Final Environmental Assessment

Volume 2 of 3

For the proposed

Barbers Point Solar Project

Department of Hawaiian Home Lands Property

ʻEwa District, Oʻahu, Hawaiʻi

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Pacific Legacy

Historic Preservation

DRAFT

ARCHAEOLOGICAL INVENTORY SURVEY OF THE PROPOSED BARBERS POINT SOLAR PROJECT IN THE AHUPUAʻA OF HONOULIULI, DISTRICT OF ʻEWA, ISLAND OF OʻAHU

[TMK: (1) 9-1-013:038; (1) 9-1-013:040; AND (1) 9-1-016:027 (POR.)]

APPENDIX B:

SITE DESCRIPTIONS FOR NEWLY IDENTIFIED HISTORIC PROPERTIES

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APPENDIX B: SITE DESCRIPTIONS FOR NEWLY IDENTIFIED HISTORIC PROPERTIES

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PREFACE

This report volume contains archaeological site descriptions, feature plan maps, and photographs for newly identified sites (T-01 through T-03, T-07 through T-12) documented in the Barbers Point Solar Project Area. A gap in temporary site numbers resulted from combining all limestone sink features in Parcel 38 (originally assigned T-03 through T-05) into a single site complex (T-03). Following additional review, the feature documented as T-06 was subsequently voided, as it was determined to be a modern feature (dating to the 1970s–80s).

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1.0 ARCHAEOLOGICAL SITE DESCRIPTIONS

SIHP No.: 50-80-12-XXXXX
TEMPORARY NO.: T-01
Site Type: U.S. Military Buildings
No. of Features: 7
Dimensions: 200 m L × 45 m W
Condition: Good
Possible Age: 1943
Possible Function: High Explosive Magazines, Building Foundation
Significance: a, d
Recommended Treatment: Preservation/No Further Work
Previous Investigation: Architectural History Report (Yoklavich 1997)

SIHP 50-80-12-XXXXX (T-01) consists of six concrete high explosive magazines (Features 1 through 6) located in Parcel 40 and a concrete building foundation (Feature 7) located east of the bunkers on the west side of Coral Sea Road (Figure 1 and Table 1). The six magazines were included in a historic building inventory survey of NAS Barbers Point and evaluated as an architectural resource eligible for the National Register (Yoklavich 1997:241). The magazines comprise concrete walls and floors and contain vented double steel doors on their east sides. The roofs of the magazines are filled with gravel and soil and have a maximum height of roughly 4.5 m. Their east-facing facades have a hexagon or semi-circular shape. The Feature 7 building foundation was not included in Yoklavich's 1997 report; however, it is shown on a 1945 NAS Barbers Point Station map as Building 183.

Feature 1 (Figure 2 and Figure 3) is the northeastern-most magazine located within the leased parcel of Kalaeloa Ranch on Long Island Street. The magazine doors were closed and not accessed during the survey. A modern ranch structure was erected on the northeast corner of Feature 1. Feature 1 measures 23 m (E/W) × 22 m (N/S). The roof supports a dense growth of *kiawe* (*Prosopis pallida*). Feature 1 is Building 176 of NAS Barbers Point. Feature 1 is in good condition.

Feature 2 (Figure 4 and Figure 5) is east of Feature 1 and lies within the pyrotechnic leased parcel on Long Island Street. The magazine doors were closed and blocked with concrete and were not accessed during the survey. Feature 2 is roughly 21 m × 21 m. Feature 2 is Building 177 of NAS Barber Point. Feature 2 is in good condition.

Feature 3 (Figure 6 and Figure 7) is east of Feature 2 and lies within the pyrotechnic leased parcel on Long Island Street. The magazine doors were open during the survey and the interior appeared vacant. Feature 3 measures 23 m (E/W) × 20 m (N/S). The magazine is Building 178 of NAS Barbers Point. Feature 3 is in good condition.

Feature 4 (Figure 8) is the most southeastern magazine, located on Casablanca Street. The magazine doors were open during the survey and the interior appeared vacant. The magazine roof and building edges support a thick growth of *kiawe* (*Prosopis pallida*) and two *noni* (*Morinda citrifolia*) trees. Feature 4 measures 24 m (E/W) × 23 m (N/S). The magazine is Building 179 of NAS Barbers Point. Feature 4 is in good condition.

