabbage, guava, mango, *liliko'i*, and pineapple were also gathered in the area. According to Mrs. Sproat, the watercress was likely planted long ago but grew wild and could be found, like the swamp cabbage, growing along the stream. The young leaves of the guava plant had medicinal properties and were chewed by Mr. Kaluahine and his family to cleanse the tongue, which was an indicator of health.

Prior to western Contact, the hill areas of the three *ahupua'a* under study may well have been used for gathering as part of the land open to all *ahupua'a* members. This is supported by the identification of economically valuable plants in association with archaeological remains on the lower slopes (25 to 125-foot elevation) of the valley ridge (i.e. *hau* and *hala*). These plants have been associated with dry land or *kula* lands to supplement the crops growing in the adjoining terraces (Cleghorn 1979; Schilt 1980). All three *ahupua'a* had irrigation systems in place in the 1850s to distribute stream and rain water to the extensive *lo'i* fields.

Numerous accounts attest to extensive pandanus groves in the uplands of Hanalei, Kalihikai and Kalihiwai in the early nineteenth century (Alexander 1991; Lydgate 1991; King 1991; Bird 1890). William DeWitt Alexander (1991:124) describes these groves during a trip around the island in 1849, "Five more miles of riding through woods of *hala*, brought us to the tip of the hill that overlooks Hanalei Valley...". William T. Brigham visited Kaua'i in 1865 and also commented on the extensive pandanus, "Vast numbers of pandanus cover the hillsides and grow so luxuriantly as to furnish an admirable shelter from the rain" (Lydgate 1991:139).

8.4 Marine Resources

All the *kūpuna* interviewed for the report once fished along the shoreline fronting the area and remember the richness of the reef. Fish like *manini*, *weke*, *uhu*, *kole* and *kala* were once plentiful. Mr. Kaluahine and his grandfather would look for fish from the bluffs along the coast (possibly within the project area).

According to Mrs. Sproat the coast was also the only *konohiki he'e* in the islands. Mrs. Sproat's grandfather and father were fishermen and the *konohiki* for *he'e* until the early 1960s. The kapu on *he'e* was from Koali to the end of 'Anini Beach Park. Wintertime is usually the best time for gathering *he'e*. Her family was so adept and knowledgeable about this resource that they would not even need to spear the *he'e* but would either gather the *he'e* by hand or tickle the *he'e*

with a pole and the *he'e* would climb up the pole. The *he'e* was then slid off the pole into the canoe. If they gathered too much *he'e* they would leave them in a wire box on the reef and go back to collect the *he'e* when needed. Mr. Woodward believes that people still may be catching squid at night.

Four of the *kama'āina* interviewed also recall the abundance of *limu* was once found on the reef, specifically *waewaei'ole)*. Mr. Woodward also remembers picking *limu 'ele'ele*, which is the fine green type of *limu*.

Although Mr. Kaluahine and Mr. Woodward thought that people might still be catching *'oama* and *he'e* in the area, all of the *kama'āina* interviewed spoke of how much the reef has changed. It is no longer bountiful like it once was. The *limu*, fish and *he'e* that were once plentiful are now rarely found. These *kama'āina* attribute such changes to the cesspools along 'Anini and runoff from the golf course.

E.S. Craighill and Elizabeth Handy describe Hanalei as, "close enough to the rich deep-sea fishing grounds off the Nāpali coast to supply its people with plenty of fish (Handy and Handy 1972:420-421).

8.5 Hunting

Pigs are plentiful in the project area and surrounding lands. According to participants in this study, they are the reason that the *'āhē* taro can no longer be found. Pig hunting is a subsistence activity which continues to occur through out the project area and surrounding lands. Although this activity is not "traditional," in the sense that pigs were typically domesticated, pig hunting is done for subsistence, so it is considered a cultural practice. All community consultants were aware of hunting in the area. Mr. Kaluahine hunted in his youth and Mr. Kimura continues to hunt every week.

8.6 Fresh Water Resources

There are a number of fresh water resources in the project area including streams, springs and a waterfall. There is a stream directly below the project site to the east that begins as underground springs and drains into the ocean underground. In a site visit, Mr. Kimura noted that he has never seen the stream go dry. However, the stream is seldom seen draining into the ocean above land because it typically filters through the sand starting at the first cement bridge along the 'Anini Beach Road

Mr. and Mrs. Sproat, as well as Mr. Woodward have seen many changes to the area below the project site. For example *hihiwai* were once plentiful in the streams before the water was interrupted by various development projects. *Hihiwai* need fast flowing water to survive. They are being seen more now in Kalihiwai Stream in the neighboring *ahupua'a*. Mr. Woodward remembers catching *'ōpae* in the stream. In 1974-1975, he began to notice a decrease in the abundance of these animals in the stream. He says at one time 'Anini had five streams but because of the water diversion, most of them have dried up. He also pointed out a cave with spring water on the other side of the hill toward the airport.

'O'opu are still gathered in the streams in the Kalihikai and Kalihiwai Ahupua'a. The Sproats demonstrated their knowledge of *'o'opu* during their interview and explained that the most succulent is a variety called *nākea*. *Nākea* have suckers on the bottom of their bodies that allow them to make it far upstream. They come down stream once a year. The first flood of the season brings the males down stream and then the females follow later, full of eggs. They lay the eggs in the brackish water. The *hinana* (baby *'o'opu*) go out to sea and return to the stream later in their lifecycle. If you're at the stream mouth at just the right moment you may be able to see clouds of *hinana* coming back to the fresh waters. This happens around April or May.

Background research supports what the *kūpuna* shared in this CIA. E.S. Craighill and Elizabeth Handy present the *ahupua'a* resources that pre-Contact Hawaiians utilized and amplified, including fresh water resources:

> Hanalei is unique on Kauai in having a broad river flowing into a magnificent level seaward area...The flats in which rice was planted by the Chinese had been the taro *lo'i* of the Hawaiians, amply irrigated by ditches from the Hanalei River. Sugar cane and ranching at different times have taken over most of the land where taro was originally grown. And yet in recent years some taro was still grown there and there was a *poi* mill... (Handy and Handy 1972:420-421).

Māhele records speak of the 'Anini Stream and the three smaller streams in Kalihikai Ahupua'a which fed the traditional agriculture and house lots in the project area along the coast and lowlands. The place name of Kalihiwai directly translates "Kalihi [with a] stream" (Pukui 1974:77).

Section 9 Summary and Recommendations

At the request of Group 70 International, Inc., Cultural Surveys Hawai'i Inc. (CSH) undertook this CIA for a section of the proposed Princeville Ranch Agriculture Subdivision Project located in the Kalihiwai and Kalihikai Ahupua'a in the Hanalei District on the Island of Kaua'i.

The area of focus is the County Land Usage Commission (LUC) petition area which is part of a larger project, the planned Princeville Agricultural Subdivision. The petition area is a 120 acre site *makai* of the Kūhiō Highway which includes one full agricultural lot, portions of four other lots and 17 potential house sites (see attached aerial photograph and USGS map of the petition area). This petition area is part of a larger 400 acre Agricultural subdivision plan which is part of the Princeville Ranch Preservation Plan. The proposed project includes a low-density agriculture subdivision in TMK (4) 5-3-006; 001 & 014 por., which will incorporate approximately 400 acres of agriculture and open-zoned land. Associated with this plan is an additional 6,000 acres, 4,000 of which will be maintained in conservation and 2,000-acres of which will be maintained as long-term grazing land as part of the agriculture use.

In addition to conducting background research into the traditional and historic importance of the project area in the context of Kalihikai, Kalihiwai and Hanalei Ahupua'a, including results from previous archaeological studies, CSH also made a substantial effort to consult with community members and organizations. A total of 35 people were contacted for the purposes of this CIA; 14 people responded; and five *kūpuna* and/or *kama'āina* were interviewed for more in-depth contributions.

9.1 Summary of Background Research

Background research shows:

1. The project area is located approximately 3.5 km east of Hanalei Bay on the north shore of Kaua'i spanning portions of the *ahupua'a* of Hanalei, Kalihikai, and Kalihiwai. Predominant coastal features located adjacent to the project area include 'Anini Beach, Honono Point, Honu Point, and Kalihikai Beach. Natural drainages within the project area include 'Anini Stream to the west and Honu, Kalihikai, and Koali Stream to the east.
2. Hanalei is the largest *ahupua'a* in the *moku* of Halele'a. During the centuries before Euro-American contact, Hanalei had long afforded possibilities for intensive agricultural and cultural development by *Kanaka Maoli* (native born). The large alluvial flat on both sides of Hanalei River has been farmed extensively for taro for centuries. Kalihikai is a small *ahupua'a* that "had quite extensive *lo'i* areas near the sea. There were *lo'i* back along main streams and side streams", although the valley is shallow (Handy and Handy 1972:421).
3. Vegetation within the project area includes mango (*Mangifera indica*), *ti* (*Cordyline fruticosa*), *noni* (*Morinda citrifolia*), *laua'e* (*Phymatosorus grossus*), cat's claw (*Caesalpinia decapetala*), *hau* (*Hibiscus tiliaceous*), *hala* (*Pandanus odoratissimus*), *koa haole* (*Leucaena leucocephala*), *palapalai* (*Microlopis strigosa*), java plum

(*Syzygium cumini*), white ginger (*Hedychium coronarium*), *kukui* (*Aleurites moluccana*), and exotic grasses.

4. Prior to western Contact, the hill areas of the three *ahupua'a* under study may well have been part of the lands open to all *ahupua'a* residents to use for gathering, Economically valuable plants have been identified in association with archaeological remains on the lower slopes (25 to 125-foot elevation) of the valley ridge; these are associated with dry land or *kula* lands to supplement the crops growing in the adjoining terraces (i.e. *kukui, hala, hau*) (Cleghorn 1979; Schilt 1980). The pandanus groves of the upper slopes of the valley wall would have been another resource for residents of Hanalei Ahupua'a, who would not have to travel so far *mauka* (inland) to find the *hala* needed for weaving items such as mats.
5. The Archaeological Inventory Survey (AIS) companion study (Yucha and Hammatt 2008) to the current CIA, which includes a larger project area, has been completed. Although a total of 11 historic properties consisting of a total of 23 total features were identified within or near the larger 400-acre (approximate) Princeville Agricultural Subdivision project, no historic properties were identified within the approximately 120-acre petition area. Eleven sites were found, nine of which are pre-Contact and two of which are historic within or near the larger 400-acre (approximate) Princeville Agricultural Subdivision project. The pre-Contact sites include: three irrigation ditches, an agricultural complex consisting of six terraces, two agricultural terraces, a modified outcrop, a wall, and a complex of eight features including four terraces, two mounds, one alignment and a leveled area; three of the features have been initially interpreted as burials.
6. Few *iliina* (burials) have been documented (e.g. Jourdane 1996, McMahan 1999, Dega 2003) near the project area and each of the burials was recovered in beach sand. No burials have been documented in the project area.
7. The *heiau* within the closest proximity to the project area is Po'okū Heiau, Bennett's (1931) Site 139. It is approximately 400.0 m south of the project's southern boundary (appears as Pooku on Figure 7). A total of five *heiau* were recorded in Hanalei ahupua'a, three in Kalihiwai, and one in Kalihikai.
8. There are many *mo'olelo* about Hanalei including the story of Lonoikamakahiki, Kawelo and the giant Kauahoa of Hanalei and the legend of the lovers Pa'alua and Kawelu. Many *'ōlelo no'eau*, traditional sayings or proverbs, associated with Hanalei have references to the rains and winds.
9. The middle 19th century brought great changes to the three *ahupua'a* under study, including private and public land ownership laws known as the Māhele (literally, 'to divide' or 'to section'). The Kuleana Act of 1850 allowed *maka'āinana* (native tenants), in principle, to own land parcels they were actively cultivating and/or where they were residing. As a result of the Māhele, Land Commission Awards (LCA) were claimed in five distinct clusters within Hanalei Ahupua'a; the shoreline, the Mahaana (taro fields adjacent to Waioli Ahupua'a), Puapuahoi-Limanui (the bottom lands of the Hanalei River), 'Anini (on the coast northeast of Hanalei Bay), and Kīloa (inland and adjacent to Limanui). Almost all of the Hanalei Ahupua'a LCAs were lowland locations far from the current project area, with the exception of

those at 'Anini, which are located along the northwest edge of the project area (Figure 9 and see Figure 2). In Kalihikai the situation is reversed – almost all of the LCAs lie within the project area (See Figure 2). Table 1, lists all of the LCAs in the vicinity of the current project area.

10. More recently, severe hurricanes – Iwa in 1982 and 'Iniki in 1992 - have demonstrated the precariousness of human development within the Halele'a environment, just as natural disasters thwarted the efforts of the newly-arrived nineteenth century entrepreneurs. However, the endurance of taro through the changes documented above - and its flourishing today – indicates the crop's importance to the continuation of the cultural landscape.

9.2 Summary of Community Consultation

CSH attempted to contact 35 people for the purposes of this CIA; 14 people responded; of those 14, five *kūpuna* and/or *kama'āina* were interviewed for more in-depth contributions. Community consultation shows the following:

1. The project area and environs including streams, shoreline, and wetlands has a long history of use by *Kanaka Maoli*, and other *kama'āina* groups for a variety of cultural and subsistence activities including fishing, gathering of *limu* (seaweed, algae), farming of taro, various vegetables and fruits including watercress, swamp cabbage, *hō'io (Diplazium sandwichianum)*, and bananas. One respondent, granddaughter of the last *konohiki he'e* (octopus resource manager) in Kalihikai-Kalihiwai, noted that the shoreline *makai* (towards the sea) of the project area was the only *konohiki he'e* in the islands.
2. There are two specific, but related concerns regarding fresh and ocean waters below the project site. One is the level of pollution in the waters. The second is that resources which were once plentiful, such as *he'e* (octopus), *limu* (seaweed) such as *waewae'iole*, *(Codim edule)* and stream resources such as *'o'opu* (goby) and *hihiwai* (snail, *Neretina granosa)* are now rare. Many interviewees described the shoreline as flourishing in the old days. The majority of community consultants interviewed for the report identify the polluted runoff from septic systems along the shoreline and development further *mauka*, including the golf course, as the primary reason for decreased marine resources. Previous interruption of waterways and overfishing are also identified as contributing factors. Two of the respondents wanted assurance that measures would be taken to control runoff from homes located in the project area both during and after construction.
3. Current subsistence practices in the project area include pig hunting. One community respondent hunts in the area weekly. He will find a different hunting area should he no longer be able to access the project area. However, several contacts attribute an excess of wild pigs in the area to the reason a particular variety of taro, the *'āhē*, prized for its *lū'au* (young taro tops), can no longer be found near project area. OHA requested that current subsistence practices be given consideration in project development.

4. A four out of five community contacts interviewed for this report voiced concerns about increasing property taxes in the 'Anini Beach area. Interviewees have observed how wealthier individuals purchase surrounding properties, and *kama'āina* families are forced to sell their land because they can no longer afford the rising property taxes. This change in demographics has affected the cultural landscape makai of the project area. According to the respondents, only one of the original *kama'āina* families, the Lannings, still live in the area. For two of the respondents who still own *kuleana* interests near the project area, a further increase in property taxes would make retaining these lands difficult.
5. Kaleo Paik from SHPD expressed concern that the proposed project will be used "for 'gentleman farmers' to build their luxury homes at the expense of losing productive land for actual viable agricultural purposes. Viable agricultural businesses cannot function on small acreages but need larger parcels in which to make any endeavor economically feasible." She also asks if the land will be used for bonafide farmers with crops that will help stimulate the island's economy.
6. Although none of the respondents knew of any burials in the project area, a number mentioned the disrespect that 'Anini Vistas showed in dealing with burials found there. Several respondents wanted assurance that any burials found at the project site will be treated respectfully and that proper SHPD procedure be followed.

9.3 Recommendations

For several of the participants in this CIA there is concern that proposed development may negatively impact Hawaiian resources and practices and beliefs. Generally, there is concern about further loss of a Hawaiian sense of place. A good faith effort to address the following recommendations may help mitigate potentially adverse effects on cultural, historic and natural resources and associated practices as result of the Princeville Ranch Agricultural Subdivision:

1. CSH recommends that project proponents pursue proactive consultation with community members and cultural and lineal descendants with connections to the project area and the lands below the project site, in the 'Anini Beach area. Consultation should address the concerns expressed in this report which include affects on stream and shoreline resources and water quality from construction runoff and infrastructure (e.g., waste management), rising property tax, and access for subsistence practices (i.e. pig hunting).
2. Although it is unlikely that there are burial sites (iwi kūpuna) as well as significant cultural and historic properties in the project area; CSH recommends that should ancestral remains be found, cultural and lineal descendants of the area be consulted in regard to burial treatment plans and the remains should be treated respectfully. Also that the personnel involved in development activities in the project area be informed of the possibility of inadvertent cultural finds, including human remains. Should cultural or burial sites be identified during ground disturbance, all work should immediately cease, and the appropriate agencies notified pursuant to applicable law.

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2008 *Archaeological Inventory Survey for the Proposed Ag Subdivision, including Developed and Undeveloped Lands for the Princeville Final Subdivision Project, Hanalei, Kalihiwai, and Kalihikai Ahupua'a, Hanalei District, Kaua'i Island, [TMK: (4) 5-3-006: 001 & 014].* Cultural Surveys Hawai'i, Kailua, Hawai'i.

Appendix A SHPD Response Letter

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
STATE HISTORIC PRESERVATION DIVISION
601 KAMOKILA BOULEVARD, ROOM 555
KAPOLEI, HAWAII 96707

June 23, 2009

LOG NO: 2009.2899
DOC. NO: 0906PC007

MEMORANDUM

TO: Mishalla Spearing, Cultural Researcher
Cultural Surveys Hawai'i, P.O. Box 1114, Kailua, Hawai'i 96734

FROM: Phyllis Coochie Cayon, History and Culture Branch Chief

Subject: **HANALEI 5: A Cultural Impact Assessment (CIA) for a Section of the Proposed Princeville Ranch Agriculture Subdivision Project located in the Kalihiwai and Kalihikai Ahupua'a, Hanalei District, Island of Kauai.**
TMK: [4] 5-3-006: 001 & 014 por.

Mahalo for the opportunity to comment on the CIA for a section of the proposed Princeville Ranch Agriculture Subdivision Project located in the Kalihiwai and Kalihikai Ahupua'a.

A brief scan of previous archaeology reports indicate many prior surveys have been done in this culturally rich ahupua'a. 1979 archaeological reconnaissance survey of the Princeville lands at Hanalei, Kauai (Cleghorn BPBM 1979) includes a map of four areas that seem to be part of the above proposed project area. While the project area may have been under heavy ranch use there is always a probability that some cultural resources were not destroyed by cattle. There are significant features (i.e., historic cemetery, upright boulder, Po'oku Heiau, agricultural terraces, water use) in the general area that will need to be assured of no development impacts.

SHPD is also concerned with any ground work that may uncover ancient or historic burials or burial sites. The department is mindful that traditional cultural access to the cultural places and/or resources in the general ahupua'a should be considered in your study.

Other folks/groups you may want to contact regarding any impacts on cultural resources in the proposed area are:

- Kaua'i Museum
- John Kruse at jkruse@kauai.gov
- C. Kunane Alpoalani, chairman, Kaua'i Niihau Islands Burial Council ckalpoalani@hawaiiantel.net
- Aunty Barbara Say, 294 Makani Rd. Kapaa 96746... Phone: 808-821-0430

Please do talk story with these folks and get information or referrals of any traditional or cultural practices in the project area. Any questions, please call me at 808-692-8015 or via email at Phyllis.L.Cayon@hawaii.gov

C: Pua Aiu, Ph.D., SHPD Administrator
Nancy McMahon, Deputy SHPD/State Archaeologist
C. Kunane Alpoalani, Chairman, Kaua'i-Niihau Island Burial Council (KNIBC)
Barbara Say, KNIBC Hanalei District Representative

Appendix B OHA Response Letter

PHONE (808) 594-1808 FAX (808) 594-1865

STATE OF HAWAI'I
OFFICE OF HAWAIIAN AFFAIRS
711 KAPIOLANI BOULEVARD, SUITE 500
HONOLULU, HAWAII 96813

HRD09/4043B

June 17, 2009

Lehua Kauhane
Cultural Surveys Hawai'i
P.O. Box 1114
Kailua, Hawai'i 96734

RE: Cultural Impact Assessment- Princeville Ranch Agricultural Subdivision Kalihiwai and Kalihikai Ahupua'a, Hanalei District, Island of Kaua'i

Aloha e Ms. Kauhane,

The Office of Hawaiian Affairs (OHA) is in receipt of your April 28, 2009 letter initiating consultation ahead of a cultural impact assessment (assessment) for a section of the proposed Princeville Ranch Agricultural Subdivision. Based on the information contained within your letter, it is our understanding that Princeville Ranch intends to submit a petition to the State Land Use Commission (LUC) to revert approximately 120 acres from urban land use classification to agriculture land use classification. If this petition is granted by the LUC, the 120 acres would be incorporated into a larger 400 acre project area which would then be subject to a proposed low-density agricultural subdivision.