Table 1. Summary of SIHP 50-80-12-XXXXX (T-001) Military Magazines and Building Foundation

Feature	Field No.	Building Number	Type	Function
1	016	176	Magazine	High explosive ammunition storage
2	062	177	Magazine	High explosive ammunition storage
3	109	178	Magazine	High explosive ammunition storage
4	485	179	Magazine	High explosive ammunition storage
5	486	180	Magazine	High explosive ammunition storage
6	489	181	Magazine	High explosive ammunition storage
7	610	183	Concrete curbing	Building foundation

Feature 5 (Figure 9 and Figure 10) is east of Feature 4 on Casablanca Street. The magazine doors were open during the survey and the interior appeared vacant. The magazine roof supports a dense growth of *kiawe* (*Prosopis pallida*) and *koa haole* (*Leucaena leucocephala*). Feature 5 measures 24 m × 24 m. The magazine is Building 180 of NAS Barbers Point. Feature 5 is in good condition.

Feature 6 (Figure 9 and Figure 10) is east of Feature 5 on Casablanca Street. The magazine doors were open during the survey and the interior was vacant. The magazine roof supports a dense growth of *kiawe* (*Prosopis pallida*) and *koa haole* (*Leucaena leucocephala*). Feature 6 measures 25 m (E/W) × 19 m (N/S) at maximum. The magazine is Building 181 of NAS Barbers Point. Feature 6 is in good condition.

Feature 7 is a rectangular concrete foundation associated with NAS Barbers Point's Building 183. The foundation comprises a 12 cm-wide by 0.2 to 0.4 m-high concrete curb that forms a rectangular enclosure measuring 8.5 m (N/S) by 6 m (E/W) and interior "room" in the north portion of the feature. A 0.2 m high concrete block is within the northern-interior portion of the feature. One vertical pipe is on the south side of the concrete block and three adjacent vertical pipes are along the eastern wall. The floor is soil covered. Feature 7 is in fair condition.

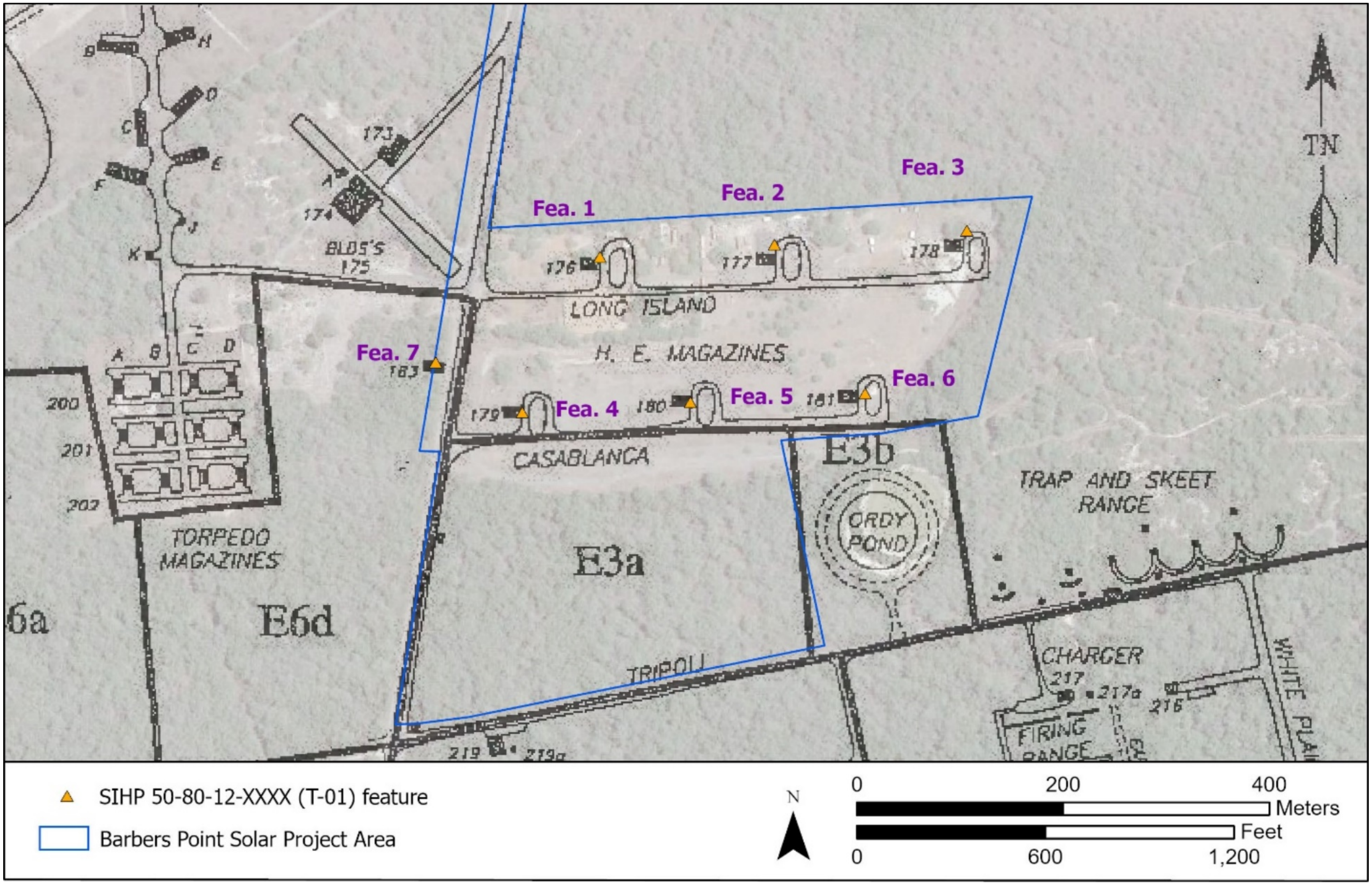

Figure 1. Plan-view map of SIHP 50-80-12-XXXXX (T-01), showing feature distribution overlaid on 1945 Station Map (in Tuggle and Tomonari-Tuggle 1997:Figure 25).

Figure 2. SIHP 50-80-12-XXXXX (T-01), east side of Feature 1 magazine (view to northwest).

Figure 3. SIHP 50-80-12-XXXXX (T-01), south side of Feature 1 magazine (view to north).

Figure 4. SIHP 50-80-12-XXXXX (T-01), east side of Feature 2 magazine (view to west).

Figure 5. SIHP 50-80-12-XXXXX (T-01), south side of Feature 2 magazine (view to north).

Figure 6. SIHP 50-80-12-XXXXX (T-01), east side of Feature 3 magazine (view to west).

Figure 7. SIHP 50-80-12-XXXXX (T-01), south side of Feature 3 magazine (view to north).

Figure 8. SIHP 50-80-12-XXXXX (T-01), east side of Feature 4 magazine (view to west).

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Figure 9. SIHP 50-80-12-XXXXX (T-01), east side of Feature 5 magazine (view to west).

Figure 10. SIHP 50-80-12-XXXXX (T-01), south side of Feature 5 magazine (view to north).

Figure 11. SIHP 50-80-12-XXXXX (T-01), east side of Feature 6 magazine (view to west).