OHA has no comments on the assessment at this time. We do seek assurances that the project area has been subject to an archaeological inventory survey which has been submitted to and approved by the Department of Land and Natural Resources- Historic Preservation Division. Consideration should also be afforded to individuals accessing the project area for traditional, customary or subsistence purposes. We look forward to the opportunity to review the draft assessment and provide additional comments at that time. Should you have any questions, please contact Keola Lindsey, Land Advocate-Culture at (808) 594-1904 or keolal@oha.org.

'O wau iho nō me ka 'oia'i'o,

Clyde W. Nāmu'o
Administrator

C: OHA-Kaua'i CRC Offices

Appendix C KHPRC Response Letter

COUNTY OF KAUAI
PLANNING DEPARTMENT
4444 RICE STREET, SUITE A473
LIHUE, KAUAI, HAWAII 96766-1326

MEMORANDUM

DATE: July 14, 2009

TO: Cultural Survey's Hawaii, Inc. Attn. Mahalia Spearing/Lehua Kaohane

FROM: Kauai Historic Preservation Review Commission

SUBJECT: Cultural Impact Assessment (CIA) For TMK 5-3-06:1 & 14 por., Hanalei, Kauai

This serves as a follow-up to our prior letter and to inform you that the Kauai Historic Preservation Review Commission (KHPRC) met on July 7, 2009 to review your letter requesting input regarding potential impacts to cultural practices as a result of the proposed project.

The following recommendations were offered in addition to the previous comments provided:

That community meetings in Princeville and Hanalei be considered. That input from the descendants of Henry Gomes, the Fu family, the Conants, the Ynkotakes and the Sproat family and other North Shore families be solicited. The KHPRC may also supplement these recommendations after SHPD's comments are submitted and reviewed.

Please feel free to contact us should you have any questions regarding this matter.

Mahalo.

cc: State Historic Preservation Division

APPENDIX I. ENVIRONMENTAL NOISE ASSESSMENT REPORT PRINCEVILLE MAKAI LANDS AGRICULTURAL SUBDIVISION, PRINCEVILLE, KAUAI, HAWAII

D. L. ADAMS ASSOCIATES, LTD.
Consultants in Acoustics and Performing Arts Technologies

Environmental Noise Assessment Report
Princeville Makai Lands Agricultural Subdivision
Princeville, Kauai, Hawaii

November 2008
Revised February 2011

DLAA Project No. 08-28

Prepared for:
Group 70 International
Honolulu, Hawaii

970 N. KALAHEO AVE. • SUITE A311 • KAILUA, HAWAII 96734
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1.0 EXECUTIVE SUMMARY

1.1 The proposed Princeville Agricultural Subdivision project is comprised of approximately 944 acres on the North Shore of Kauai. The proposed development will be limited to a total of 75 ranch houses to be built on the 17 ranch lots planned for the 'Makai Lands'. The project is expected to be fully built out by 2018.

1.2 Long term noise measurements were conducted at two locations on the northern and southern boundaries of the project site. The hourly L_{eq} noise levels generally ranged from 48 dBA to 56 dBA throughout the daytime and nighttime hours. The calculated day-night level, Ldn, at the project site was approximately 59 dBA for the measurement period. Environmental noises such as the ocean, wind, and rain dominated the ambient noise environment.

1.3 Development of project areas will involve excavation, grading, and other typical construction activities during construction. Construction noise from the Princeville Agricultural Subdivision project is not expected to impact the distant residential neighbors. Noise from construction activities should be short term and must comply with State Department of Health noise regulations.

1.4 After construction is complete, noise generated from stationary mechanical equipment on the project site must meet the State of Hawaii noise regulations. For residential areas (i.e., single-family homes), noise limits are 55 dBA during the day and 45 during the night. Mitigation of mechanical noise to meet the State DOH noise rules should be incorporated into the project design.

1.5 The 2018 projections of traffic volumes along Kuhio Highway indicate a minor change in traffic so a negligible future increase in traffic noise along the highway can be expected. Homes within 50 feet from the edge-of-pavement of Kuhio Highway will experience noise levels that exceed the FHWA maximum noise limit of 67 dBA for peak hour traffic volumes. If homes are built within this setback, noise mitigation will be required to meet the FHWA noise limit.

1.6 The project site is located in the vicinity of Princeville Airport. The airport currently serves private jets on an irregular basis and helicopter tours. Measurements will be conducted on the project site to assess the impact of airport noise on the project.

2.0 PROJECT DESCRIPTION

The proposed Princeville Agricultural Subdivision project is comprised of approximately 944 acres on the North Shore of Kauai. The "Makai Lands" stretch from Kuhio Highway down to Anini Road, and between the developed area of Princeville to the west and Anini Vista to the east. The land is currently used for agricultural purposes such as grazing grounds for cattle, as part of the Prince Golf Course, and as a County Shoreline Management Area (SMA).

The proposed development will be limited to a total of 75 ranch houses to be built on the 17 ranch lots planned for the Makai Lands. Much of the existing land within each lot will remain available to the ranch for grazing livestock and related operations. The remainder of the lots will be retained for continued use as part of the existing Prince Golf Course, as part of a SMA, or for use as roadway access. The project is expected to be fully built out by 2018.

3.0 NOISE STANDARDS

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts and set noise limits as a function of land use. A brief description of common acoustic terminology used in these guidelines and standards is presented in Appendix A.

3.1 State of Hawaii, Community Noise Control (DOH)

The State of Hawaii Community Noise Control Rule [Reference 1] defines three classes of zoning districts and specifies corresponding maximum permissible sound levels due to *stationary* noise sources such as air-conditioning units, exhaust systems, generators, compressors, pumps, etc. The Community Noise Control Rule does not address most *moving* sources, such as vehicular traffic noise, air traffic noise, or rail traffic noise. However, the Community Noise Control Rule does regulate noise related to agricultural, construction, and industrial activities, which may not be stationary.

The maximum permissible noise levels are enforced by the State Department of Health (DOH) for any location at or beyond the property line and shall not be exceeded for more than 10% of the time during any 20-minute period. The specified noise limits which apply are a function of the zoning and time of day as shown in Figure 1. With respect to mixed zoning districts, the rule specifies that the primary land use designation shall be used to determine the applicable zoning district class and the maximum permissible sound level. In determining the maximum permissible sound level, the background noise level is taken into account by the DOH.

3.2 U.S. Federal Highway Administration (FHWA)

The FHWA defines four land use categories and assigns corresponding maximum hourly equivalent sound levels, $L_{eq(h)}$, for traffic noise exposure [Reference 2], which are listed in Figure 2. For example, Category B, defined as picnic and recreation areas, parks, residences, motels, hotels, schools, churches, libraries, and

hospitals, has a corresponding maximum exterior L_{eq} of 67 dBA and a maximum interior L_{eq} of 52 dBA. These limits are viewed as design goals, and all projects meeting these limits are deemed in conformance with FHWA noise standards. Calculation of traffic noise levels should be conducted using a Federal Highway Administration traffic noise model [Reference 3].

3.3 Hawaii Department of Transportation (HDOT)

The HDOT has adopted FHWA's design goals for traffic noise exposure in its noise analysis and abatement policy [Reference 4]. According to the policy, a traffic noise impact occurs when the predicted traffic noise levels "approach" or exceed FHWA's design goals or when the predicted traffic noise levels "substantially exceed the existing noise levels." The policy also states that "approach" means at least 1 dB less than FHWA's design goals and "substantially exceed the existing noise levels" means an increase of at least 15 dB.

3.4 U.S. Environmental Protection Agency (EPA)

The U.S. EPA has identified a range of yearly day-night equivalent sound levels, L_{dn}, sufficient to protect public health and welfare from the effects of environmental noise [Reference 5]. The EPA has established a goal to reduce exterior environmental noise to an L_{dn} not exceeding 65 dBA and a future goal to further reduce exterior environmental noise to an L_{dn} not exceeding 55 dBA. Additionally, the EPA states that these goals are not intended as regulations as it has no authority to regulate noise levels, but rather they are intended to be viewed as levels below which the general population will not be at risk from any of the identified effects of noise.

4.0 EXISTING ACOUSTICAL ENVIRONMENT

Two types of noise measurements were conducted to assess the existing acoustical environment in the vicinity of the project location. The first noise measurement type consisted of continuous long-term ambient noise level measurements at two locations (Location L1 and L2). The second type of noise measurement was short-term and included traffic counts. The purpose of the short-term noise measurements and corresponding traffic counts were to validate a traffic noise prediction model. The noise measurements were conducted between November 17, 2008 and November 18, 2008. Photographs of the noise measurement locations on the project site can be seen in Appendix B.

4.1 Noise Measurement Procedure

Long-Term Noise Measurement Procedure

Continuous, hourly, statistical sound levels were recorded for approximately 24 hours. The measurement was taken using a Larson-Davis Laboratories, Model 820, Type-1 Sound Level Meter together with a Larson-Davis, Model 2560 Type-1 Microphone. Calibration was checked before and after the measurements with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended calibration period. The microphone was mounted on a tripod, approximately 8

feet above grade. A windscreen covered the microphone during the entire measurement period. The sound level meter was secured in a weather resistant case.

Short-Term Noise Measurement Procedure

An approximate 30-minute equivalent sound level, L_{eq}, was measured. Vehicular traffic counts and traffic mix were documented during the measurement period. The noise measurement was taken using a Larson-Davis Laboratories, Model 824, Type-1 Sound Level Meter together with a Larson-Davis, Model 2541 Type-1 Microphone. Calibration was checked before and after the measurements with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended calibration period. The microphone and sound level meter were mounted on a tripod, approximately 5 feet above grade. A windscreen covered the microphone during the entire measurement period.

4.2 Noise Measurement Locations

Long-Term Noise Measurement Location

Location L1: Near the southern boundary of the project site, approximately 500 feet makai of Kuhio Highway, as shown in Figure 3. The dominant noise source was traffic noise from the highway. Secondary noise sources included environmental noises such as wind, rain, birds, and occasional noises from the operation of the Prince Golf Course.

Location L2: Near the northern boundary of the project site, at the edge of the bluff overlooking Anini Road. The dominant noise sources were environmental noises such as the ocean, wind, rain, and birds.

Short-Term Noise Measurement Locations

Location S1: Positioned adjacent to Kuhio Highway across the street from the Prince Golf Corse access road, approximately 60 feet mauka of the edge-of-pavement.

4.3 Long-Term Noise Measurement Results

The results from the long-term noise measurements are graphically presented in Figure 4, which shows the measured equivalent sound level, L_{eq}, in A-weighted decibels (dBA) as a function of the measurement date and time.

The measured sound levels at the project site were relatively static and are typical of a rural environment. The hourly L_{eq} noise levels generally ranged from 48 dBA to 56 dBA throughout the daytime and nighttime hours. The calculated day-night level, L_{dn}, at the project site was approximately 59 dBA for the measurement period. However, the windy and rainy weather during the measurement period caused ambient noise levels that could be slightly higher than

usual. In addition, construction equipment was noticable in the vicinity of location L1 which created excessive sound levels, as indicated in Figure 4.

5.0 POTENTIAL NOISE IMPACTS AND NOISE MITIGATION

5.1 Project Construction Noise

Development of project areas will involve excavation, grading, and other typical construction activities during construction. The various construction phases of the Princeville Makai Lands Agricultural Subdivision will generate significant amounts of noise but will not likely impact the distant adjacent residential properties. The actual noise levels produced during construction will be a function of the methods employed during each stage of the construction process. Typical ranges of construction equipment noise are shown in Figure 5. Earth-moving equipment, e.g., bulldozers and diesel-powered trucks, will probably be the loudest equipment used during construction.

5.2 Project Generated Stationary Mechanical Noise and Compliance with State of Hawaii Community Noise Control Rule

The new land development will incorporate stationary mechanical equipment that is typical for residential housing, commercial buildings, etc. Expected mechanical equipment may include air handling equipment, condensing units, etc. Noise from this mechanical equipment and other equipment must meet the State noise rules, which stipulate maximum permissible noise limits at the property line. For residential areas (i.e., single-family homes), noise limits are 55 dBA during the day and 45 during the night. Mitigation of mechanical noise to meet the State DOH noise rules should be incorporated into the project design.

5.3 Compliance with FHWA/HDOT Noise Limits

A vehicular traffic noise analysis was completed for the existing conditions and future year 2018 projections with the "No Build" and "Build" conditions using the FHWA Traffic Noise Model Look-up Tables Software Version 2.5 (2004) [Reference 7]. The traffic noise analysis is based on the traffic counts provided by the Traffic Consultant [Reference 8]. Vehicular traffic noise levels were calculated for 1 location (Location A) along Kuhio Highway, as shown in Figure 3. The traffic report shows an insignificant future increase in traffic volume on other minor roadways in the vicinity of the Princeville Makai Lands Agricultural Subdivision, therefore, traffic noise along these streets was not analyzed. The results of the traffic noise analysis are described below and summarized in Table 1.

5.3.1 Vehicular Traffic Noise Impacts on the Surrounding Community

The Princeville development project will provide approximately 75 dwelling units, which will increase vehicular traffic in the surrounding area. However, the 2018 projections of traffic volumes along Kuhio Highway indicate a minor change in traffic due to the project. Therefore, a negligible increase in traffic noise (less than 1 dB) can be expected. A

change in noise level of less than 3 dB is not considered a significant noise impact.

5.3.2 Vehicular Traffic Noise Impacts on the Project

Noise from vehicular traffic along the access roads within the project site is not expected to be significant. However, vehicular traffic is the primary noise source at the southern portion of the Makai Lands that is close to Kuhio Highway. Results from the traffic noise analysis show that homes within 50 feet from the edge-of-pavement of Kuhio Highway will experience noise levels that exceed the FHWA maximum noise limit of 67 dBA for peak hour traffic volumes. If new homes are built within this setback, noise mitigation will be required to meet the FHWA noise limit.

5.4 Compliance with EPA Noise Guidelines

The EPA has an existing design goal of $L_{dn} \leq 65$ dBA and a future design goal $L_{dn} \leq 55$ dBA for exterior noise levels. The results from the long-term noise measurements conducted at the Princeville Makai Lands project site show a calculated day-night noise level, L_{dn}, of approximately 59 dBA. After completion of the project, ambient noise levels are not likely to increase by a significant amount because the traffic volumes in the area are not expected to change considerably. The day-night equivalent sound level at the Princeville Makai Lands Agricultural Subdivision is expected to be below the future EPA design goals.

It is important to note that the EPA noise guidelines are design goals and not enforceable regulations. However, this guideline is a useful tool for assessing the noise environment.

5.5 Airport Noise

The Princeville development project is located in the vicinity of the Princeville Airport. The airport is utilized by small commuter jets and helicopter tour operators. Service at this airport is sporadic and on demand. A supplementary noise analysis was conducted in order to assess the impact of airport noise on the project. The analysis and discussion can be found in Appendix C.

6.0 POTENTIAL NOISE IMPACT ON THE PROJECT AND NOISE MITIGATION

6.1 Mitigation of Construction Noise

In cases where construction noise exceeds, or is expected to exceed the State's "maximum permissible" property line noise levels [Reference 1], a permit must be obtained from the State DOH to allow the operation of vehicles, cranes, construction equipment, power tools, etc., which emit noise levels in excess of the "maximum permissible" levels.

In order for the State DOH to issue a construction noise permit, the Contractor must submit a noise permit application to the DOH, which describes the construction activities for the project. Prior to issuing the noise permit, the State

DOH may require action by the Contractor to incorporate noise mitigation into the construction plan. The DOH may also require the Contractor to conduct noise monitoring or community meetings inviting the neighboring residents and business owners to discuss construction noise. The Contractor should use reasonable and standard practices to mitigate noise, such as using mufflers on diesel and gasoline engines, using properly tuned and balanced machines, etc. However, the State DOH may require additional noise mitigation, such as temporary noise barriers, or time of day usage limits for certain kinds of construction activities.

Specific permit restrictions for construction activities [Reference 1] are:

> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels ... before 7:00 a.m. and after 6:00 p.m. of the same day, Monday through Friday."
> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels... before 9:00 a.m. and after 6:00 p.m. on Saturday."
>
> "No permit shall allow any construction activities which emit noise in excess of the maximum permissible sound levels on Sundays and on holidays."

The use of hoe rams and jack hammers 25 lbs. or larger, high pressure sprayers, and chain saws are restricted to 9:00 a.m. to 5:30 p.m., Monday through Friday. In addition, construction equipment and on-site vehicles or devices whose operations involve the exhausting of gas or air, excluding pile hammers and pneumatic hand tools weighing less than 15 pounds, must be equipped with mufflers [Reference 1].

The DOH noise permit does not limit the noise level generated at the construction site, but rather the times at which noisy construction can take place. Therefore, noise mitigation for construction activities should be addressed using project management, such that the time restrictions within the DOH permit are followed.

6.2 Mitigation of the Princeville Development Noise

The design of the new development should give consideration to controlling the noise emanating from stationary mechanical equipment so as to comply with the State Department of Health *Community Noise Control* rules [Reference 1]. Noisy equipment should be located away from neighbors as much as is practical. Enclosed mechanical rooms may be required for some equipment.

The proposed development is located adjacent to the existing Prince Golf Club. Noise from this commercial activity (mechanical noises) may be disturbing to the future residents who will expect low ambient noise levels typical of a rural environment. Noise mitigation options should be considered during the design of the commercial area. An effective option is to install a wall which will provide

both a visual and acoustical barrier between mechanical equipment at the golf clubhouse lot and the adjacent homes.

6.3 Mitigation of Traffic Noise

Vehicular traffic noise from Kuhio Highway is not expected to significantly impact the proposed development if the future residences are constructed farther than 50 feet from the edge-of-pavement of Kuhio Highway.

REFERENCES

1. Chapter 46, *Community Noise Control*, Department of Health, State of Hawaii, Administrative Rules, Title 11, September 23, 1996.

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

3. *Federal Highway Administration's Traffic Noise Model*, FHWA-RD-77-108; U.S. Department of Transportation, December 1978.

4. *Noise Analysis and Abatement Policy*, Department of Transportation, Highways Division, State of Hawaii, June 1977.

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

6. *Department of Housing and Urban Development Environmental Criteria and Standards*, Title 24, CFR, Part 51, 44 FR 40860, July 12, 1979; Amended by 49 FR 880, January 6, 1984.

7. *Federal Highway Administration's Traffic Noise Model Look-up Tables Software*, Ver. 2.5; U.S. Department of Transportation, December 17, 2004.

8. *Traffic Impact Report – Princeville Subdivision*, Wilson Okamoto Corporation, October, 2008.

TABLE 1:
Predicted Traffic Noise Levels With and Without the Project and Resulting Increases Due to the Project[+]

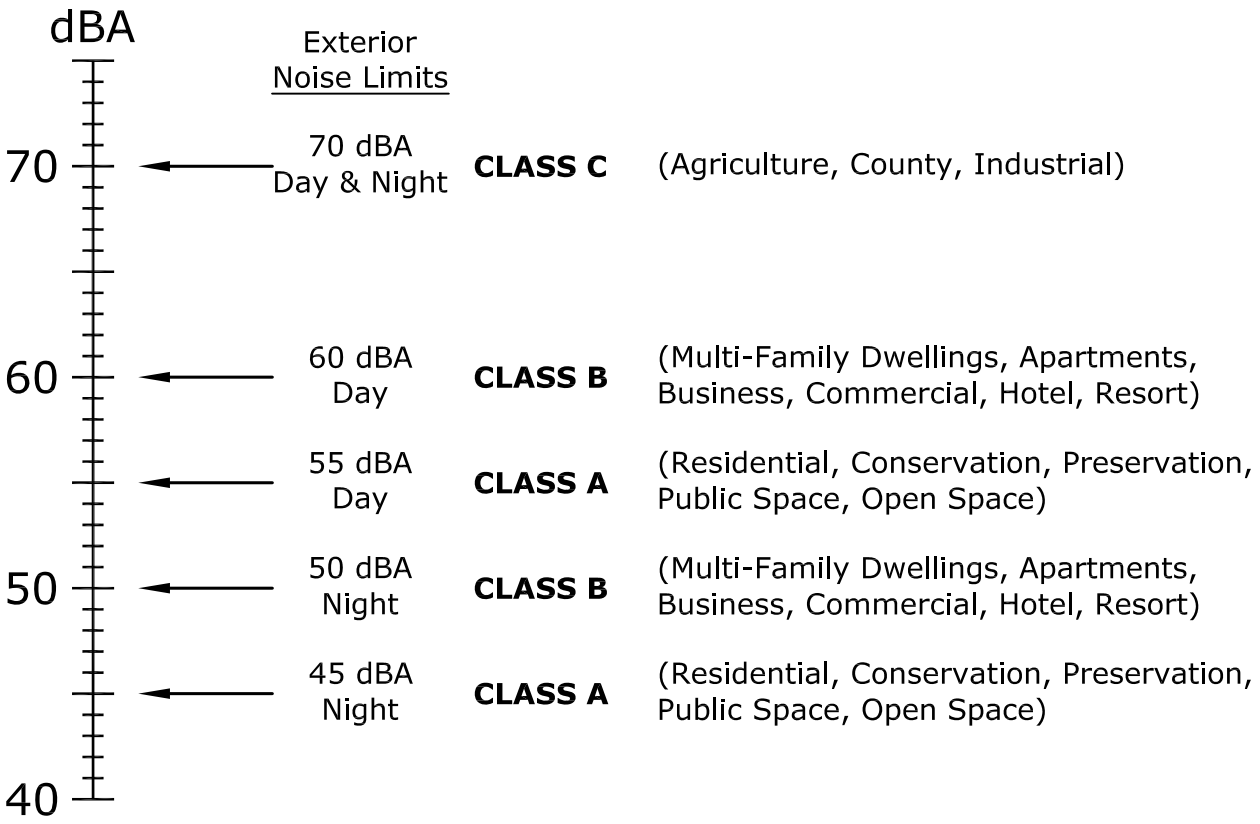
Noise levels shown in the table are based on peak-hour traffic volumes, and are expressed in A-weighted decibels (dBA).

	Location A[*]	
	AM	**PM**
Existing (Calculated)	66.3	66.4
Future Without Project (2018)	66.5	66.6
Future With Project (2018)	66.7	66.7
Future Increase Without Project (2018)	0.2	0.2
Future Increase With Project (2018)	0.4	0.3
Future Increase Due to Project (2018)	**0.2**	**0.1**

[+] The noise level calculations were based on the traffic study provided by the Traffic Consultant [Reference 8].

[*] Location A - 50 feet makai of Kuhio Highway edge-of-pavement

Zoning District	Day Hours (7 AM to 10 PM)	Night Hours (10 PM to 7 AM)
CLASS A Residential, Conservation, Preservation, Public Space, Open Space	55 dBA (Exterior)	45 dBA (Exterior)
CLASS B Multi-Family Dwellings, Apartments, Business, Commercial, Hotel, Resort	60 dBA (Exterior)	50 dBA (Exterior)
CLASS C Agriculture, Country, Industrial	70 dBA (Exterior)	70 dBA (Exterior)



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KAILUA, HAWAII 96734
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Hawaii Maximum Permissible Sound Levels for Various Zoning Districts

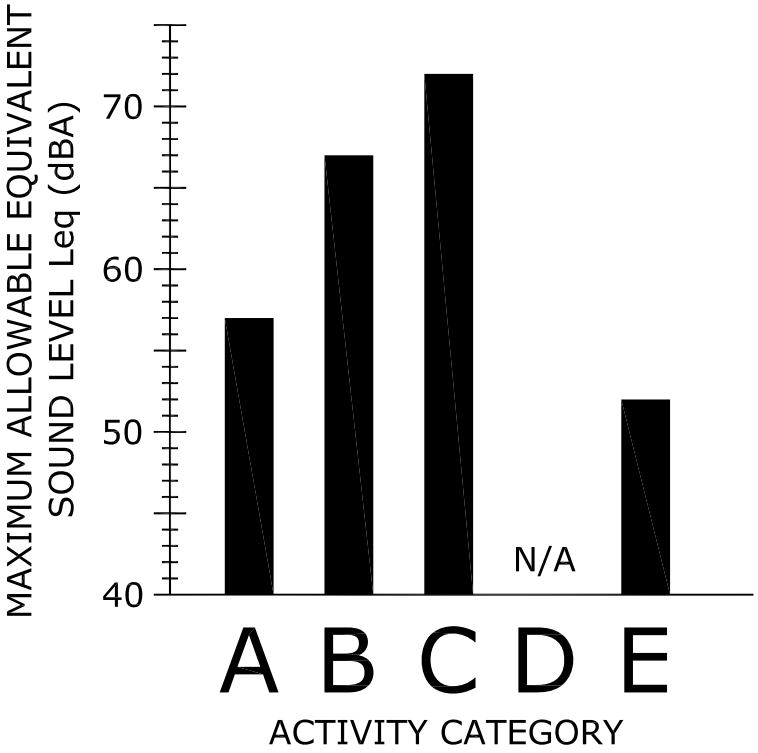
Princeville Makai Lands Agricultural Subdivision

Not to Scale

Figure No 1

Date	Project No.	Drawn By
November 2008	08-28	TRB

ACTIVITY CATEGORY	ACTIVITY CATEGORY DESCRIPTION	MAXIMUM EQUIVALENT SOUND LEVEL $L_{eq(h)}$
A	LANDS ON WHICH SERENITY AND QUIET ARE OF EXTRAORDINARY SIGNIFICANCE AND SERVE AN IMPORTANT PUBLIC NEED AND WHERE THE PRESERVATION OF THOSE QUALITIES IS ESSENTIAL IF THE AREA IS TO CONTINUE TO SERVE ITS INTENDED PURPOSE.	57 dBA (EXTERIOR)
B	PICNIC AREAS, RECREATION AREAS, PLAYGROUNDS, ACTIVE SPORT AREAS, PARKS, RESIDENCES, MOTELS, HOTELS, SCHOOLS, CHURCHES, LIBRARIES, AND HOSPITALS.	67 dBA (EXTERIOR)
C	DEVELOPED LANDS, PROPERTIES, OR ACTIVITIES NOT INCLUDED IN ACTIVITY CATEGORIES A OR B ABOVE.	72 dBA (EXTERIOR)
D	UNDEVELOPED LAND	N/A
E	RESIDENCES, MOTELS, HOTELS, PUBLIC MEETING ROOMS, SCHOOLS, CHURCHES, LIBRARIES, HOSPITALS, AND AUDITORIUMS.	52 dBA (INTERIOR)



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Federal Highways Administration Recommended Equivalent Hourly Sound Levels Based on Land Use

Princeville Makai Lands Agricultural Subdivision

Not to Scale

Figure No 2

Date	Project No.	Drawn By
November 2008	08-28	TRB

Noise Measurement and Prediction Locations

Princeville Makai Lands Agricultural Subdivision

Not to Scale

Date	Project No.	Drawn By
November 2008	08-28	DFD

Figure No 3

D. L. ADAMS ASSOCIATES, LTD.
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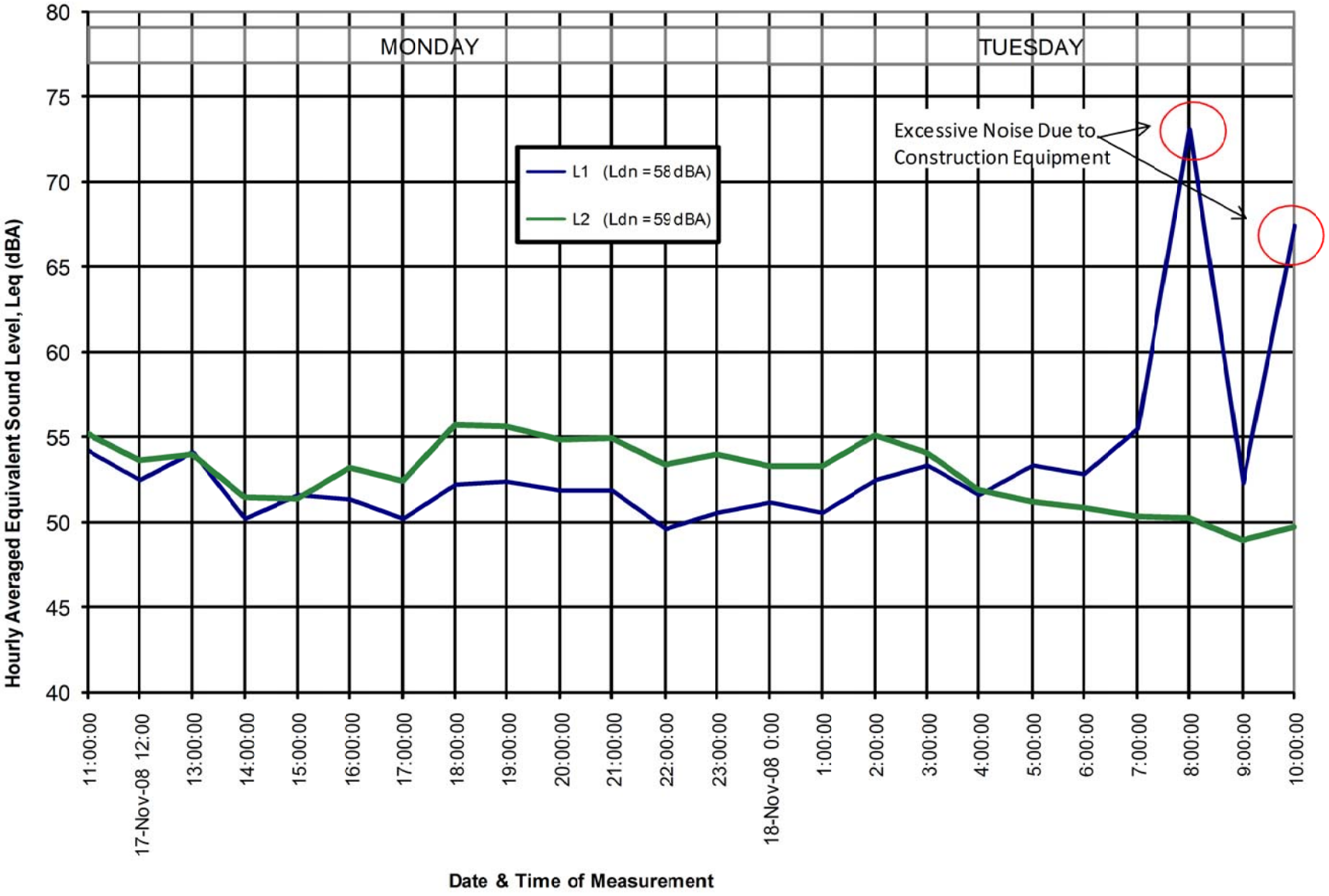

D. L. ADAMS ASSOCIATES, LTD.
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KAILUA, HAWAII 96734
808/254-3318 FAX 808/254-5295

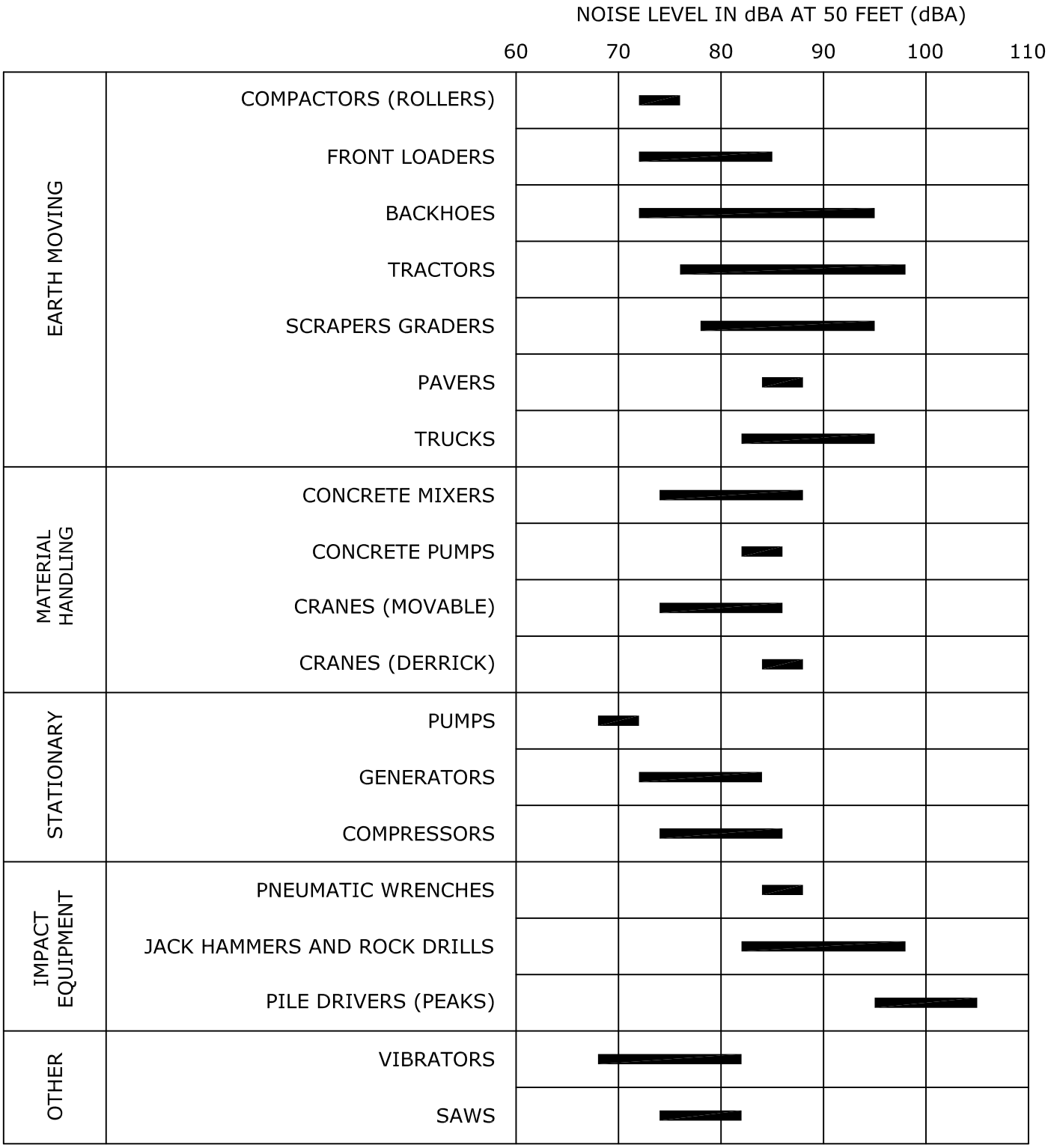
Graph of Long Term Noise Measurements

Princeville Makai Lands Agricultural Subdivision

Not to Scale

Date	Project No.	Drawn By
November 2008	08-28	DFD

Figure No
4



NOTE: BASED ON LIMITED AVAILABLE DATA SAMPLES

Typical Sound Levels from Construction Equipment

D. L. ADAMS ASSOCIATES, LTD.
970 N. KALAHEO AVE, A-311
KAILUA, HAWAII 96734
808/254-3318 FAX 808/254-5295

Princeville Makai Lands Agricultural Subdivision

Not to Scale

Figure No 5

Date	Project No.	Drawn By
November 2008	08-28	TRB

APPENDIX A

Acoustic Terminology

Acoustic Terminology

Sound Pressure Level

Sound, or noise, is the term given to variations in air pressure that are capable of being detected by the human ear. Small fluctuations in atmospheric pressure (sound pressure) constitute the physical property measured with a sound pressure level meter. Because the human ear can detect variations in atmospheric pressure over such a large range of magnitudes, sound pressure is expressed on a logarithmic scale in units called decibels (dB). Noise is defined as "unwanted" sound.

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

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

where P is the sound pressure fluctuation (above or below atmospheric pressure) and P_{ref} is the reference pressure, 20 µPa, which is approximately the lowest sound pressure that can be detected by the human ear. For example:

If P = 20 µPa, then SPL = 0 dB
If P = 200 µPa, then SPL = 20 dB
If P = 2000 µPa, then SPL = 40 dB

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

Human sensitivity to changes in sound pressure level is highly individualized. Sensitivity to sound depends on frequency content, time of occurrence, duration, and psychological factors such as emotions and expectations. However, in general, a change of 1 or 2 dB in the level of sound is difficult for most people to detect. A 3 dB change is commonly taken as the smallest perceptible change and a 6 dB change corresponds to a noticeable change in loudness. A 10 dB increase or decrease in sound level corresponds to an approximate doubling or halving of loudness, respectively.

A-Weighted Sound Level

Studies have shown conclusively that at equal sound pressure levels, people are generally more sensitive to certain higher frequency sounds (such as made by speech, horns, and whistles) than most lower frequency sounds (such as made by motors and engines)[1] at the same level. To address this preferential response to frequency, the A-weighted scale was developed. The A-weighted scale adjusts the sound level in each frequency band in much the same manner that the

[1] D.W. Robinson and R.S. Dadson, "A Re-Determination of the Equal-Loudness Relations for Pure Tones," *British Journal of Applied Physics*, vol. 7, pp. 166 - 181, 1956. (Adopted by the International Standards Organization as Recommendation R-226.

human auditory system does. Thus the A-weighted sound level (read as "dBA") becomes a single number that defines the level of a sound and has some correlation with the sensitivity of the human ear to that sound. Different sounds with the same A-weighted sound level are perceived as being equally loud. The A-weighted noise level is commonly used today in environmental noise analysis and in noise regulations. Typical values of the A-weighted sound level of various noise sources are shown in Figure A-1.

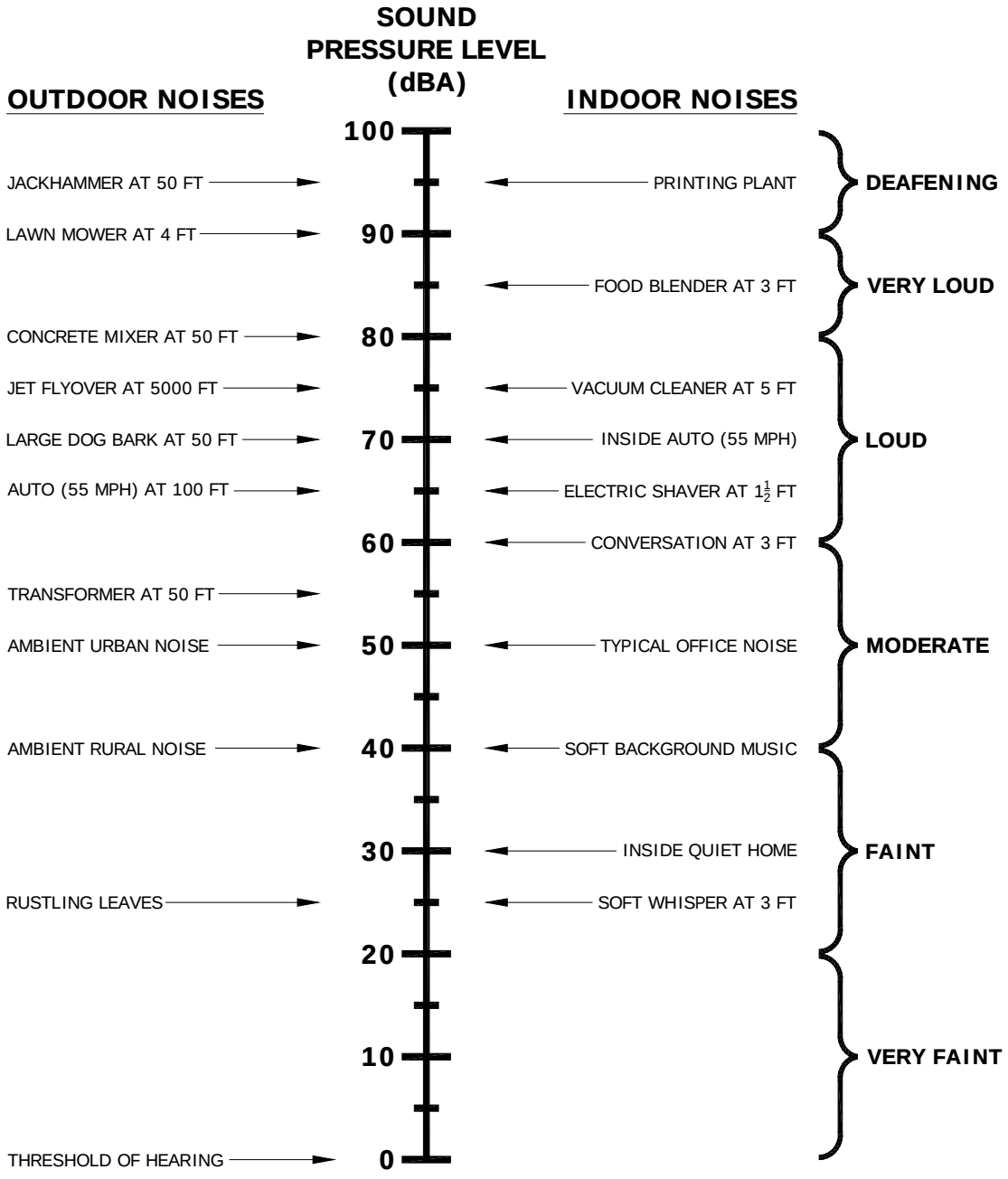


Figure A-1. Common Outdoor/Indoor Sound Levels

Equivalent Sound Level

The Equivalent Sound Level (L_{eq}) is a type of average which represents the steady level that, integrated over a time period, would produce the same energy as the actual signal. The actual *instantaneous* noise levels typically fluctuate above and below the measured L_{eq} during the measurement period. The A-weighted L_{eq} is a common index for measuring environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