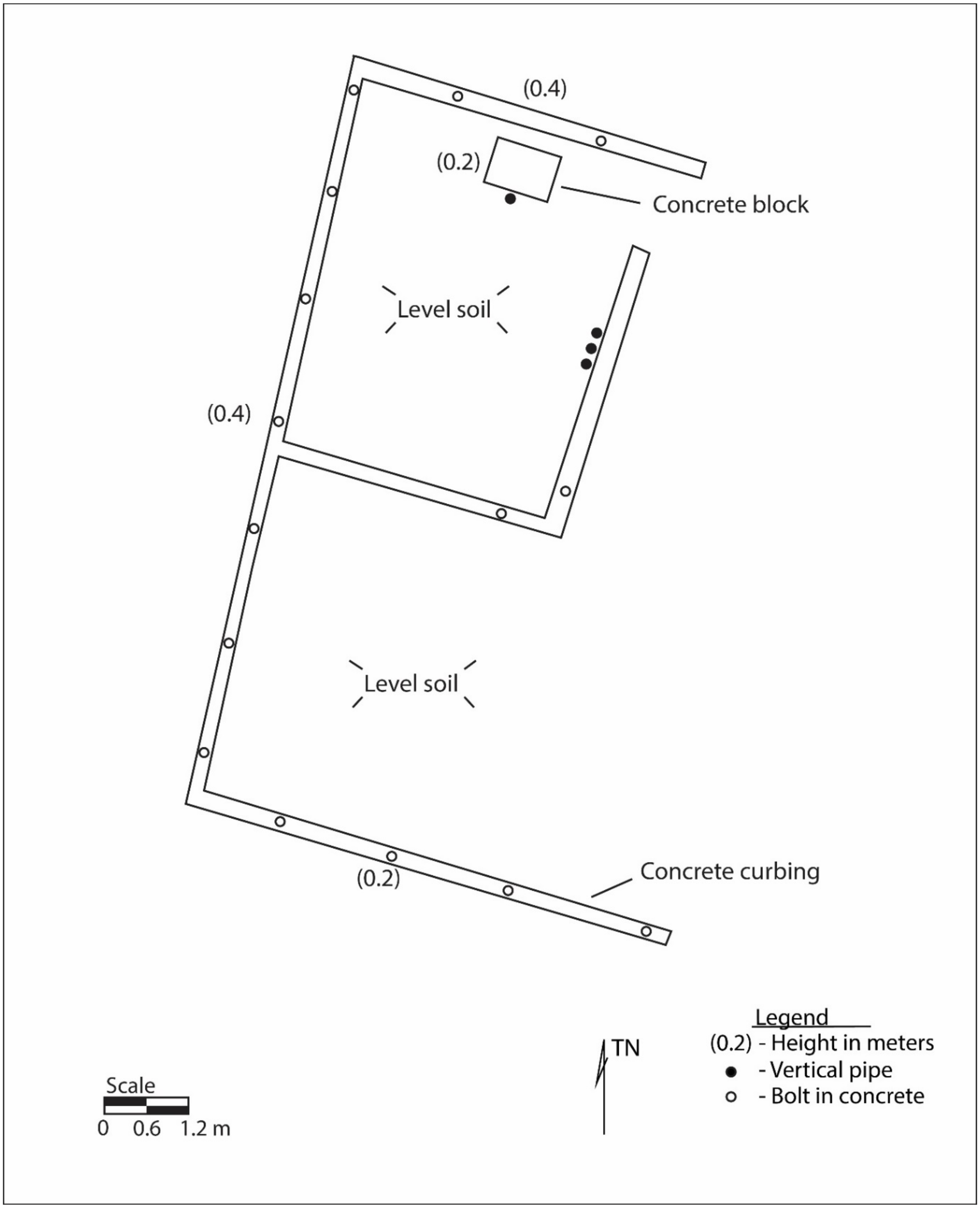

Figure 12. Plan map of SIHP 50-80-12-XXXXX (T-01), Feature 7 concrete foundation.

Figure 13. SIHP 50-80-12-XXXXX (T-01), Feature 7 concrete foundation (view to north).

SIHP No.: 50-80-12-XXXXX
TEMPORARY NO.: T-02
Site Type: Complex of U.S. military buildings, revetments, and associated infrastructure
No. of Features: 57
Dimensions: 700 m L × 430 m W
Condition: Poor to Good
Possible Age: 1942–1957
Function: U.S. Military Facility
Significance: a, c, d
Recommended Treatment: Preservation/No Further Work
Previous Investigation: Architectural History Report (Yoklavich 1997); National Register Nomination (Ewa Field Revetment District South; Resnick, Frye, and Salo 2018)

SIHP 50-80-12-XXXXX (T-02) consists of a complex of 57 U.S. military structures and a limestone quarry associated with development of Marine Corps Air Station Ewa (MCAS Ewa) following the Japanese attack on Oʻahu Island on December 7, 1941 (Figure 14 and Table 2). The revetments and associated structures were documented by Yoklavich (1997). Table 2 provides a summary of the 59 features documented in the project area and correlating building numbers and dates of construction provided by Yoklavich (1997).

The current survey documented a total of 42 revetments (Features 1–4, 6, 7, 9–16, 22–33, 38–46, 48–53, 57, and 58), a high-explosive magazine (Feature 5), stone-rubble berm (Feature 8), two Quonset huts (Features 20 and 34), four concrete structures (Features 19, 35, 37, and 56), a C-shaped wall built into one of the revetments (Feature 17), a fire hydrant barrier (Feature 21), a mound (Feature 18), a stone-masoned building remnant (Feature 36), a signpost and foundation (Feature 47), and the limestone quarry (Feature 59).
Each feature is described below by formal type.

Aircraft Revetments
A total of 42 revetments (Figure 15 through Figure 53) were documented within the current project area and designated Features 1–4, 6, 7, 9–16, 22–33, 38–46, 48–53, 57, and 58 (see Table 2). The revetments were constructed in 1942 in response to the December 7, 1941 Japanese attack and destruction of aircraft left unprotected on the adjacent MCAS Ewa airfield. The aircraft revetments are in fair to good condition, and many have been altered by graffiti. Excerpts from the Historic American Buildings Survey (HABS No. HI-279-A) provide a description of the revetment construction efforts:

> The revetments are built with a parabolic-shaped cast-in-place concrete beam over the one opening to each revetment. Each beam is 6 feet high and 12 inches thick. Although the title of the drawings says they are "44' Clear Span" they actually span about 53 feet. The 44-foot clear span measurement is based on the span between points at which there is a 7-foot vertical clearance. The maximum clear height of the front arch is 16'-9". The beam is further reinforced with five concrete fins, each six inches thick, which act as buttresses for the beam and as a further interconnection between the beam and the revetment shell. The reinforced concrete shell structure has an inside radius at the floor of 28 feet.
>
> After completion, the revetments were covered with about ten feet of sand. Many of the revetments are still completely covered by the sand, with grass and trees growing from the mounds. The top surface of some revetments are partially exposed due to erosion. The floors of the revetments are covered with asphalt paving.