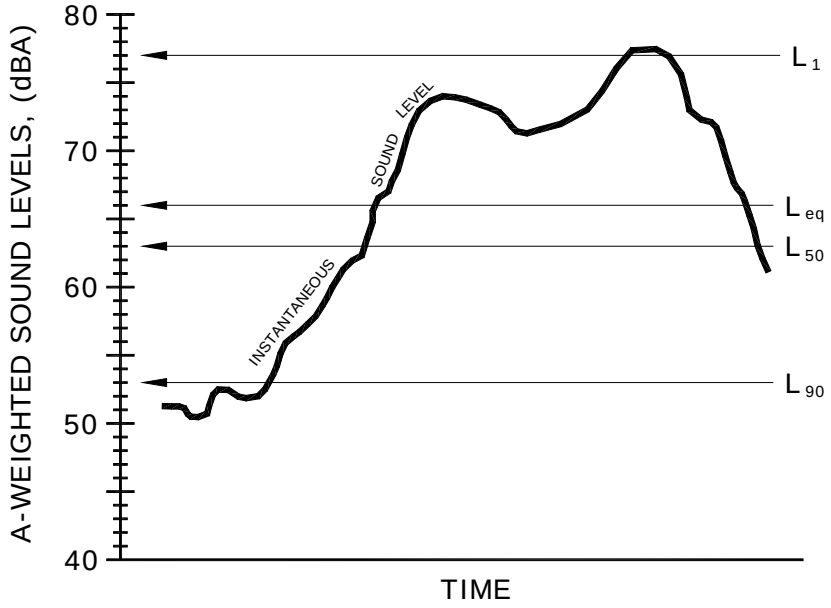


Figure A-2. Example Graph of Equivalent and Statistical Sound Levels

Statistical Sound Level

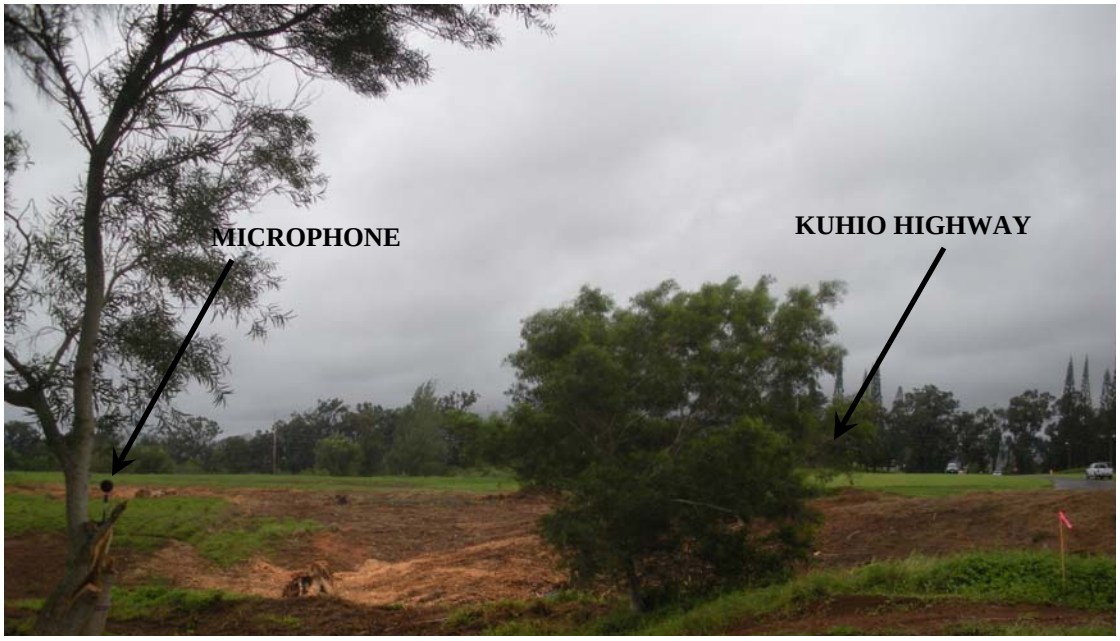
The sound levels of long-term noise producing activities such as traffic movement, aircraft operations, etc., can vary considerably with time. In order to obtain a single number rating of such a noise source, a statistically-based method of expressing sound or noise levels has been developed. It is known as the Exceedence Level, L_n. The L_n represents the sound level that is exceeded for n% of the measurement time period. For example, L_{10} = 60 dBA indicates that for the duration of the measurement period, the sound level exceeded 60 dBA 10% of the time. Typically, in noise regulations and standards, the specified time period is one hour. Commonly used Exceedence Levels include L_{01}, L_{10}, L_{50}, and L_{90}, which are widely used to assess community and environmental noise. A graphical description of the equivalent sound level is shown in Figure A-2.

Day-Night Equivalent Sound Level

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

APPENDIX B

Photographs at Project Site



Location L1
Approximately 500 feet makai of Kuhio Highway, ear the Prince Golf Clubhouse.

Location L2
Near the northern boundary of the project site, located on bluff overlooking Anini Road.

APPENDIX C

Supplementary Airport Noise Analysis

1.0 DESCRIPTION

The proposed Princeville Agricultural Subdivision project is located in the vicinity of the Princeville Airport. While the airport serves infrequent private jets and helicopter tours, aircraft takeoff and landings are a source of noise that may be bothersome to the proposed residences. Therefore, a supplementary noise analysis was conducted to determine the impact of airport noise on the project site.

2.0 NOISE STANDARDS

Various local and federal agencies have established guidelines and standards for assessing environmental noise impacts due to aircraft noise exposure.

2.1 Federal Aviation Administration (FAA)

Federal Aviation Regulation, Part 150, Airport Noise Compatibility Planning [Reference1], is the primary Federal regulation guiding and controlling planning for aviation noise compatibility on and around airports. The 14 CFR Part 150 (Table A) addresses the thresholds for evaluating the probable effect of aircraft noise exposure on human activities characteristic of specific land uses. Table C-1 summarizes these federal guidelines for land use compatibility. The guidelines for land use compatibility due to aircraft operations are expressed in terms of yearly day-night average sound levels, or L_{dn}.

2.2 Hawaii Department of Transportation (HDOT), Airports Division

The State of Hawaii, Department of Transportation, Airports Division has adopted noise restrictions similar to the FAA's, but more strict [Reference 2]. Similar to the FAA, HDOT expresses land use compatibility guidelines based on yearly day-night average sound levels, L_{dn}, due to aircraft operations. In most cases, the HDOT states maximum noise limits that are 5 dB lower than the FAA. For example, the HDOT states that residences outside of the 60 L_{dn} noise contour are compatible. Residences between 60 and 70 L_{dn} contours are only compatible if noise mitigation treatments are implemented. The compatibility of other land uses, such as manufacturing, public, and recreation, are shown in Table C-2.

3.0 EXISTING ACOUSTICAL ENVIRONMENT

Two types of noise measurements were conducted to assess aircraft noise in the vicinity of the project site. The first noise measurement type consisted of continuous long-term ambient noise level measurements at two locations (Location L3 and L4). The second type of noise measurement was short-term. The noise measurements are scheduled to be conducted for two weeks at the end of February/beginning of March, 2011.

3.1 Noise Measurement Procedure

Long-Term Noise Measurement Procedure

Continuous, 15-minute, statistical sound levels were recorded for approximately 24 hours. The measurement data was collected using a Larson-Davis Laboratories, Model 831, Type-1 Sound Level Meter together with a PCB, Model 377B20 Type-1 Microphone. Calibration was checked before and after the

measurements with a Larson-Davis Model CAL200 calibrator. Both the sound level meter and the calibrator have been certified by the manufacturer within the recommended calibration period. The microphone was mounted on a tripod, approximately 5 feet above grade. A windscreen covered the microphone during the entire measurement period. The sound level meter was secured in a weather resistant case.

Short-Term Noise Measurement Procedure

Short term measurements were conducted at several locations in the vicinity of Princeville Airport. The noise measurement data was also collected using a Larson-Davis Laboratories, Model 831, Type-1 Sound Level Meter together with a PCB, Model 377B20 Type-1 Microphone. An approximate 1/5-second equivalent sound level, L_{eq}, was measured during each aircraft event.

3.2 Noise Measurement Locations

Long-Term Noise Measurement Location

Location L3: Description forthcoming.

Location L4: Description forthcoming.

Short-Term Noise Measurement Locations

Location S2: Description forthcoming.

3.3 Noise Measurement Results

The results from the noise measurements will be graphically presented once the data collection period is complete.

4.0 POTENTIAL NOISE IMPACTS AND NOISE MITIGATION

4.1 Airport Noise

An analysis of noise from Princeville Airport will be provided once the data collection period is complete.

5.0 POTENTIAL NOISE IMPACT ON THE PROJECT AND NOISE MITIGATION

5.1 Mitigation of Airport Noise

If an airport noise impact is determined, mitigation measures will be provided.

REFERENCES

1. *FAA Regulations on Airport Noise Compatibility Planning Programs,* Code of Federal Regulations, Title 14, Chapter 1, Subchapter 1, Part 150; Issued by 49 FR 49269, December 18, 1984; corrected by 50 FR 5063, February 6, 1985; amended by 53 FR 8723, March 16, 1988; corrected by 53 FR 9726, March 24, 1988.

2. *Honolulu International Airport Master Plan Update and Noise Compatibility Program*, State of Hawaii Department of Transportation, Airports Division, Vol. 2, December 1989.

Table C-1: FAR Part 150 Recommendations for Land Use Compatibility in Yearly Day-Night Average Sound Levels

TYPE OF LAND USE	Yearly Day-Night Average Sound Level (L_{dn})					
	< 65	**65-70**	**70-75**	**75-80**	**80-85**	**> 85**
RESIDENTIAL:						
Residential (except mobile homes & transient lodgings)	Y	N(1)	N(1)	N	N	N
Mobile home parks	Y	N	N	N	N	N
Transient lodgings	Y	N(1)	N(1)	N(1)	N	N
PUBLIC USE:						
Schools	Y	N(1)	N(1)	N	N	N
Hospitals and nursing homes	Y	25	30	N	N	N
Churches, auditoriums, and concert halls	Y	25	30	N	N	N
Government services	Y	Y	25	30	N	N
Transportation	Y	Y	Y(2)	Y(3)	Y(4)	Y(4)
Parking	Y	Y	Y(2)	Y(3)	Y(4)	N
COMMERCIAL USE:						
Offices, business and professional	Y	Y	25	30	N	N
Wholesale/Retail:(bldg. Mater., hardware, & farm equip.)	Y	Y	Y(2)	Y(3)	Y(4)	N
Retail trade – general	Y	Y	25	30	N	N
Utilities	Y	Y	Y(2)	Y(3)	Y(4)	N
Communication	Y	Y	25	30	N	N
MANUFACTURING AND PRODUCTION:						
Manufacturing, general	Y	Y	Y(2)	Y(3)	Y(4)	N
Photographic and optical	Y	Y	25	30	N	N
Agriculture (except livestock) and forestry	Y	Y(6)	Y(7)	Y(8)	Y(8)	Y(8)
Livestock farming and breeding	Y	Y(6)	Y(7)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL USE:						
Outdoor sports arenas and spectator sports	Y	Y(5)	Y(5)	N	N	N
Outdoor music shells, amphitheaters	Y	N	N	N	N	N
Nature exhibits and zoos	Y	Y	N	N	N	N
Amusements, parks, resorts and camps	Y	Y	Y	N	N	N
Golf courses, riding stables and water recreation	Y	Y	25	30	N	N

Note: Numbers in parentheses refer to the following notes.

(1) Where the community determines that residential or school uses must be allowed, measures to achieve outdoor-to-indoor Noise Level Reduction (NLR) of at least 25 dB and 30 dB should be incorporated into building codes and be considered in individual approvals. Normal residential construction can be expected to provide a NLR of 20 dB, thus, the reduction requirements are often stated as 5, 10, or 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. However, the use of NLR criteria will not eliminate outdoor noise problems.

(2) Measures to achieve NLR 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

(3) Measures to achieve NLR 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

(4) Measures to achieve NLR 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

(5) Land use compatible provided special sound reinforcement systems are installed.

(6) Residential buildings require a NLR of 25.

(7) Residential buildings require a NLR of 30.

(8) Residential buildings are not permitted.

Abbreviations:

Y(Yes) = Land Use and related structures compatible w/o restrictions.

N(No) = Land Use and related structures are not compatible and should be prohibited.

NLR = Noise Level Reduction (outdoor-to-indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.

25, 30, or 35 = Land use and related structures general compatible; measures to achieve NLR of 25, 30, or 35 dB must be incorporated into design and construction of structures.

Regulatory Note.

The designations contained in this table do not constitute a Federal determination that any use of land covered by the program is acceptable or unacceptable under Federal, State, or local law. The responsibility for determining the acceptable and permissible land uses and the relationship between specific properties and specific noise contours rests with the local authorities. FAA determinations under Part 150 are not intended to substitute federally determined land uses for those determined to be appropriate by local authorities in response to locally determined needs and values in achieving noise compatible land uses.

Source: FAR Part 150, Appendix A, Table 1. "Land Use Compatibility with Yearly Day-Night Average Sound Levels."

Table C-2: State Department of Transportation Airports Division Recommendations for Local Land Use Compatibility in Yearly Day-Night Average Sound Levels (L_{dn})

TYPE OF LAND USE	Yearly Day-Night Average Sound Level (L_{dn})					
	< 60	**60-65**	**65-70**	**70-75**	**75-80**	**80-85**
RESIDENTIAL:						
Low density residential, resorts, & hotels (w/ outdoor fac).....	Y(a)	N(b)	N	N	N	N
Low density apartment w/ moderate outdoor use.....	Y	N(b)	N	N	N	N
High density apartment with limited outdoor use	Y	N(b)	N(b)	N	N	N
Transient lodgings (w/limited outdoor use)	Y	N(b)	N(b)	N	N	N
PUBLIC USE:						
Schools, day care centers, libraries, and churches.....	Y	N(c)	N(c)	N(c)	N	N
Hospitals, nursing homes, clinics, and health facilities	Y	Y(d)	Y(d)	Y(d)	N	N
Indoor auditoriums, and concert halls	Y(c)	Y(c)	N	N	N	N
Government services and offices serving the public	Y	Y	Y(d)	Y(d)	N	N
Transportation and parking	Y	Y	Y(d)	Y(d)	Y(d)	Y(d)
COMMERCIAL USE:						
Offices - government, business and professional	Y	Y	Y(d)	Y(d)	N	N
Wholesale/Retail: bldg. Mater., hardware, & heavy equip.....	Y	Y	Y(d)	Y(d)	Y(d)	Y(d)
Airport businesses - car rental, ticketing, lei stands, etc.....	Y	Y	Y(d)	Y(d)	N	N
Retail trade, restaurants, shp. Centers, financial inst., etc	Y	Y	Y(d)	Y(d)	N	N
Power plants, sweage treatment plants, & base yards	Y	Y	Y(d)	Y(d)	Y(d)	N
Studios w/o outdoor sets, broadcasting & Production fac.....	Y(c)	Y(c)	N	N	N	N
MANUFACTURING AND PRODUCTION:						
Manufacturing, general	Y	Y	Y(d)	Y(d)	Y(d)	N
Photographic and optical.....	Y	Y	Y(d)	Y(d)	N	N
Agriculture (except livestock) and forestry.....	Y	Y(e)	Y(e)	Y(e)	Y(e)	Y(e)
Livestock farming and breeding.....	Y	Y(e)	Y(e)	N	N	N
Mining and fishing, resource production and extraction	Y	Y	Y	Y	Y	Y
RECREATIONAL USE:						
Outdoor sports arenas and spectator sports	Y	Y(f)	Y(f)	N	N	N
Outdoor music shells, amphitheaters.....	Y(f)	N	N	N	N	N
Nature exhibits and zoos, neighborhood parks.....	Y	Y	Y	N	N	N
Amusements, beach parks, active playgrounds, etc	Y	Y	Y	Y	N	N
Public golf courses, riding stables, cemeteries, gardens, etc	Y	Y	N	N	N	N
Professional/resort sports facil., media event facil., etc	Y(f)	N	N	N	N	N
Extensive natural wildlife and recreation areas.....	Y(f)	N	N	N	N	N

Note: Letters in parentheses refer to the following notes.

(a) A noise level of 60 L_{dn} does not eliminate all risks of adverse noise impacts from aircraft noise. However, the 60 L_{dn} planning level has been selected by the State Airports Division as an appropriate compromise between the minimal risk of level of 55 L_{dn} and the significant risk level of 65 L_{dn}.

(b) Where the community determines that these uses should be allowed, Noise Level Reduction (NLR) measures to achieve interior levels of 45 L_{dn} or less should be incorporated into building codes and be considered in individual approvals. Normal local construction employing natural ventilation can be expected to provide an average NLR of approximately 9 dB. Total closure plus air conditioning may be required to provide additional outdoor-to-indoor NLR, but will not eliminate outdoor noise problems.

(c) Because the L_{dn} noise descriptor system represents a 24-hour average of individual aircraft noise events, each of which can be unique in respect to amplitude, duration, and tonal content, the NLR requirements should be evaluated for the specific land use, interior acoustical requirements, and properties of the aircraft noise events. NLR requirements should not be based solely upon the exterior L_{dn} exposure level.

(d) Measures to achieve required NLR must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas, or where the normal noise level is low.

(e) Residential buildings require NLR. Residential buildings should not be located where exterior noise is greater than 65 L_{dn}.

(f) Impact of amplitude, duration, frequency, and tonal content of aircraft noise events should be evaluated.

Abbreviations:

Y(Yes) =Land Use and related structures compatible without restrictions.

N(No) = Land Use and related structures are not compatible and should be prohibited.

Source: Airports Division, Department of Transportation, State of Hawaii

APPENDIX J. TRAFFIC IMPACT REPORT PRINCEVILLE SUBDIVISION

Traffic Impact Report

Princeville Subdivision

Prepared For

Group 70 International, Inc.

Prepared By

Wilson Okamoto Corporation

November 2008

TRAFFIC IMPACT REPORT

FOR THE PROPOSED

PRINCEVILLE SUBDIVISION

Prepared for:

Group 70 International, Inc.
925 Bethel Street, Fifth Floor
Honolulu, Hi 96813

Prepared by:

Wilson Okamoto Corporation
1907 S. Beretania Street, Suite 400
Honolulu, Hawaii 96826
WOC Ref. #7881-01

November 2008

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I. INTRODUCTION

A. Purpose of Study

The purpose of this study is to identify and assess the traffic impacts resulting from the proposed Princeville Subdivision located adjacent to Kuhio Highway in Princeville on the island of Kauai. The proposed project entails the subdivision of an existing 942-acre parcel into 21 lots.

B. Scope of Study

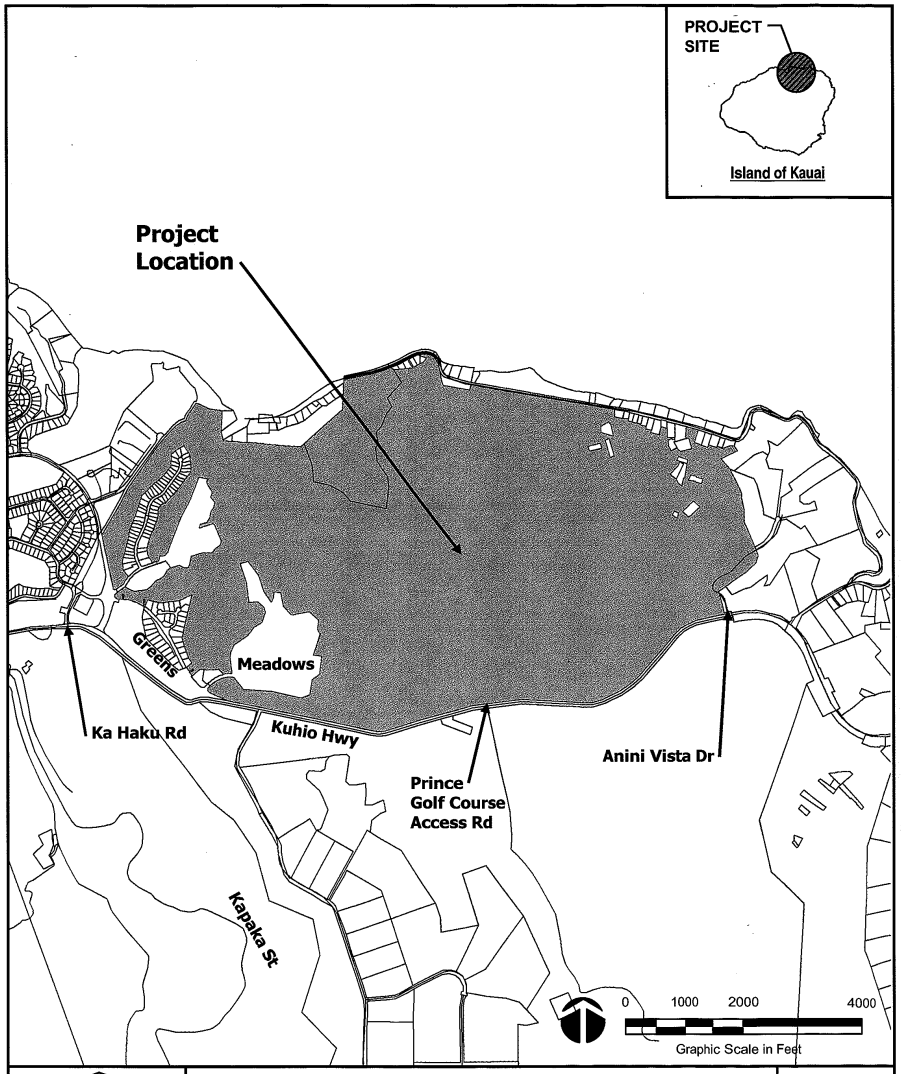
This report presents the findings and conclusions of the traffic study, the scope of which includes:

1. Description of the proposed project.
2. Evaluation of existing roadway and traffic operations in the vicinity.
3. Analysis of future roadway and traffic conditions without the proposed project.
4. Analysis and development of trip generation characteristics for the proposed project.
5. Superimposing site-generated traffic over future traffic conditions.
6. The identification and analysis of traffic impacts resulting from the proposed project.
7. Recommendations of improvements, if appropriate, that would mitigate the traffic impacts resulting from the proposed project.