Table 2. Summary of SIHP 50-80-12-XXXXX (T-02) Features

Feature	Field No.	Building No.	Type	Function	Date	Comments
1	246	1272	Revetment	Aircraft concealment	1942	graffiti
2	248	1273/48	Revetment	Aircraft concealment	1942	graffiti
3	259	1274	Revetment	Aircraft concealment	1942	graffiti, garbage, tires
4	260	1275	Revetment	Aircraft concealment	1942	wood, graffiti
5	264	1525	Bunker remnant	Ammunition storage	1944	-
6	266	1280	Revetment	Aircraft concealment	1942	-
7	267	1281	Revetment	Aircraft concealment	1942	-
8	269	-	Stone-soil Berm	Land clearing for revetments	1942	-
9	292	1278/53	Revetment	Aircraft concealment	1942	white truck; graffiti
10	293	1279/53	Revetment	Aircraft concealment	1942	trash, graffiti
11	298	1284/59	Revetment	Aircraft concealment	1942	thick vegetation; graffiti
12	299	1285/60	Revetment	Aircraft concealment	1942	thick vegetation; graffiti
13	320	1288/63	Revetment	Aircraft concealment	1942	tractor tow, diesel fuel truck, water truck, graffiti
14	321	1289/64	Revetment	Aircraft concealment	1942	diesel fuel truck, boat, F650 truck, graffiti
15	322	1290/65	Revetment	Aircraft concealment	1942	equipment storage
16	324	1285	Revetment	Aircraft concealment	1942	-
17	325	-	C-shaped Wall	Military training	1944-1957?	built into edge of revetment
18	350	-	Mound	Military development	1944-1957?	-
19	357	-	Concrete structure	Military Quonset hut foundation	1944	-
20	358	1506	Quonset hut	Military	1944	-
21	361	-	Metal barrier	Military fire hydrant	1944-1957?	-
22	376	1283/57	Revetment	Aircraft concealment	1942	wooden planks, ladder
23	377	1282	Revetment	Aircraft concealment	1942	living room chair
24	395	1253/28	Revetment	Aircraft concealment	1942	graffiti
25	396	1255/30	Revetment	Aircraft concealment	1942	graffiti
26	397	1248/23	Revetment	Aircraft concealment	1942	black sedan, trash
27	398	1249/24	Revetment	Aircraft concealment	1942	graffiti
28	399	1251/26	Revetment	Aircraft concealment	1942	graffiti
29	400	1250/25	Revetment	Aircraft concealment	1942	trash, graffiti
30	401	1257	Revetment	Aircraft concealment	1942	desk, corrugated metal, kiawe wood

Feature	Field No.	Building No.	Type	Function	Date	Comments
31	402	1259	Revetment	Aircraft concealment	1942	piled kiawe wood
32	408	1301	Revetment	Aircraft concealment	1942	-
33	411	1256/31	Revetment	Aircraft concealment	1942	storage for lease holder
34	412	1523	Quonset hut	Facility building	1944	no interior access; used by lease holder
35	413	87	Concrete structure	Air raid shelter	1944	-
36	414	-	Stone-mason building	Military structure	1944-1957?	-
37	415	-	Concrete footings	Military building foundation	1944-1957?	-
38	416	12/58/33	Revetment	Aircraft concealment	1942	trash, wooden pallets
39	417	1261	Revetment	Aircraft concealment	1942	wooden pallet, graffiti
40	418	1260	Revetment	Aircraft concealment	1942	Graffiti
41	419	1263	Revetment	Aircraft concealment	1942	Graffiti
42	420	1262	Revetment	Aircraft concealment	1942	Graffiti
43	421	1265	Revetment	Aircraft concealment	1942	Graffiti
44	422	1264	Revetment	Aircraft concealment	1942	Graffiti
45	423	1277	Revetment	Aircraft concealment	1942	Graffiti
46	424	1276	Revetment	Aircraft concealment	1942	graffiti
47	426	-	Concrete foundation	Facility signpost	1942-1957	-
48	428	1266	Revetment	Aircraft concealment	1942	graffiti
49	429	1267	Revetment	Aircraft concealment	1942	graffiti
50	430	1268	Revetment	Aircraft concealment	1942	graffiti
51	431	1269	Revetment	Aircraft concealment	1942	graffiti
52	432	1271	Revetment	Aircraft concealment	1942	graffiti
53	433	1270	Revetment	Aircraft concealment	1942	graffiti
56	454	-	Concrete box	Undetermined	Post 1941	-
57	525	1252	Revetment	Aircraft concealment	1942	-
58	526	1254	Revetment	Aircraft concealment	1942	-
59	527	-	Quarry	Revetment building material	1942	-