II. PROJECT DESCRIPTION

A. Location

The project site is located adjacent to Kuhio Highway in Princeville on the island of Kauai between Anini Vista Drive and Ka Haku Road (see Figure 1). The project site is further identified as Tax Map Keys: (4) 5-3-06: 1 and 14. Access to the project site will be provided via Anini Vista Drive and the access road for the existing Prince Golf Course.



WILSON OKAMOTO CORPORATION
ENGINEERS - PLANNERS

PRINCEVILLE SUBDIVISION

LOCATION MAP AND VICINITY MAP

FIGURE 1

B. Project Characteristics

The project site is located on an existing 942-acre parcel adjacent to Kuhio Highway currently utilized by the Princeville Ranch. The proposed subdivision will result in a total 21 lots which include the following:

- 17 agricultural lots which are expected to include 75 new residential dwelling units (~451 acres)
- 2 golf course lots containing portions of the existing Prince Golf Course (~350 acres)
- An SMA lot that is intended to remain undeveloped (~126 acres)
- Roadway lot (~15 acres)

Access to these lots will be provided via Anini Vista Drive and the existing Prince Golf Course access road. Although the time frame for the full build out of the lots is not known at this time, for the purpose of this report, all of the lots are assumed to be developed and occupied within 10 years (by the Year 2018). Figure 2 shows the proposed project site plan.

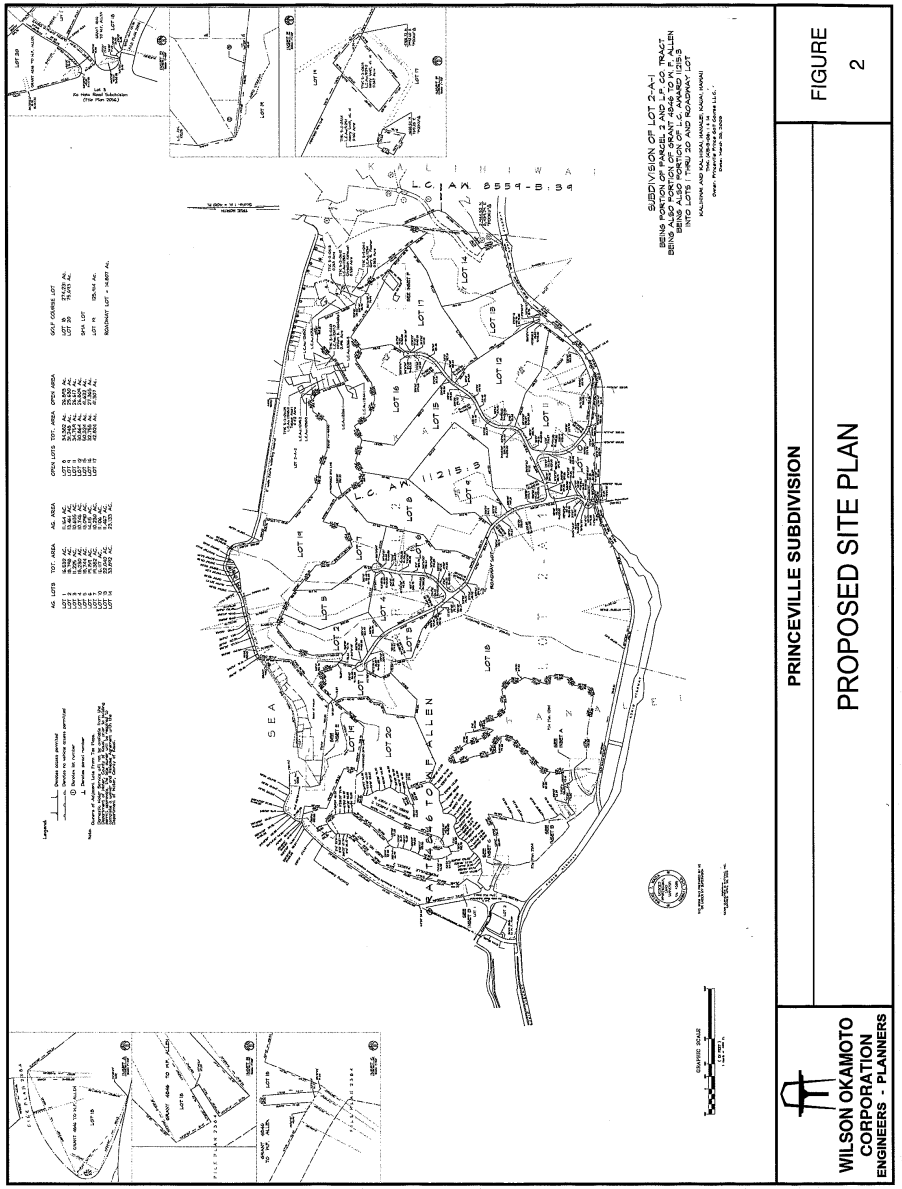
III. EXISTING TRAFFIC CONDITIONS

A. General

The project site is located adjacent to Kuhio Highway between Anini Vista Drive and Ka Haku Road. Kuhio Highway serves as the main access road along the northern and eastern coasts of Kauai from its origin in Haena along the north shore of the island to its termination at Kaumualii Highway and Rice Street in Lihue.

B. Area Roadway System

In the vicinity of the project site, Kuhio Highway is a predominantly two-lane, two-way State of Hawaii roadway oriented in the east-west direction. At the southeast corner of the project site, Kuhio Highway intersects Anini Vista Drive. At this unsignalized T-intersection, the eastbound approach of the highway has one lane that serves left-turn and through traffic movements while the westbound approach has one lane that serves through and right-turn traffic movements. Anini Vista Drive is a two-lane, two-way roadway generally oriented in the north-south direction. At the intersection with Kuhio Highway, the Anini Vista Drive approach has one lane that serves left-turn and right-turn traffic movements.



West of the intersection with Anini Vista Drive, Kuhio Highway intersects the existing access roads for the Prince Golf Course and Princeville Ranch. At this unsignalized intersection, the eastbound approach of the highway has a shared through and right-turn lane and an exclusive left-turn lane while the westbound approach has one through lane and exclusive turning lanes. The northbound approach is comprised of the access road for the Princeville Ranch while the southbound approach is comprised of the access road for the Prince Golf Course. Both approaches have one lane at this intersection that serve all traffic movements. In addition, there is an additional westbound departure lane along Kuhio Highway to allow right-turning vehicles from the golf course to turn freely onto the highway.

Further west, Kuhio Highway intersects Kapaka Street. At this unsignalized intersection, both approaches of the highway have one lane that serves all traffic movements. Kapaka Street is a two-lane, two-way roadway generally oriented in the north-south direction. At the intersection with the highway, the Kapaka Street approach has one lane that serves all traffic movements. The southbound approach is comprised of an access road for an adjacent parking area. At the intersection with the highway, this access road has one lane that serves all traffic movements.

Near the southwest corner of the project site, Kuhio Highway intersects Ka Haku Road. At this unsignalized T-intersection, the eastbound approach of the highway has one through lane and an exclusive left-turn lane while the westbound approach has one through lane and an exclusive right-turn lane. Ka Haku Road is a two-lane, two-way roadway that provides access to the residential, commercial, and resort uses along its alignment. At the intersection with the highway, the Ka Haku Road approach has one lane that serves left-turn and right-turn traffic movements.

C. Traffic Volumes and Conditions

1. General

a. Field Investigation

Field investigations were conducted on September 23-24, 2008 and consisted of manual turning movement count surveys along Kuhio Highway in the project vicinity. The manual turning movement count

surveys were conducted between the morning peak hours of 6:00 AM and 9:00 AM, and the afternoon peak hours of 3:00 PM and 6:00 PM at the following intersections:

- Kuhio Highway and Anini Vista Drive
- Kuhio Highway, Prince Golf Course Access Road, and Princeville Ranch Access Road
- Kuhio Highway and Kapaka Street
- Kuhio Highway and Ka Haku Road

Appendix A includes the existing traffic count data.

b. Capacity Analysis Methodology

The highway capacity analysis performed in this study is based upon procedures presented in the "Highway Capacity Manual", Transportation Research Board, 2000, and the "Highway Capacity Software", developed by the Federal Highway Administration. The analysis is based on the concept of Level of Service (LOS).

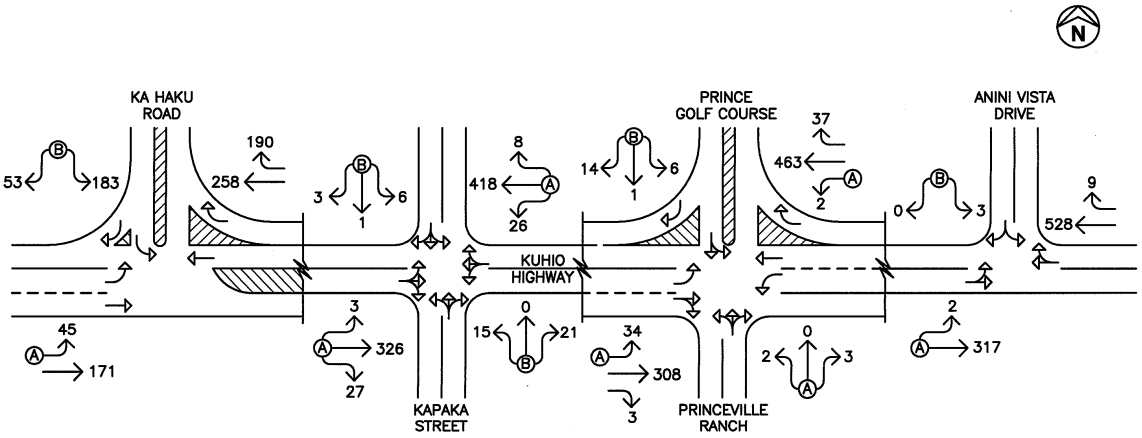
LOS is a quantitative and qualitative assessment of traffic operations. Levels of Service are defined by LOS "A" through "F"; LOS "A" representing ideal or free-flow traffic operating conditions and LOS "F" unacceptable or potentially congested traffic operating conditions.

"Volume-to-Capacity" (v/c) ratio is another measure indicating the relative traffic demand to the road carrying capacity. A v/c ratio of one (1.00) indicates that the roadway is operating at or near capacity. A v/c ratio of greater than 1.00 indicates that the traffic demand exceeds the road's carrying capacity. The LOS definitions are included in Appendix B.

2. Existing Peak Hour Traffic

a. General

Figures 3 and 4 show the existing AM and PM peak hour traffic volumes and operating traffic conditions. The AM peak hour of



LEGEND

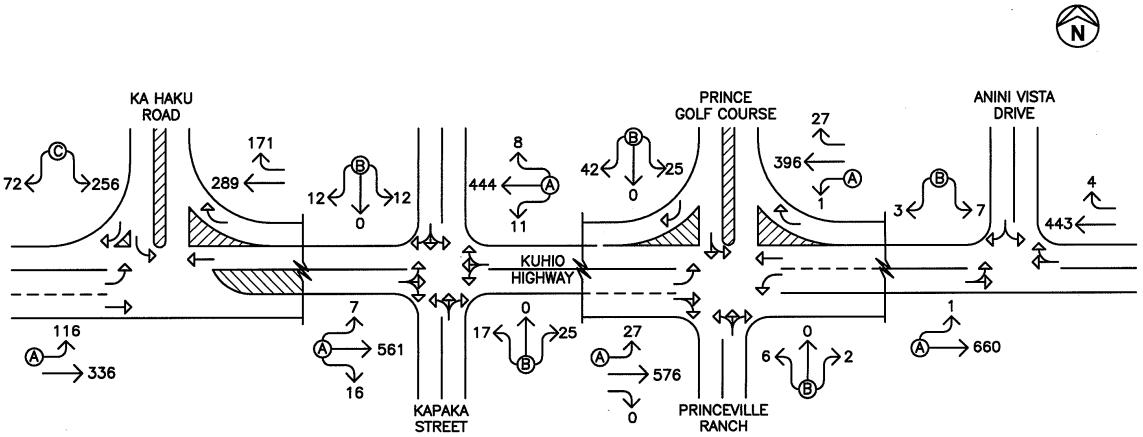
90 TRAFFIC MOVEMENT VOLUME (VPH)

LANE USAGE

Ⓐ LANE GROUP LEVEL OF SERVICE

Date of Count: September 23–24, 2008

WILSON OKAMOTO CORPORATION ENGINEERS • PLANNERS	PRINCEVILLE SUBDIVISION	FIGURE
	EXISTING AM PEAK HOUR OF TRAFFIC	3



LEGEND

90 TRAFFIC MOVEMENT VOLUME (VPH)

LANE USAGE

Ⓐ LANE GROUP LEVEL OF SERVICE

Date of Count: September 23–24, 2008

WILSON OKAMOTO CORPORATION ENGINEERS • PLANNERS	PRINCEVILLE SUBDIVISION	FIGURE
	EXISTING PM PEAK HOUR OF TRAFFIC	4

traffic generally occurs between 7:30 AM and 8:30 AM in the vicinity of the proposed project. In the afternoon, the PM peak hour of traffic generally occurs between the hours of 4:15 PM and 5:15 PM. Although the peak hours of traffic generally occurs around the same time periods at each of the study intersections, the absolute commuter peak hour time periods for each intersection may differ slightly as shown in Table 1.

Table 1: Peak Hours of Traffic

Intersection	AM Peak	PM Peak
Kuhio Hwy/ Anini Vista Dr	7:45 AM-8:45 AM	4:15 PM-5:15 PM
Kuhio Hwy/Prince GC Access Rd/ Princeville Ranch Access Rd	7:45 AM-8:45 AM	4:15 PM-5:15 PM
Kuhio Hwy/ Kapaka St	7:30 AM-8:30 AM	4:15 PM-5:15 PM
Kuhio Hwy/ Ka Haku Rd	7:30 AM-8:30 AM	4:15 PM-5:15 PM

The analysis is based on these absolute commuter peak hour time periods for each intersection to identify the traffic impacts resulting from the proposed project. LOS calculations are included in Appendix C.

b. Kuhio Highway and Anini Vista Drive

At the intersection with Anini Vista Drive, Kuhio Highway carries 319 vehicles eastbound and 537 vehicles westbound during the AM peak hour of traffic. During the PM peak hour, the overall traffic volume is higher with 661 vehicles traveling eastbound and 447 vehicles traveling westbound. The critical traffic movement on the Kuhio Highway approaches is the eastbound left-turn and through traffic movement which operates at LOS "A" during both peak periods.

The Anini Vista Drive approach of this intersection carries a low volume of vehicles during both peak periods. Only 3 vehicles and 10 vehicles were observed heading southbound on this approach during the AM and PM peak periods, respectively. The Anini Vista Drive approach operates at LOS "B" during both peak periods.

c. Kuhio Highway, Prince Golf Course Access Road, and Princeville Ranch Access Road

At the intersection with the access roads for the Prince Golf Course and Princeville Ranch, Kuhio Highway carries 345 vehicles eastbound and 502 vehicles westbound during the AM peak hour of traffic. During the PM peak hour, the overall traffic volume is higher with 603 vehicles traveling eastbound and 424 vehicles traveling westbound. The critical traffic movements on the Kuhio Highway approaches are the eastbound and westbound left-turn traffic movements which operates at LOS "A" during both peak periods.

The northbound approach of the intersection is comprised of the access road for the Princeville Ranch. This approach carries a low volume of vehicles during both peak periods. Only 5 vehicles and 8 vehicles were observed heading northbound on this approach during the AM and PM peak periods, respectively. The Princeville Ranch access road approach operates at LOS "A" and LOS "B" during the AM and PM peak periods, respectively.

The southbound approach of the intersection is comprised of the access road for the Prince Golf Course. This approach carries 21 vehicles and 67 vehicles southbound during the AM and PM peak periods, respectively, and operates at LOS "B" during both peak periods.

d. Kuhio Highway and Kapaka Street

At the intersection with Kapaka Street, Kuhio Highway carries 356 vehicles eastbound and 452 vehicles westbound during the AM

peak hour of traffic. During the PM peak hour, traffic volumes are higher with 584 vehicles traveling eastbound and 463 vehicles traveling westbound. Both approaches of Kuhio Highway operate at LOS "A" during both peak periods.

The Kapaka Street approach of this intersection carries 36 vehicles northbound during AM peak period. The traffic volume is slightly higher during the PM peak period with 42 vehicles traveling northbound. The Kapaka Street approach operates at LOS "B" during both peak periods.

The southbound approach of the intersection is comprised of an access road for an adjacent parking area. This approach carries a relatively low volume of traffic during the peak periods with 10 vehicles and 24 vehicles observed on the approach during the AM and PM peak periods, respectively. The parking area access road approach operates at LOS "B" during both peak periods.

e. Kuhio Highway and Ka Haku Road

At the intersection with Ka Haku Road, Kuhio Highway carries 448 vehicles eastbound and 216 vehicles westbound during the AM peak hour of traffic. During the PM peak hour, traffic volumes are higher with 452 vehicles traveling eastbound and 460 vehicles traveling westbound. The critical traffic movement on the Kuhio Highway approaches is the eastbound left-turn traffic movement which operates at LOS "A" during both peak periods.

The Ka Haku Road approach of this intersection carries 236 vehicles southbound during the AM peak period. During the PM peak period, the traffic volume is higher with 328 vehicles traveling southbound. The Ka Haku Road approach operates at LOS "B" and LOS "C" during the AM and PM peak periods, respectively. Traffic queues periodically formed on the Ka Haku Road approach with

average queue lengths of 3-5 vehicles observed during both peak periods.

IV. PROJECTED TRAFFIC CONDITIONS

A. Site-Generated Traffic

1. Trip Generation Methodology

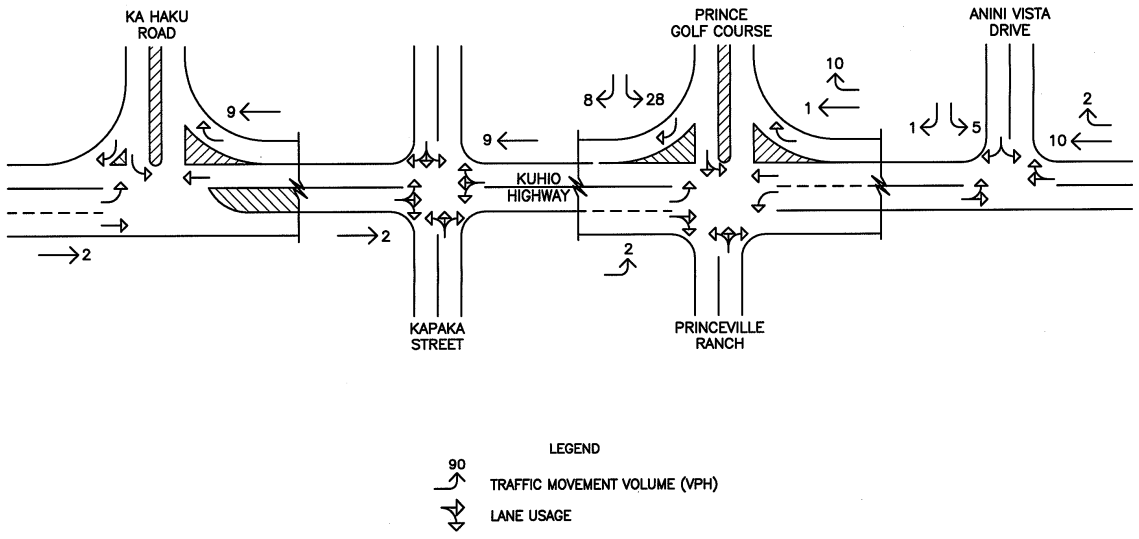
The trip generation methodology used in this study is based upon generally accepted techniques developed by the Institute of Transportation Engineers (ITE) and published in "Trip Generation, 7th Edition," 2003. The ITE trip generation rates are developed empirically by correlating the vehicle trip generation data with various land use characteristics such as the number of vehicle trips generated per dwelling unit. Table 2 summarizes the project site trip generation characteristics applied to the AM and PM peak hours of traffic to measure the impact resulting from the proposed Princeville Subdivision.