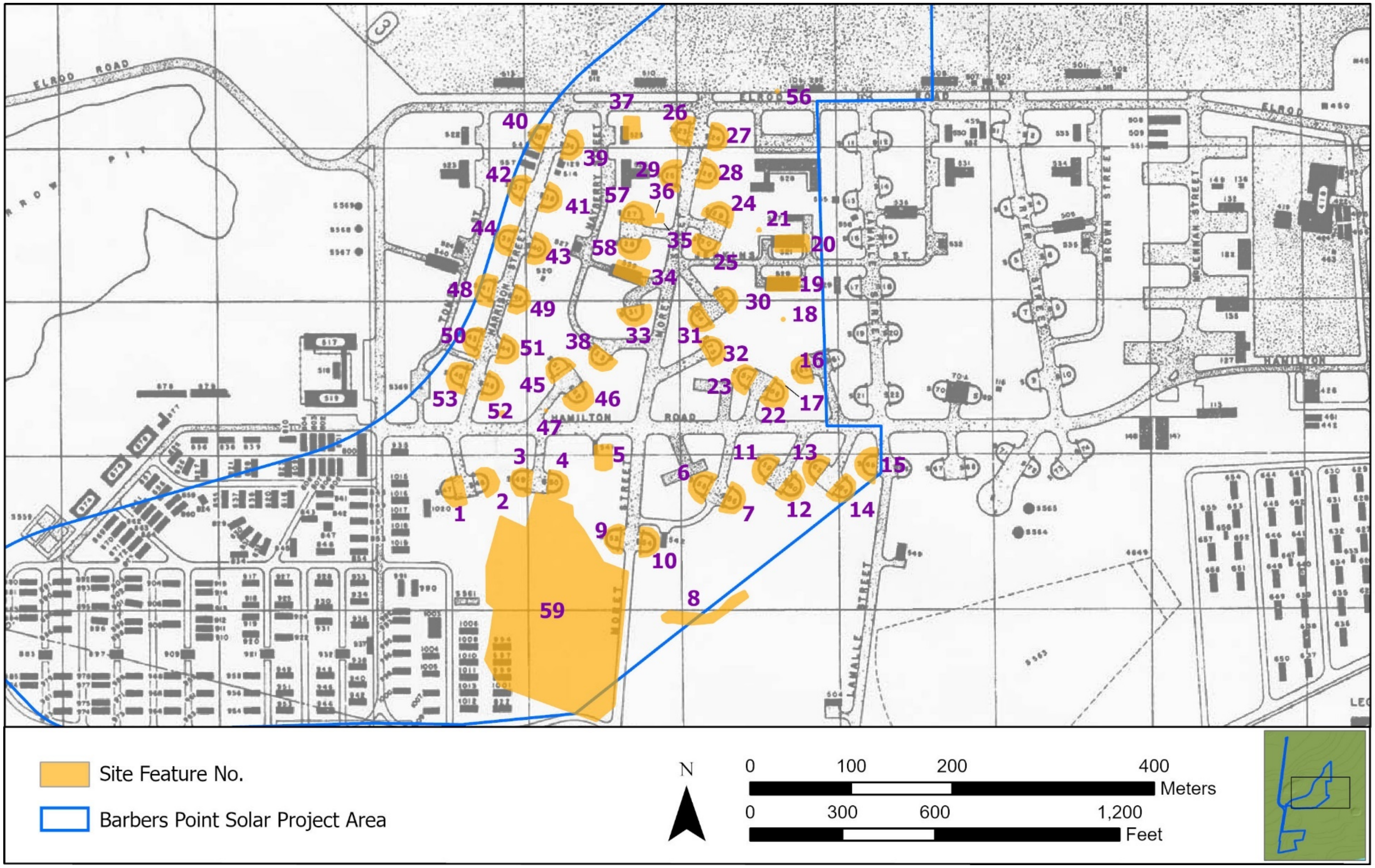

Figure 14. Plan view of SIHP 50-80-12-XXXXX (T-02) features overlaid on MCAS Ewa map (U.S. Navy 1948).

Figure 15. SIHP 50-80-12-XXXXX (T-02), Feature 1 revetment (view to west).

Figure 16. SIHP 50-80-12-XXXXX (T-02), Feature 2 revetment (view to east).

Figure 17. SIHP 50-80-12-XXXXX (T-02), Feature 3 revetment (view to west).

Figure 18. SIHP 50-80-12-XXXXX (T-02), Feature 4 revetment (view to east).

Figure 19. SIHP 50-80-12-XXXXX (T-02), Feature 6 revetment (view to west).

Figure 20. SIHP 50-80-12-XXXXX (T-02), Feature 7 revetment (view to east).

Figure 21. SIHP 50-80-12-XXXXX (T-02), Feature 9 revetment (view to west).

Figure 22. SIHP 50-80-12-XXXXX (T-02), Feature 10 revetment (view to east).

Figure 23. SIHP 50-80-12-XXXXX (T-02), Feature 11 revetment (view to northwest).

Figure 24. SIHP 50-80-12-XXXXX (T-02), Feature 12 revetment (view to southeast).

Figure 25. SIHP 50-80-12-XXXXX (T-02), Feature 13 revetment (view to northwest).

Figure 26. SIHP 50-80-12-XXXXX (T-02), Feature 14 revetment (view to southeast).

Figure 27. SIHP 50-80-12-XXXXX (T-02), Feature 15 revetment (view to west).

Figure 28. SIHP 50-80-12-XXXXX (T-02), Feature 22 revetment (view to east).

Figure 29. SIHP 50-80-12-XXXXX (T-02), Feature 23 revetment (view to west).

Figure 30. SIHP 50-80-12-XXXXX (T-02), Feature 24 revetment (view to north).

Figure 31. SIHP 50-80-12-XXXXX (T-02), Feature 25 revetment (view to south).

Figure 32. SIHP 50-80-12-XXXXX (T-02). Feature 26 revetment (view to northwest).

Figure 33. SIHP 50-80-12-XXXXX (T-02), Feature 27 revetment (view to east).

Figure 34. SIHP 50-80-12-XXXXX (T-02), Feature 28 revetment (view to east).

Figure 35. SIHP 50-80-12-XXXXX (T-02), Feature 29 revetment (view to west).

Figure 36. SIHP 50-80-12-XXXXX (T-02), Feature 30 revetment (view to northeast).

Figure 37. SIHP 50-80-12-XXXXX (T-02), Feature 31 revetment (view to southwest).

Figure 38. SIHP 50-80-12-XXXXX (T-02), Feature 32 revetment (view to east).

Figure 39. SIHP 50-80-12-XXXXX (T-02), Feature 33 revetment (view to south).

Figure 40. SIHP 50-80-12-XXXXX (T-02), Feature 38 revetment (view to southwest).

Figure 41. SIHP 50-80-12-XXXXX (T-02), Feature 39 revetment (view to east).

Figure 42. SIHP 50-80-12-XXXXX (T-02), Feature 40 revetment (view to west).

Figure 43. SIHP 50-80-12-XXXXX (T-02), Feature 41 revetment (view to east).

Figure 44. SIHP 50-80-12-XXXXX (T-02), Feature 42 revetment (view to west-northwest).

Figure 45. SIHP 50-80-12-XXXXX (T-02), Feature 43 revetment (view to east).

Figure 46. SIHP 50-80-12-XXXXX (T-02), Feature 44 revetment (view to west).

Figure 47. SIHP 50-80-12-XXXXX (T-02), Feature 45 revetment (view to northwest).

Figure 48. SIHP 50-80-12-XXXXX (T-02), Feature 46 revetment (view to southeast).

Figure 49. SIHP 50-80-12-XXXXX (T-02), Feature 49 revetment (view to east).

Figure 50. SIHP 50-80-12-XXXXX (T-02), Feature 50 revetment (view to west).

Figure 51. SIHP 50-80-12-XXXXX (T-02), Feature 51 revetment (view to east).

Figure 52. SIHP 50-80-12-XXXXX (T-02), Feature 52 revetment (view to east).

Figure 53. SIHP 50-80-12-XXXXX (T-02), Feature 53 revetment (view to west).

Air Raid Shelter
Feature 35 (Figure 54) is a portable air raid shelter located 2.0 m east of Feature 36 stone structure and east of Feature 57 revetment. Yoklavich (1997:220) provides the following description of the WWII feature, which is designated as Building 87:

> This parabolic-arch air raid shelter is built of pre-cast concrete sections, except the floor which is poured-in-place concrete. It is built of four sections, each about 5 feet in length, about 13 feet in height, and about 13 feet in width measured at the floor. There are four metal loops embedded in each section for lifting.