Table 2: Peak Hour Trip Generation

SINGLE-FAMILY DETACHED HOUSING INDEPENDENT VARIABLE: # of Units = 75		
		PROJECTED TRIP ENDS
AM PEAK	ENTER	14
	EXIT	42
	TOTAL	56
PM PEAK	ENTER	48
	EXIT	28
	TOTAL	76

2. Trip Distribution

Figures 5 and 6 show the distribution of site-generated vehicular trips at the study intersections during the AM and PM peak hours. Access to the proposed subdivision will be provided via Anini Vista Drive and the existing access road for the Prince Golf Course. Site-generated trips were distributed between these two access points based upon their proximity to the proposed residential dwelling units. At Kuhio Highway, the directional distribution of these trips was based upon the distribution of traffic for the other existing



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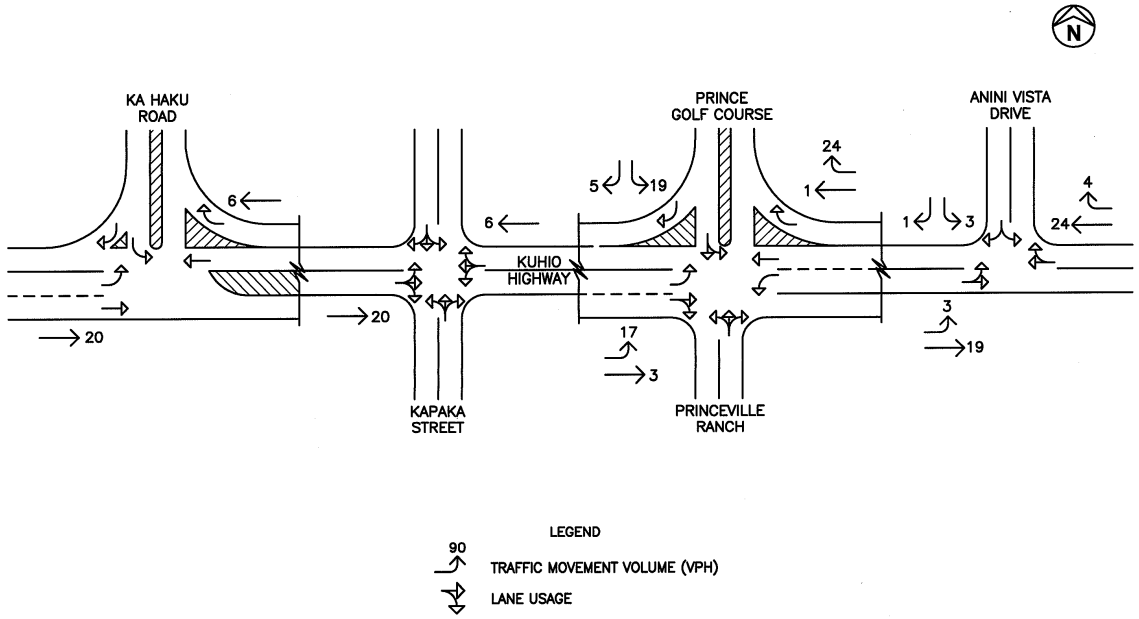
DISTRIBUTION OF SITE-GENERATED VEHICLES
AM PEAK HOUR OF TRAFFIC

FIGURE 5



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DISTRIBUTION OF SITE-GENERATED VEHICLES
PM PEAK HOUR OF TRAFFIC

FIGURE 6

Princeville developments. As such, the directional distribution of site-generated trips at the intersections with Anini Vista Drive and the Prince Golf Course/Princeville Ranch access roads was based on the existing distribution of traffic at the intersection of Kuhio Highway with Ka Haku Road. Therefore, during the AM peak period of traffic, 80.9% of entering vehicles were assumed to be heading northbound while 19.1% were assumed to be heading southbound. Similarly, 22.5% of exiting vehicles were assumed to be heading northbound while 77.5% were assumed to be heading southbound. During the PM peak period, 59.6% of entering vehicles were assumed to be heading northbound while 40.4% were assumed to be heading southbound. Similarly, 22.0% of exiting vehicles were assumed to be heading northbound while 78.0% were assumed to be heading southbound.

B. Through Traffic Forecasting Methodology

Typically, travel forecasts are developed based upon historical traffic count data obtained from the State Department of Transportation (SDOT), Highway Division survey stations. However, since the SDOT traffic survey data along Kuhio Highway in the vicinity of the project indicates relatively stable or decreasing traffic volumes, use of the SDOT data is inappropriate to derive a reasonable level of accuracy or certainty in the traffic forecast. As such, the travel forecast developed for this study conservatively assumes the existing traffic volumes along Kuhio Highway and Ka Haku Road will increase at a rate of 0.5% per year to the Year 2018. Using 2008 as the Base Year, a growth factor of 1.05 was applied to the existing traffic demands along those roadways to achieve the projected Year 2018 traffic demands.

C. Other Considerations

There are two developments in the immediate vicinity of the proposed Princeville Subdivision that are expected to be completed by the Year 2018. The first development is the Greens project which includes approximately 70 timeshare units and the second development is the Meadows project which includes approximately 240 timeshare units. Access to both of these projects is expected to be provided off Ka Haku Road. The traffic generated by these projects was estimated based on the

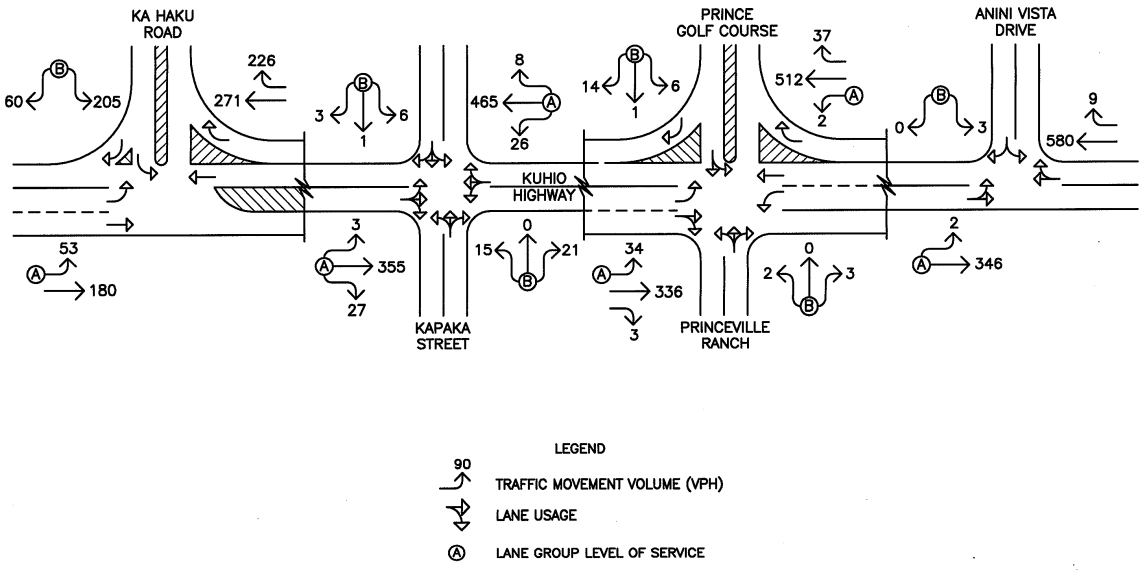
generation rates and procedures identified in the Institute of Transportation Engineers publication on trip generation for specific land use types, and incorporated Year 2018 without project conditions. Although there may be other future developments in the region that are not explicitly accounted for in the analyses, the average annual ambient traffic growth rate utilized in the traffic forecast is expected to encompass the increase in traffic demands resulting from these unknown developments.

D. Total Traffic Volumes Without Project

The projected Year 2018 AM and PM peak hour traffic volumes and operating conditions at the study intersections without the proposed Princeville Subdivision are shown on Figures 7 and 8, and summarized in Table 3. The existing levels of service are provided for comparison purposes. LOS calculations are included in Appendix D.

Table 3: Existing and Projected (Without Project) LOS Traffic Operating Conditions

Intersection	Critical Movement		AM		PM	
			Exist	Year 2018 w/out Proj	Exist	Year 2018 w/out Proj
Kuhio Hwy/ Anini Vista Dr	Eastbound	LT	A	A	A	A
	Southbound	LT-RT	B	B	B	B
Kuhio Hwy/Prince GC Access Rd/ Princeville Ranch Access Rd	Eastbound	LT	A	A	A	A
	Westbound	LT	A	A	A	A
	Northbound	LT-TH-RT	A	B	B	B
	Southbound	LT-TH-RT	B	B	B	B
Kuhio Hwy/ Kapaka St	Eastbound	LT-TH-RT	A	A	A	A
	Westbound	LT-TH-RT	A	A	A	A
	Northbound	LT-TH-RT	B	B	B	B
	Southbound	LT-TH-RT	B	B	B	B
Kuhio Hwy/ Ka Haku Rd	Eastbound	LT	A	A	A	A
	Southbound	LT-RT	B	B	C	C



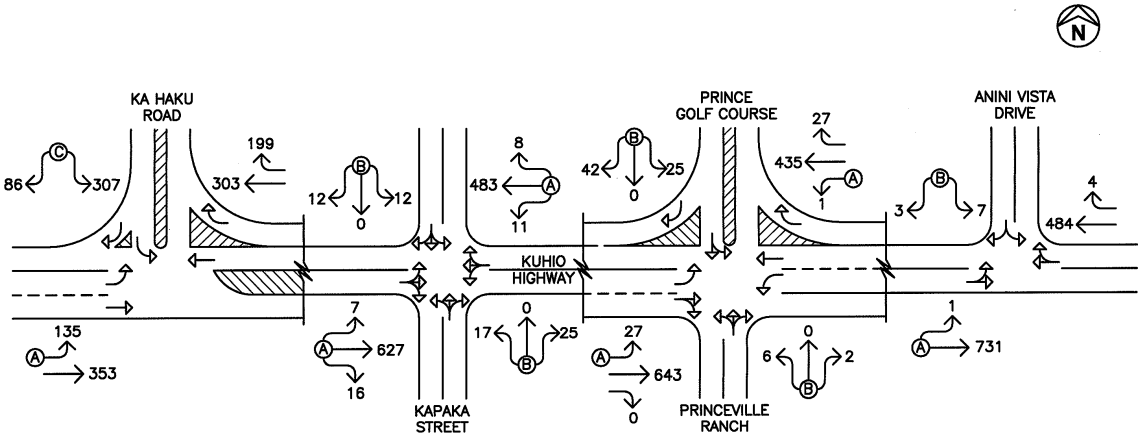
LEGEND

90 TRAFFIC MOVEMENT VOLUME (VPH)

LANE USAGE

Ⓐ LANE GROUP LEVEL OF SERVICE

WILSON OKAMOTO CORPORATION ENGINEERS · PLANNERS	PRINCEVILLE SUBDIVISION	FIGURE
	YEAR 2018 AM PEAK HOUR OF TRAFFIC WITHOUT PROJECT	7



LEGEND

90 TRAFFIC MOVEMENT VOLUME (VPH)

LANE USAGE

Ⓐ LANE GROUP LEVEL OF SERVICE

WILSON OKAMOTO CORPORATION ENGINEERS · PLANNERS	PRINCEVILLE SUBDIVISION	FIGURE
	YEAR 2018 PM PEAK HOUR OF TRAFFIC WITHOUT PROJECT	8

Traffic operations within the project vicinity are generally expected to remain similar to existing conditions during both peak hours of traffic despite the anticipated increases in traffic along Kuhio Highway and Ka Haku Road due to ambient growth in traffic and the development of other projects in the vicinity. The northbound approach of Princeville Ranch access road at the intersection with Kuhio Highway and the Prince Golf Course access road is expected to deteriorate from LOS "A" to LOS "B" during the AM peak period. The remaining traffic movements at this intersection, as well as, the other study intersections are expected to continue operating at levels of service similar to existing traffic conditions during both peak hours of traffic

E. Total Traffic Volumes With Project

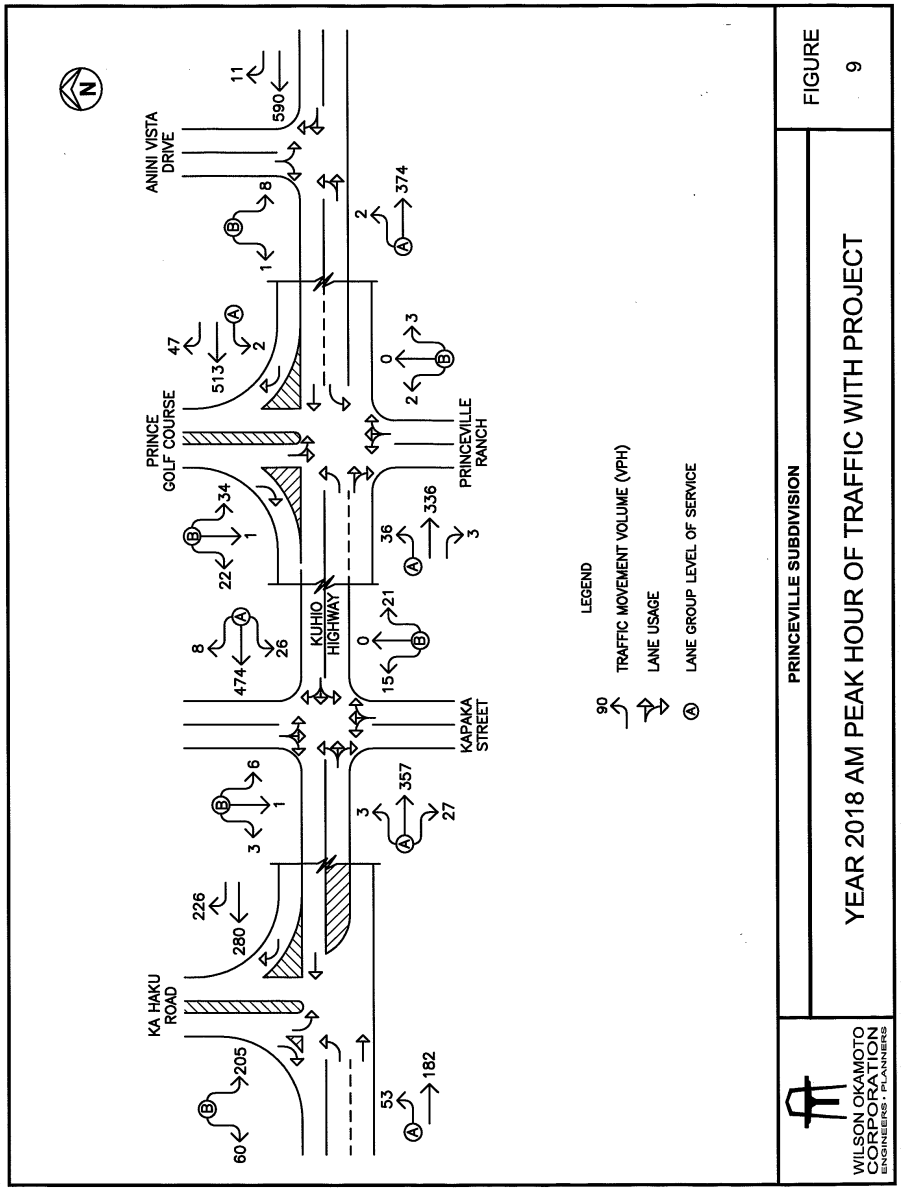
Figures 9 and 10 show the Year 2018 cumulative AM and PM peak hour traffic conditions at the study intersections with the proposed Princeville Subdivision. The cumulative volumes consist of site-generated traffic superimposed over Year 2018 projected traffic demands. The traffic impacts resulting from the proposed project are addressed in the following section.

V. TRAFFIC IMPACT ANALYSIS

The Year 2018 cumulative AM and PM peak hour traffic conditions with proposed Princeville Subdivision are summarized in Table 4. The existing and projected Year 2018 without project operating conditions are provided for comparison purposes. LOS calculations are included in Appendix E.

Table 4: Existing and Projected (Without and With Project) Traffic Operating Conditions

Intersection	Critical Movement		AM			PM		
			Exist	Year 2018		Exist	Year 2018	
				w/out Proj	w/ Proj		w/out Proj	w/ Proj
Kuhio Hwy/ Anini Vista Dr	Eastbound	LT	A	A	A	A	A	A
	Southbound	LT-RT	B	B	B	B	B	B



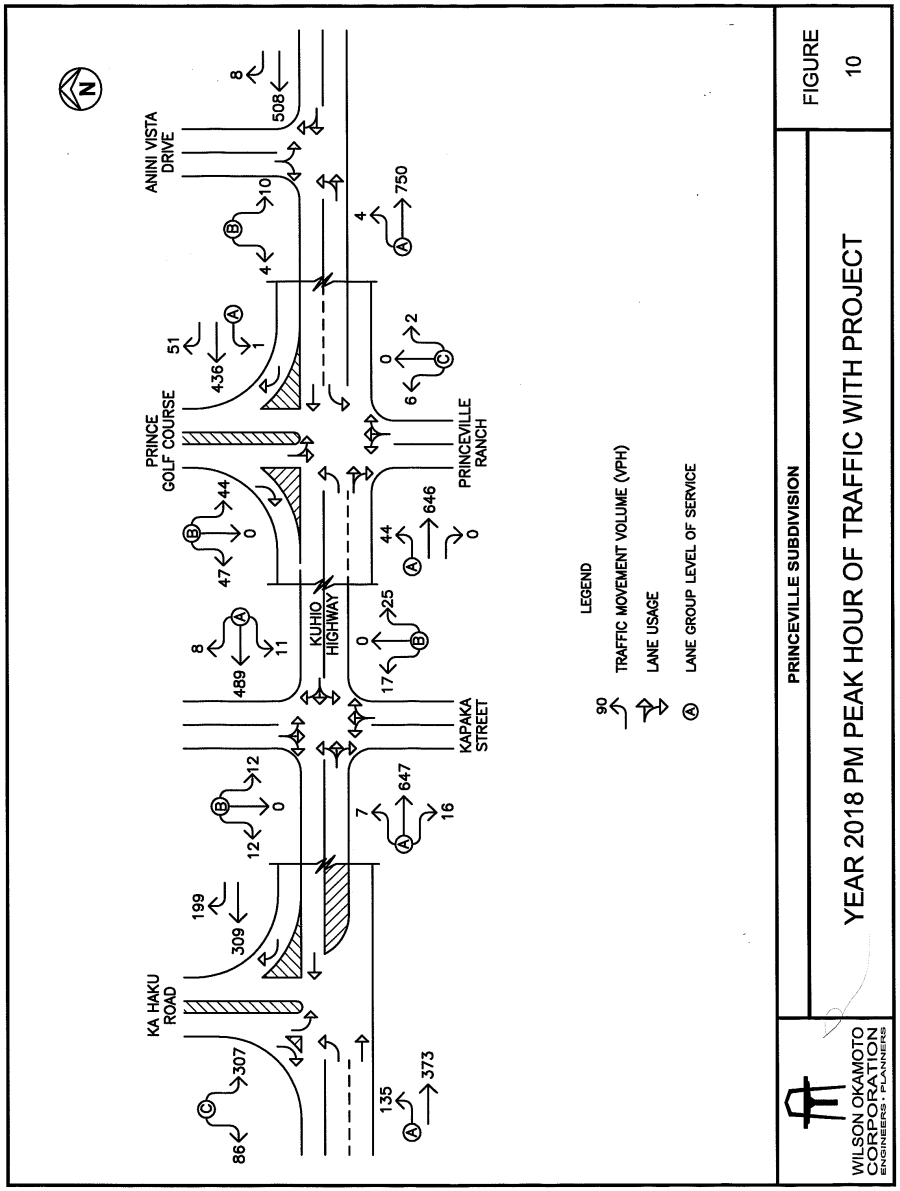


Table 4: Existing and Projected (Without and With Project) Traffic Operating Conditions (Cont'd)

Intersection	Critical Movement		AM			PM		
			Exist	Year 2018		Exist	Year 2018	
				w/out Proj	w/ Proj		w/out Proj	w/ Proj
Kuhio Hwy/Prince GC Access Rd/ Princeville Ranch Access Rd	Eastbound	LT	A	A	A	A	A	A
	Westbound	LT	A	A	A	A	A	A
	Northbound	LT-TH-RT	A	B	B	B	B	B
	Southbound	LT-TH-RT	B	B	B	B	B	B
Kuhio Hwy/ Kapaka St	Eastbound	LT-TH-RT	A	A	A	A	A	A
	Westbound	LT-TH-RT	A	A	A	A	A	A
	Northbound	LT-TH-RT	B	B	B	B	B	C
	Southbound	LT-TH-RT	B	B	B	B	B	B
Kuhio Hwy/ Ka Haku Rd	Eastbound	LT	A	A	A	A	A	A
	Southbound	LT-RT	B	B	B	C	C	C

Traffic operations within the project vicinity are expected, in general, to remain similar to Year 2018 without project conditions despite the addition of site-generated traffic to the surrounding roadway network. The northbound approach of the intersection of Kuhio Highway with Kapaka Street is expected to operate at a slightly lower level of service during the PM peak period due to the anticipated increase in traffic along Kuhio Highway. The remainder of the critical movements at this intersection, as well as, the other study intersections are expected to operate at levels of service similar to Year 2018 without project conditions.

VI. RECOMMENDATIONS

Based on the analysis of the traffic data, the following are the recommendations of this study:

1. Maintain sufficient sight distance for motorists to safely enter and exit all project driveways/roadways.

2. Provide adequate on-site loading and off-loading service areas and prohibit off-site loading operations.

3. Provide adequate turn-around area for service, delivery, and refuse collection vehicles to maneuver on the project site to avoid vehicle-reversing maneuvers onto public roadways.

4. Provide sufficient turning radii at all project driveways/roadways to avoid or minimize vehicle encroachments to oncoming traffic lanes.

VII. CONCLUSION

The proposed Princeville Subdivision is not expected to have a significant impact on traffic operations in the project vicinity. The total traffic volumes entering the intersections of Kuhio Highway with Kapaka Street and Ka Haku Road are expected to increase by approximately 1-2% during both peak periods. These increases in the total traffic volumes are in the range of daily volume fluctuations along Kuhio Highway and represent a minimal increase in the overall traffic volumes. At the intersections of Kuhio Highway with Anini Vista Drive and the Prince Golf Course/Princeville Ranch access roads, the total traffic volumes entering the intersections are expected to increase by approximately 4-5% during both peak periods. However, the critical traffic movements at these intersections are expected to continue operating at levels of service similar to Year 2018 without project conditions.

APPENDIX A

EXISTING TRAFFIC COUNT DATA

WILSON OKAMOTO CORPORATION
1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counter:D4-3889
Counted:EK
Weather:Clear

File Name : KuhAni AM
Site Code : 00000001
Start Date : 9/24/2008
Page No : 1

Groups Printed- Unshifted

	Kuhio Highway Southbound					Anini Vista Drive Westbound					Kuhio Highway Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	14	0	0	14	0	0	0	0	0	0	26	0	0	26	0	0	0	0	0	40
06:15 AM	0	33	0	0	33	0	0	0	0	0	0	49	0	0	49	0	0	0	0	0	82
06:30 AM	0	37	0	0	37	0	0	0	0	0	0	81	0	0	81	0	0	0	0	0	118
06:45 AM	0	54	0	0	54	0	0	0	0	0	0	113	1	0	114	0	0	0	0	0	168
Total	0	138	0	0	138	0	0	0	0	0	0	269	1	0	270	0	0	0	0	0	408
07:00 AM	0	65	0	0	65	0	0	0	0	0	0	94	2	0	96	0	0	0	0	0	161
07:15 AM	0	65	0	0	65	0	0	0	0	0	0	69	1	0	70	0	0	0	0	0	135
07:30 AM	0	70	0	0	70	0	0	0	0	0	0	139	1	0	140	0	0	0	0	0	210
07:45 AM	1	93	0	0	94	1	0	0	0	1	0	150	4	0	154	0	0	0	0	0	249
Total	1	293	0	0	294	1	0	0	0	1	0	452	8	0	460	0	0	0	0	0	755
08:00 AM	0	83	0	0	83	1	0	0	0	1	0	127	1	0	128	0	0	0	0	0	212
08:15 AM	1	71	1	0	73	1	0	0	0	1	0	112	3	0	115	0	0	0	0	0	189
08:30 AM	1	87	0	0	88	4	0	1	0	5	0	115	1	0	116	0	0	0	0	0	209
08:45 AM	0	77	0	0	77	0	0	1	0	1	0	117	1	0	118	0	0	0	0	0	196
Total	2	318	1	0	321	6	0	2	0	8	0	471	6	0	477	0	0	0	0	0	806
Grand Total	3	749	1	0	753	7	0	2	0	9	0	1192	15	0	1207	0	0	0	0	0	1969
Apprch %	0.4	99.5	0.1	0		77.8	0	22.2	0		0	98.8	1.2	0		0	0	0	0		
Total %	0.2	38	0.1	0	38.2	0.4	0	0.1	0	0.5	0	60.5	0.8	0	61.3	0	0	0	0	0	

	Kuhio Highway Southbound					Anini Vista Drive Westbound					Kuhio Highway Northbound					Eastbound		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 07:30 AM																	
07:30 AM	0	70	0	0	70	0	0	0	0	0	0	139	1	0	140	0	210
07:45 AM	1	**93**	0	0	**94**	**1**	0	0	0	**1**	0	**150**	**4**	0	**154**	0	**249**
08:00 AM	0	83	0	0	83	1	0	0	0	1	0	127	1	0	128	0	212
08:15 AM	1	71	**1**	0	73	1	0	0	0	1	0	112	3	0	115	0	189
Total Volume	2	317	1	0	320	3	0	0	0	3	0	528	9	0	537	0	860
% App. Total	0.6	99.1	0.3	0		100	0	0	0		0	98.3	1.7	0			
PHF	.500	.852	.250	.000	.851	.750	.000	.000	.000	.750	.000	.880	.563	.000	.872	.000	.863

WILSON OKAMOTO CORPORATION
1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counter:D4-3889
Counted:EK
Weather:Clear

File Name : KuhAni PM
Site Code : 00000001
Start Date : 9/23/2008
Page No : 1

Groups Printed- Unshifted

	Southbound					Westbound					Northbound					Eastbound					
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03:00 PM	1	150	0	0	151	2	0	0	1	3	0	115	0	0	115	0	0	0	0	0	269
03:15 PM	4	146	0	0	150	2	0	1	0	3	0	95	1	0	96	0	0	0	0	0	249
03:30 PM	1	122	0	0	123	2	0	0	0	2	0	109	2	0	111	0	0	0	0	0	236
03:45 PM	4	131	0	0	135	4	0	1	0	5	0	108	0	0	108	0	0	0	0	0	248
Total	10	549	0	0	559	10	0	2	1	13	0	427	3	0	430	0	0	0	0	0	1002
04:00 PM	0	159	0	0	159	1	0	0	0	1	0	108	1	0	109	0	0	0	0	0	269
04:15 PM	0	151	0	0	151	3	0	1	0	4	0	93	1	0	94	0	0	0	0	0	249
04:30 PM	0	153	0	0	153	4	0	2	0	6	0	90	2	0	92	0	0	0	0	0	251
04:45 PM	0	167	0	0	167	0	0	0	0	0	0	136	1	0	137	0	0	0	0	0	304
Total	0	630	0	0	630	8	0	3	0	11	0	427	5	0	432	0	0	0	0	0	1073
05:00 PM	1	189	0	0	190	0	0	0	0	0	0	124	0	0	124	0	0	0	0	0	314
05:15 PM	0	121	0	0	121	0	0	0	0	0	0	106	0	0	106	0	0	0	0	0	227
05:30 PM	1	99	0	0	100	1	0	0	0	1	0	128	0	0	128	0	0	0	0	0	229
05:45 PM	1	98	0	0	99	1	0	0	0	1	0	81	1	0	82	0	0	0	0	0	182
Total	3	507	0	0	510	2	0	0	0	2	0	439	1	0	440	0	0	0	0	0	952
Grand Total	13	1686	0	0	1699	20	0	5	1	26	0	1293	9	0	1302	0	0	0	0	0	3027
Apprch %	0.8	99.2	0	0		76.9	0	19.2	3.8		0	99.3	0.7	0		0	0	0	0		
Total %	0.4	55.7	0	0	56.1	0.7	0	0.2	0	0.9	0	42.7	0.3	0	43	0	0	0	0	0	

	Southbound					Westbound					Northbound					Eastbound		
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	0	151	0	0	151	3	0	1	0	4	0	93	1	0	94	0	249
04:30 PM	0	153	0	0	153	**4**	0	**2**	0	**6**	0	90	**2**	0	92	0	251
04:45 PM	0	167	0	0	167	0	0	0	0	0	0	**136**	1	0	**137**	0	304
05:00 PM	**1**	**189**	0	0	**190**	0	0	0	0	0	0	124	0	0	124	0	**314**
Total Volume	1	660	0	0	661	7	0	3	0	10	0	443	4	0	447	0	1118
% App. Total	0.2	99.8	0	0		70	0	30	0		0	99.1	0.9	0			
PHF	.250	.873	.000	.000	.870	.438	.000	.375	.000	.417	.000	.814	.500	.000	.816	.000	.890

WILSON OKAMOTO CORPORATION
1907 S. Beretania Street Suite 400
Honolulu, Hi 96826

Counter:D4-5677
Counted:RY
Weather:Clear

File Name : KuhPri AM
Site Code : 00000001
Start Date : 9/24/2008
Page No : 1

Groups Printed- Unshifted

	Kuhio Highway Southbound					Princeville Prince Course Clubhouse Westbound					Kuhio Highway Northbound					Princeville Trail Tours Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	0	13	0	0	13	0	0	0	0	0	0	24	1	0	25	0	0	0	0	0	38
06:15 AM	1	31	0	0	32	0	0	1	0	1	0	42	1	1	44	0	0	0	0	0	77
06:30 AM	3	37	0	0	40	0	0	0	0	0	0	81	1	0	82	0	0	0	0	0	122
06:45 AM	6	50	2	0	58	0	0	0	0	0	1	102	8	0	111	0	0	0	0	0	169
Total	10	131	2	0	143	0	0	1	0	1	1	249	11	1	262	0	0	0	0	0	406
07:00 AM	7	69	2	0	78	2	0	0	0	2	0	86	5	0	91	0	0	0	0	0	171
07:15 AM	2	70	0	0	72	0	0	2	0	2	0	71	4	0	75	0	0	0	0	0	149
07:30 AM	1	70	2	0	73	1	0	3	0	4	2	120	10	0	132	1	0	1	0	2	211
07:45 AM	8	85	1	0	94	0	0	3	0	3	0	143	7	0	150	0	0	0	0	0	247
Total	18	294	5	0	317	3	0	8	0	11	2	420	26	0	448	1	0	1	0	2	778
08:00 AM	8	76	0	0	84	2	1	2	0	5	0	100	7	0	107	0	0	0	0	0	196
08:15 AM	17	77	0	0	94	3	0	6	0	9	0	100	13	0	113	1	0	2	0	3	219
08:30 AM	5	78	4	0	87	5	0	6	0	11	0	99	7	0	106	1	0	1	0	2	206
08:45 AM	10	71	5	0	86	1	0	7	0	8	0	112	6	0	118	3	0	0	0	3	215
Total	40	302	9	0	351	11	1	21	0	33	0	411	33	0	444	5	0	3	0	8	836
Grand Total	68	727	16	0	811	14	1	30	0	45	3	1080	70	1	1154	6	0	4	0	10	2020
Apprch %	8.4	89.6	2	0		31.1	2.2	66.7	0		0.3	93.6	6.1	0.1		60	0	40	0		
Total %	3.4	36	0.8	0	40.1	0.7	0	1.5	0	2.2	0.1	53.5	3.5	0	57.1	0.3	0	0.2	0	0.5	

	Kuhio Highway Southbound					Princeville Prince Course Clubhouse Westbound					Kuhio Highway Northbound					Princeville Trail Tours Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:30 AM																					
07:30 AM	1	70	**2**	0	73	1	0	3	0	4	**2**	120	10	0	132	**1**	0	1	0	2	211
07:45 AM	8	**85**	1	0	**94**	0	0	3	0	3	0	**143**	7	0	**150**	0	0	0	0	0	**247**
08:00 AM	8	76	0	0	84	2	**1**	2	0	5	0	100	7	0	107	0	0	0	0	0	196
08:15 AM	**17**	77	0	0	94	**3**	0	**6**	0	**9**	0	100	**13**	0	113	1	0	**2**	0	**3**	219
Total Volume	34	308	3	0	345	6	1	14	0	21	2	463	37	0	502	2	0	3	0	5	873
% App. Total	9.9	89.3	0.9	0		28.6	4.8	66.7	0		0.4	92.2	7.4	0		40	0	60	0		
PHF	.500	.906	.375	.000	.918	.500	.250	.583	.000	.583	.250	.809	.712	.000	.837	.500	.000	.375	.000	.417	.884

WILSON OKAMOTO CORPORATION
1907 S. Beretania Street Suite 400
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Site Code : 00000001
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Groups Printed- Unshifted

	Kuhio Highway Southbound					Princeville Prince Course Clubhouse Westbound					Kuhio Highway Northbound					Princeville Trail Tours Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	3	146	0	0	149	5	0	6	0	11	0	105	5	0	110	0	0	1	0	1	271
03:15 PM	9	141	0	0	150	3	0	10	0	13	0	85	13	0	98	0	0	0	0	0	261
03:30 PM	7	143	0	0	150	5	0	9	0	14	0	129	4	0	133	0	0	0	0	0	297
03:45 PM	5	133	0	0	138	7	0	3	0	10	0	101	1	0	102	0	0	0	0	0	250
Total	24	563	0	0	587	20	0	28	0	48	0	420	23	0	443	0	0	1	0	1	1079
04:00 PM	6	147	1	0	154	3	0	7	0	10	0	96	3	0	99	0	0	0	0	0	263
04:15 PM	9	143	0	0	152	7	0	10	0	17	0	106	4	0	110	0	0	1	0	1	280
04:30 PM	5	152	0	0	157	3	0	11	0	14	0	83	7	0	90	2	0	1	0	3	264
04:45 PM	5	138	0	0	143	7	0	9	0	16	0	114	9	0	123	2	0	0	0	2	284
Total	25	580	1	0	606	20	0	37	0	57	0	399	23	0	422	4	0	2	0	6	1091
05:00 PM	8	143	0	0	151	8	0	12	0	20	1	93	7	0	101	2	0	0	1	3	275
05:15 PM	1	119	0	0	120	1	0	5	0	6	0	100	4	0	104	0	0	0	0	0	230
05:30 PM	4	92	1	0	97	2	0	6	0	8	0	102	4	0	106	0	1	0	0	1	212
05:45 PM	5	90	1	0	96	2	0	5	0	7	1	79	2	0	82	4	0	1	0	5	190
Total	18	444	2	0	464	13	0	28	0	41	2	374	17	0	393	6	1	1	1	9	907
Grand Total	67	1587	3	0	1657	53	0	93	0	146	2	1193	63	0	1258	10	1	4	1	16	3077
Apprch %	4	95.8	0.2	0		36.3	0	63.7	0		0.2	94.8	5	0		62.5	6.2	25	6.2		
Total %	2.2	51.6	0.1	0	53.9	1.7	0	3	0	4.7	0.1	38.8	2	0	40.9	0.3	0	0.1	0	0.5	

	Kuhio Highway Southbound					Princeville Prince Course Clubhouse Westbound					Kuhio Highway Northbound					Princeville Trail Tours Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	**9**	143	0	0	152	7	0	10	0	17	0	106	4	0	110	0	0	**1**	0	1	280
04:30 PM	5	**152**	0	0	**157**	3	0	11	0	14	0	83	7	0	90	**2**	0	1	0	**3**	264
04:45 PM	5	138	0	0	143	7	0	9	0	16	0	**114**	**9**	0	**123**	2	0	0	0	2	**284**
05:00 PM	8	143	0	0	151	**8**	0	**12**	0	**20**	**1**	93	7	0	101	2	0	0	**1**	3	275
Total Volume	27	576	0	0	603	25	0	42	0	67	1	396	27	0	424	6	0	2	1	9	1103
% App. Total	4.5	95.5	0	0		37.3	0	62.7	0		0.2	93.4	6.4	0		66.7	0	22.2	11.1		
PHF	.750	.947	.000	.000	.960	.781	.000	.875	.000	.838	.250	.868	.750	.000	.862	.750	.000	.500	.250	.750	.971

WILSON OKAMOTO CORPORATION
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Site Code : 00000001
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Groups Printed- Unshifted

	Kuhio Highway Southbound					Kapaka Street Westbound					Kuhio Highway Northbound					Kapaka Street Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	1	14	1	0	16	0	0	1	0	1	1	22	0	0	23	0	0	0	0	0	40
06:15 AM	0	33	0	0	33	0	0	0	0	0	0	40	2	0	42	0	0	1	0	1	76
06:30 AM	1	40	0	0	41	1	0	2	0	3	2	69	2	0	73	1	0	1	0	2	119
06:45 AM	0	57	3	0	60	0	0	0	0	0	4	94	2	0	100	2	0	3	0	5	165
Total	2	144	4	0	150	1	0	3	0	4	7	225	6	0	238	3	0	5	0	8	400
07:00 AM	2	71	5	0	78	0	1	0	0	1	8	80	2	0	90	3	0	6	0	9	178
07:15 AM	2	59	6	0	67	1	0	1	0	2	1	57	0	0	58	2	0	4	0	6	133
07:30 AM	4	67	0	0	71	0	0	1	0	1	3	118	2	0	123	4	0	4	0	8	203
07:45 AM	1	99	7	0	107	1	0	0	0	1	9	130	3	0	142	4	0	5	0	9	259
Total	9	296	18	0	323	2	1	2	0	5	21	385	7	0	413	13	0	19	0	32	773
08:00 AM	1	65	2	0	68	0	1	1	0	2	4	100	1	0	105	1	0	5	0	6	181
08:15 AM	0	84	13	0	97	2	0	1	0	3	8	88	0	0	96	5	0	2	0	7	203
08:30 AM	1	78	5	0	84	3	0	1	0	4	5	100	4	0	109	5	0	9	0	14	211
08:45 AM	1	77	4	0	82	0	0	4	0	4	7	117	1	0	125	4	0	8	0	12	223
Total	3	304	24	0	331	5	1	7	0	13	24	405	6	0	435	15	0	24	0	39	818
Grand Total	14	744	46	0	804	8	2	12	0	22	52	1015	19	0	1086	31	0	48	0	79	1991
Apprch %	1.7	92.5	5.7	0		36.4	9.1	54.5	0		4.8	93.5	1.7	0		39.2	0	60.8	0		
Total %	0.7	37.4	2.3	0	40.4	0.4	0.1	0.6	0	1.1	2.6	51	1	0	54.5	1.6	0	2.4	0	4	

	Kuhio Highway Southbound					Kapaka Street Westbound					Kuhio Highway Northbound					Kapaka Street Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	**1**	**99**	7	0	**107**	1	0	0	0	1	**9**	**130**	3	0	**142**	4	0	5	0	9	**259**
08:00 AM	1	65	2	0	68	0	**1**	**1**	0	2	4	100	1	0	105	1	0	5	0	6	181
08:15 AM	0	84	**13**	0	97	2	0	1	0	3	8	88	0	0	96	**5**	0	2	0	7	203
08:30 AM	1	78	5	0	84	**3**	0	1	0	**4**	5	100	**4**	0	109	5	0	**9**	0	**14**	211
Total Volume	3	326	27	0	356	6	1	3	0	10	26	418	8	0	452	15	0	21	0	36	854
% App. Total	0.8	91.6	7.6	0		60	10	30	0		5.8	92.5	1.8	0		41.7	0	58.3	0		
PHF	.750	.823	.519	.000	.832	.500	.250	.750	.000	.625	.722	.804	.500	.000	.796	.750	.000	.583	.000	.643	.824

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Site Code : 00000001
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Groups Printed- Unshifted

	Kuhio Highway Southbound					Kapaka Street Westbound					Kuhio Highway Northbound					Kapaka Street Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
03:00 PM	1	143	6	0	150	1	0	1	0	2	2	114	0	0	116	5	1	3	0	9	277
03:15 PM	1	130	3	0	134	0	0	1	0	1	0	107	2	0	109	6	0	3	0	9	253
03:30 PM	2	124	6	0	132	2	0	1	0	3	4	125	0	0	129	6	1	6	0	13	277
03:45 PM	1	116	5	0	122	0	0	1	0	1	8	101	1	0	110	5	0	5	0	10	243
Total	5	513	20	0	538	3	0	4	0	7	14	447	3	0	464	22	2	17	0	41	1050
04:00 PM	0	145	6	0	151	2	0	1	0	3	3	91	3	0	97	5	0	8	0	13	264
04:15 PM	0	149	6	0	155	0	0	0	0	0	5	115	0	0	120	4	0	6	0	10	285
04:30 PM	2	145	2	0	149	1	0	2	0	3	0	103	2	0	105	3	0	6	0	9	266
04:45 PM	2	130	2	0	134	7	0	7	0	14	4	121	3	0	128	3	0	5	0	8	284
Total	4	569	16	0	589	10	0	10	0	20	12	430	8	0	450	15	0	25	0	40	1099
05:00 PM	3	137	6	1	147	4	0	3	0	7	2	105	3	0	110	7	0	8	0	15	279
05:15 PM	0	104	6	0	110	3	2	5	0	10	2	107	0	0	109	1	0	2	0	3	232
05:30 PM	3	92	6	0	101	1	0	0	0	1	3	102	3	0	108	4	0	2	0	6	216
05:45 PM	0	89	4	0	93	5	0	2	0	7	4	85	2	0	91	1	2	4	0	7	198
Total	6	422	22	1	451	13	2	10	0	25	11	399	8	0	418	13	2	16	0	31	925
Grand Total	15	1504	58	1	1578	26	2	24	0	52	37	1276	19	0	1332	50	4	58	0	112	3074
Apprch %	1	95.3	3.7	0.1		50	3.8	46.2	0		2.8	95.8	1.4	0		44.6	3.6	51.8	0		
Total %	0.5	48.9	1.9	0	51.3	0.8	0.1	0.8	0	1.7	1.2	41.5	0.6	0	43.3	1.6	0.1	1.9	0	3.6	

	Kuhio Highway Southbound					Kapaka Street Westbound					Kuhio Highway Northbound					Kapaka Street Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 04:15 PM																					
04:15 PM	0	**149**	**6**	0	**155**	0	0	0	0	0	**5**	115	0	0	120	4	0	6	0	10	**285**
04:30 PM	2	145	2	0	149	1	0	2	0	3	0	103	2	0	105	3	0	6	0	9	266
04:45 PM	2	130	2	0	134	**7**	0	**7**	0	**14**	4	**121**	**3**	0	**128**	3	0	5	0	8	284
05:00 PM	**3**	137	6	**1**	147	**4**	0	3	0	7	2	105	3	0	110	**7**	0	**8**	0	**15**	279
Total Volume	7	561	16	1	585	12	0	12	0	24	11	444	8	0	463	17	0	25	0	42	1114
% App. Total	1.2	95.9	2.7	0.2		50	0	50	0		2.4	95.9	1.7	0		40.5	0	59.5	0		
PHF	.583	.941	.667	.250	.944	.429	.000	.429	.000	.429	.550	.917	.667	.000	.904	.607	.000	.781	.000	.700	.977

WILSON OKAMOTO CORPORATION
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File Name : KuhKa AM
Site Code : 00000004
Start Date : 9/24/2008
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Groups Printed- Unshifted

	Kuhio Highway Southbound					Ka Haku Road Westbound					Kuhio Highway Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
06:00 AM	5	4	0	0	9	11	0	2	0	13	0	17	7	0	24	0	0	0	0	0	46
06:15 AM	0	15	0	0	15	18	0	5	0	23	0	26	11	0	37	0	0	0	0	0	75
06:30 AM	3	25	0	0	28	19	0	4	0	23	0	40	29	0	69	0	0	0	0	0	120
06:45 AM	4	28	0	0	32	40	0	9	0	49	0	58	41	0	99	0	0	0	0	0	180
Total	12	72	0	0	84	88	0	20	0	108	0	141	88	0	229	0	0	0	0	0	421
07:00 AM	6	22	0	0	28	55	0	12	0	67	0	47	43	0	90	0	0	0	0	0	185
07:15 AM	3	35	0	0	38	30	0	13	0	43	0	43	19	0	62	0	0	0	0	0	143
07:30 AM	7	31	0	0	38	43	0	15	0	58	0	84	39	0	123	0	0	0	0	0	219
07:45 AM	19	47	0	0	66	54	0	16	0	70	0	74	58	0	132	0	0	0	0	0	268
Total	35	135	0	0	170	182	0	56	0	238	0	248	159	0	407	0	0	0	0	0	815
08:00 AM	8	40	0	0	48	29	0	11	0	40	0	56	33	0	89	0	0	0	0	0	177
08:15 AM	10	42	0	0	52	58	0	6	0	64	0	62	44	0	106	0	0	0	0	0	222
08:30 AM	8	42	0	0	50	42	0	20	0	62	0	66	55	0	121	0	0	0	0	0	233
08:45 AM	10	36	0	0	46	49	0	14	0	63	0	80	46	0	126	0	0	0	0	0	235
Total	36	160	0	0	196	178	0	51	0	229	0	264	178	0	442	0	0	0	0	0	867
Grand Total	83	367	0	0	450	448	0	127	0	575	0	653	425	0	1078	0	0	0	0	0	2103
Apprch %	18.4	81.6	0	0		77.9	0	22.1	0		0	60.6	39.4	0		0	0	0	0		
Total %	3.9	17.5	0	0	21.4	21.3	0	6	0	27.3	0	31.1	20.2	0	51.3	0	0	0	0	0	

	Kuhio Highway Southbound					Ka Haku Road Westbound					Kuhio Highway Northbound					Eastbound					
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Int. Total
Peak Hour Analysis From 06:00 AM to 08:45 AM - Peak 1 of 1																					
Peak Hour for Entire Intersection Begins at 07:45 AM																					
07:45 AM	**19**	**47**	0	0	**66**	54	0	16	0	**70**	0	**74**	**58**	0	**132**	0	0	0	0	0	**268**
08:00 AM	8	40	0	0	48	29	0	11	0	40	0	56	33	0	89	0	0	0	0	0	177
08:15 AM	10	42	0	0	52	**58**	0	6	0	64	0	62	44	0	106	0	0	0	0	0	222
08:30 AM	8	42	0	0	50	42	0	**20**	0	62	0	66	55	0	121	0	0	0	0	0	233
Total Volume	45	171	0	0	216	183	0	53	0	236	0	258	190	0	448	0	0	0	0	0	900
% App. Total	20.8	79.2	0	0		77.5	0	22.5	0		0	57.6	42.4	0		0	0	0	0		
PHF	.592	.910	.000	.000	.818	.789	.000	.663	.000	.843	.000	.872	.819	.000	.848	.000	.000	.000	.000	.000	.840

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Groups Printed- Unshifted

	Southbound					Westbound					Northbound					Eastbound	
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
03:00 PM	20	74	0	0	94	82	0	19	0	101	0	70	51	0	121	0	316
03:15 PM	27	78	0	0	105	58	0	12	0	70	0	66	47	0	113	0	288
03:30 PM	32	95	0	0	127	51	0	13	0	64	0	93	45	0	138	0	329
03:45 PM	29	79	0	0	108	56	0	19	0	75	0	70	41	0	111	0	294
Total	108	326	0	0	434	247	0	63	0	310	0	299	184	0	483	0	1227
04:00 PM	33	92	0	0	125	61	0	13	0	74	0	69	31	0	100	0	299
04:15 PM	33	88	0	0	121	65	0	11	0	76	0	74	44	0	118	0	315
04:30 PM	32	87	0	0	119	64	0	23	0	87	0	73	35	0	108	0	314
04:45 PM	24	84	0	0	108	57	0	21	0	78	0	67	56	0	123	0	309
Total	122	351	0	0	473	247	0	68	0	315	0	283	166	0	449	0	1237
05:00 PM	27	77	0	0	104	70	0	17	0	87	0	75	36	0	111	0	302
05:15 PM	37	72	0	0	109	36	1	18	0	55	0	70	48	0	118	0	282
05:30 PM	28	68	0	0	96	38	0	20	0	58	0	60	43	0	103	0	257
05:45 PM	26	54	0	0	80	36	0	20	0	56	0	57	26	0	83	0	219
Total	118	271	0	0	389	180	1	75	0	256	0	262	153	0	415	0	1060
Grand Total	348	948	0	0	1296	674	1	206	0	881	0	844	503	0	1347	0	3524
Apprch %	26.9	73.1	0	0		76.5	0.1	23.4	0		0	62.7	37.3	0			
Total %	9.9	26.9	0	0	36.8	19.1	0	5.8	0	25	0	24	14.3	0	38.2	0	

	Southbound					Westbound					Northbound					Eastbound	
Start Time	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	Left	Thru	Right	Peds	App. Total	App. Total	Int. Total
Peak Hour Analysis From 03:00 PM to 05:45 PM - Peak 1 of 1																	
Peak Hour for Entire Intersection Begins at 04:15 PM																	
04:15 PM	**33**	**88**	0	0	**121**	65	0	11	0	76	0	74	44	0	118	0	**315**
04:30 PM	32	87	0	0	119	64	0	**23**	0	**87**	0	73	35	0	108	0	314
04:45 PM	24	84	0	0	108	57	0	21	0	78	0	67	**56**	0	**123**	0	309
05:00 PM	27	77	0	0	104	**70**	0	17	0	87	0	**75**	36	0	111	0	302
Total Volume	116	336	0	0	452	256	0	72	0	328	0	289	171	0	460	0	1240
% App. Total	25.7	74.3	0	0		78	0	22	0		0	62.8	37.2	0			
PHF	.879	.955	.000	.000	.934	.914	.000	.783	.000	.943	.000	.963	.763	.000	.935	.000	.984

APPENDIX B

LEVEL OF SERVICE DEFINITIONS

LEVEL OF SERVICE DEFINITIONS

LEVEL-OF-SERVICE CRITERIA FOR UNSIGNALIZED INTERSECTIONS

Level of Service (LOS) criteria are given in Table 1. As used here, control delay is defined as the total elapsed time from the time a vehicle stops at the end of the queue to the time required for the vehicle to travel from the last-in-queue position to the first-in-queue position, including deceleration of vehicles from free-flow speed to the speed of vehicles in the queue.

The average total delay for any particular minor movement is a function of the service rate or capacity of the approach and the degree of saturation. If the degree of saturation is greater than about 0.9, average control delay is significantly affected by the length of the analysis period.

Table 1: Level-of-Service Criteria for Unsignalized Intersections

Level of Service	Average Control Delay (Sec/Veh)
A	≤10.0
B	>10.0 and ≤15.0
C	>15.0 and ≤25.0
D	>25.0 and ≤35.0
E	>35.0 and ≤50.0
F	>50.0

"Highway Capacity Manual," Transportation Research Board, 2000.

APPENDIX C

CAPACITY ANALYSIS CALCULATIONS
EXISTING PEAK HOUR TRAFFIC ANALYSIS

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Ka Haku Rd
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	45	171			258	190
Peak-Hour Factor, PHF	0.82	0.82			0.85	0.85
Hourly Flow Rate, HFR	54	208			303	223
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						No
Lanes	1	1			1	1
Configuration	L	T			T	R
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				183		53
Peak Hour Factor, PHF				0.84		0.84
Hourly Flow Rate, HFR				217		63
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			Yes /2
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L						LR	
v (vph)	54						280	
C(m) (vph)	1041						849	
v/c	0.05						0.33	
95% queue length	0.16						1.47	
Control Delay	8.6						12.1	
LOS	A						B	
Approach Delay							12.1	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period:
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Ka Haku Rd
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	116	336			289	171
Peak-Hour Factor, PHF	0.93	0.93			0.94	0.94
Hourly Flow Rate, HFR	124	361			307	181
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?					No	
Lanes	1	1			1	1
Configuration	L	T			T	R
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				256		72
Peak Hour Factor, PHF				0.94		0.94
Hourly Flow Rate, HFR				272		76
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/			Yes /2
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L						LR	
v (vph)	124						348	
C(m) (vph)	1075						711	
v/c	0.12						0.49	
95% queue length	0.39						2.83	
Control Delay	8.8						15.6	
LOS	A						C	
Approach Delay							15.6	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Kapaka St
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	326	27	26	418	8
Peak-Hour Factor, PHF	0.83	0.83	0.83	0.80	0.80	0.80
Hourly Flow Rate, HFR	3	392	32	32	522	9
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	0	21	6	1	3
Peak Hour Factor, PHF	0.64	0.64	0.64	0.63	0.63	0.63
Hourly Flow Rate, HFR	23	0	32	9	1	4
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No	/			No /
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	3	32		55			14	
C(m) (vph)	1036	1135		691			526	
v/c	0.00	0.03		0.08			0.03	
95% queue length	0.01	0.09		0.26			0.08	
Control Delay	8.5	8.3		10.7			12.0	
LOS	A	A		B			B	
Approach Delay				10.7			12.0	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: PM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Kapaka St
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	561	16	11	444	8
Peak-Hour Factor, PHF	0.94	0.94	0.94	0.90	0.90	0.90
Hourly Flow Rate, HFR	7	596	17	12	493	8
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	17	0	25	12	0	12
Peak Hour Factor, PHF	0.70	0.70	0.70	0.43	0.43	0.43
Hourly Flow Rate, HFR	24	0	35	27	0	27
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No	/		No	/
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	7	12		59			54	
C(m) (vph)	1063	966		589			552	
v/c	0.01	0.01		0.10			0.10	
95% queue length	0.02	0.04		0.33			0.32	
Control Delay	8.4	8.8		11.8			12.2	
LOS	A	A		B			B	
Approach Delay				11.8			12.2	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Kuhio Hwy
North/South Street: GC Dwy
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	34	308	3	2	463	37
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.84	0.84	0.84
Hourly Flow Rate, HFR	36	334	3	2	551	44
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	0	3	6	1	14
Peak Hour Factor, PHF	0.42	0.42	0.42	0.58	0.58	0.58
Hourly Flow Rate, HFR	4	0	7	10	1	24
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No	/		Yes	/2
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L		LTR			LTR	
v (vph)	36	2		11			35	
C(m) (vph)	981	1222		741			1384	
v/c	0.04	0.00		0.01			0.03	
95% queue length	0.11	0.00		0.05			0.08	
Control Delay	8.8	8.0		9.9			10.1	
LOS	A	A		A			B	
Approach Delay				9.9			10.1	
Approach LOS				A			B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: PM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Kuhio Hwy
North/South Street: GC Dwy
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	27	576	0	1	396	27
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.86	0.86	0.86
Hourly Flow Rate, HFR	28	600	0	1	460	31
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	6	0	2	25	0	42
Peak Hour Factor, PHF	0.75	0.75	0.75	0.84	0.84	0.84
Hourly Flow Rate, HFR	8	0	2	29	0	50
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No	/		Yes	/2
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L		LTR			LTR	
v (vph)	28	1		10			79	
C(m) (vph)	1072	977		426			1098	
v/c	0.03	0.00		0.02			0.07	
95% queue length	0.08	0.00		0.07			0.23	
Control Delay	8.4	8.7		13.7			10.9	
LOS	A	A		B			B	
Approach Delay				13.7			10.9	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Anini Vista Rd
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	2	317			528	9
Peak-Hour Factor, PHF	0.85	0.85			0.87	0.87
Hourly Flow Rate, HFR	2	372			606	10
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1			1	0
Configuration	LT					TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				3		0
Peak Hour Factor, PHF				0.75		0.75
Hourly Flow Rate, HFR				4		0
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		No /
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	2						4	
C(m) (vph)	964						588	
v/c	0.00						0.01	
95% queue length	0.01						0.02	
Control Delay	8.7						11.2	
LOS	A						B	
Approach Delay							11.2	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: PM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Existing
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Anini Vista Rd
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	1	660			443	4
Peak-Hour Factor, PHF	0.87	0.87			0.82	0.82
Hourly Flow Rate, HFR	1	758			540	4
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						
Lanes	0	1			1	0
Configuration		LT				TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				7		3
Peak Hour Factor, PHF				0.42		0.42
Hourly Flow Rate, HFR				16		7
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage			/		No	/
Lanes				0	0	
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LT						LR	
v (vph)	1						23	
C(m) (vph)	1025						528	
v/c	0.00						0.04	
95% queue length	0.00						0.14	
Control Delay	8.5						12.1	
LOS	A						B	
Approach Delay							12.1	
Approach LOS							B	

APPENDIX D

CAPACITY ANALYSIS CALCULATIONS
PROJECTED YEAR 2018 PEAK HOUR TRAFFIC
ANALYSIS WITHOUT PROJECT

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2018 w/out project
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Ka Haku Rd
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	53	180			271	226
Peak-Hour Factor, PHF	0.82	0.82			0.85	0.85
Hourly Flow Rate, HFR	64	219			318	265
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						No
Lanes	1	1			1	1
Configuration	L	T			T	R
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				205		60
Peak Hour Factor, PHF				0.84		0.84
Hourly Flow Rate, HFR				244		71
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		Yes /2
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L						LR	
v (vph)	64						315	
C(m) (vph)	991						954	
v/c	0.06						0.33	
95% queue length	0.21						1.47	
Control Delay	8.9						11.4	
LOS	A						B	
Approach Delay							11.4	
Approach LOS							B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: PM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2018 w/out project
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Ka Haku Rd
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	135	353			303	199
Peak-Hour Factor, PHF	0.93	0.93			0.94	0.94
Hourly Flow Rate, HFR	145	379			322	211
Percent Heavy Vehicles	2	--	--		--	--
Median Type/Storage	Undivided		/			
RT Channelized?						No
Lanes	1	1			1	1
Configuration	L	T			T	R
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume				307		86
Peak Hour Factor, PHF				0.94		0.94
Hourly Flow Rate, HFR				326		91
Percent Heavy Vehicles				2		2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage				/		Yes /2
Lanes				0		0
Configuration					LR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L						LR	
v (vph)	145						417	
C(m) (vph)	1035						623	
v/c	0.14						0.67	
95% queue length	0.49						5.75	
Control Delay	9.0						22.3	
LOS	A						C	
Approach Delay							22.3	
Approach LOS							C	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2018 w/out project
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Kapaka St
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	3	355	27	26	465	8
Peak-Hour Factor, PHF	0.83	0.83	0.83	0.80	0.80	0.80
Hourly Flow Rate, HFR	3	427	32	32	581	9
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	15	0	21	6	1	3
Peak Hour Factor, PHF	0.64	0.64	0.64	0.63	0.63	0.63
Hourly Flow Rate, HFR	23	0	32	9	1	4
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	3	32		55			14	
C(m) (vph)	985	1102		638			476	
v/c	0.00	0.03		0.09			0.03	
95% queue length	0.01	0.09		0.28			0.09	
Control Delay	8.7	8.4		11.2			12.8	
LOS	A	A		B			B	
Approach Delay				11.2			12.8	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: PM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2018 w/out project
Project ID:
East/West Street: Kuhio Hwy
North/South Street: Kapaka St
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	7	627	16	11	483	8
Peak-Hour Factor, PHF	0.94	0.94	0.94	0.90	0.90	0.90
Hourly Flow Rate, HFR	7	667	17	12	536	8
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	17	0	25	12	0	12
Peak Hour Factor, PHF	0.70	0.70	0.70	0.43	0.43	0.43
Hourly Flow Rate, HFR	24	0	35	27	0	27
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No /			No /	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	LTR	LTR		LTR			LTR	
v (vph)	7	12		59			54	
C(m) (vph)	1025	909		529			495	
v/c	0.01	0.01		0.11			0.11	
95% queue length	0.02	0.04		0.38			0.37	
Control Delay	8.5	9.0		12.7			13.2	
LOS	A	A		B			B	
Approach Delay				12.7			13.2	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: AM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2018 w/out project
Project ID:
East/West Street: Kuhio Hwy
North/South Street: GC Dwy
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	34	336	3	2	512	37
Peak-Hour Factor, PHF	0.92	0.92	0.92	0.84	0.84	0.84
Hourly Flow Rate, HFR	36	365	3	2	609	44
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	2	0	3	6	1	14
Peak Hour Factor, PHF	0.42	0.42	0.42	0.58	0.58	0.58
Hourly Flow Rate, HFR	4	0	7	10	1	24
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No /			Yes /2	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L		LTR			LTR	
v (vph)	36	2		11			35	
C(m) (vph)	934	1191		692			1315	
v/c	0.04	0.00		0.02			0.03	
95% queue length	0.12	0.01		0.05			0.08	
Control Delay	9.0	8.0		10.3			10.5	
LOS	A	A		B			B	
Approach Delay				10.3			10.5	
Approach LOS				B			B	

HCS+: Unsignalized Intersections Release 5.3

TWO-WAY STOP CONTROL SUMMARY

Analyst: CL
Agency/Co.:
Date Performed: 10/13/2008
Analysis Time Period: PM Peak
Intersection:
Jurisdiction:
Units: U. S. Customary
Analysis Year: Year 2018 w/out project
Project ID:
East/West Street: Kuhio Hwy
North/South Street: GC Dwy
Intersection Orientation: EW Study period (hrs): 1.00

Vehicle Volumes and Adjustments

Major Street: Approach	Eastbound			Westbound		
Movement	1	2	3	4	5	6
	L	T	R	L	T	R
Volume	27	643	0	1	435	27
Peak-Hour Factor, PHF	0.96	0.96	0.96	0.86	0.86	0.86
Hourly Flow Rate, HFR	28	669	0	1	505	31
Percent Heavy Vehicles	2	--	--	2	--	--
Median Type/Storage	Undivided /					
RT Channelized?						
Lanes	1	1	0	1	1	0
Configuration	L		TR	L		TR
Upstream Signal?		No			No	

Minor Street: Approach	Northbound			Southbound		
Movement	7	8	9	10	11	12
	L	T	R	L	T	R
Volume	6	0	2	25	0	42
Peak Hour Factor, PHF	0.75	0.75	0.75	0.84	0.84	0.84
Hourly Flow Rate, HFR	8	0	2	29	0	50
Percent Heavy Vehicles	2	2	2	2	2	2
Percent Grade (%)		0			0	
Flared Approach: Exists?/Storage		No /			Yes /2	
Lanes	0	1	0	0	1	0
Configuration		LTR			LTR	

Delay, Queue Length, and Level of Service

Approach	EB	WB	Northbound			Southbound		
Movement	1	4	7	8	9	10	11	12
Lane Config	L	L		LTR			LTR	
v (vph)	28	1		10			79	
C(m) (vph)	1032	921		375			964	
v/c	0.03	0.00		0.03			0.08	
95% queue length	0.08	0.00		0.08			0.27	
Control Delay	8.6	8.9		14.9			11.5	
LOS	A	A		B			B	
Approach Delay				14.9			11.5	
Approach LOS				B			B	