Feature 35 was evaluated as a “distinctive constructive type” specific to the time following the Japanese attack on December 7, 1941 and represents the only remaining temporary air raid shelter at former NAS Barbers Point (Yoklavich 1997:220). Except for the painted graffiti, the building is in good condition.

Figure 54. SIHP 50-80-12-XXXXX (T-02), Feature 35 air raid shelter with Feature 36 stone structure on left (view to north).

Concrete and Other Structures
Four concrete structures (Features 37, 47, 55, and 56) and one metal pipe structure (Feature 21) are included in the Site T-02 inventory. The condition of all the concrete structures is good, but they represent remnant components of former buildings or utilities.

Feature 37 (Figure 55) consists of 28 concrete footings once serving as a building foundation in the northwest corner of the revetment area. The footings are 0.3 m high by 0.3 in diameter and they are arranged in a rectangular shape that measures 22.0 m (N/S) x 18.0 m (E/W). The former building corresponds to Building 525 shown on a 1948 MCAS Ewa Station map (see Figure 14). Building 525 was not identified in the Yoklavich (1997) investigation (Figure 56).

Feature 47 (Figure 57) is a metal and concrete post located on a paved road leading to revetment Features 45 and 46. It contains a circular metal base 0.3 m in diameter × 2.2 m high, with 2.2 m high metal post on top. The feature is a former signpost.

Feature 56 (Figure 58) consists of a square concrete rim with a separate metal-sheet top on the edge of El Rod Road. The feature appears to have been displaced from its original location. It measures 0.6 m square and is 0.2 m thick. The metal plate fits the open space of the concrete-rimmed feature. The structure might represent a former electrical or other utility valve box.

Feature 21 (Figure 59) is a fire hydrant and surrounding metal-pipe triangular barrier located 20 m northwest of the Feature 20 Quonset hut. The triangle of the metal-pipe barrier is 2 m in diameter. The existing fire hydrant is labeled “487.” A concrete drainage hole is on the northeast side of the hydrant.

Figure 55. SIHP 50-80-12-XXXXX (T-02), Feature 37 building foundation (view to southwest).

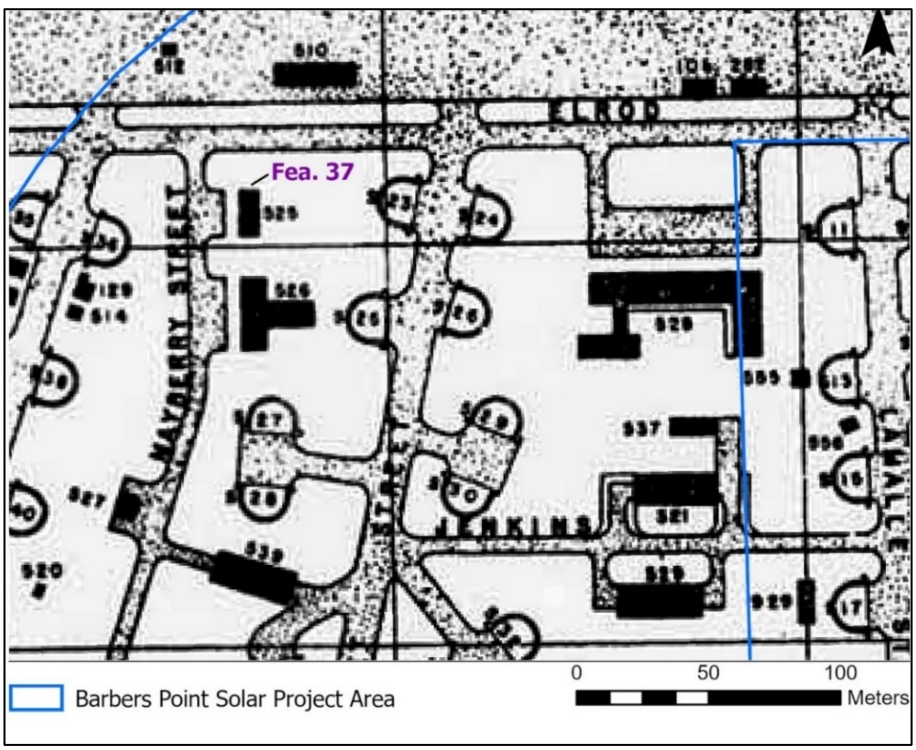

Figure 56. MCAS Ewa Station map (U.S. Navy 1948) showing SIHP 50-80-12-XXXXX (T-02), Feature 37 (Building 525).

Figure 57. SIHP 50-80-12-XXXXX (T-02), Feature 47 signpost (view to northeast).

Figure 58. SIHP 50-80-12-XXXXX (T-02), Feature 56 possible concrete utility box (view to southwest).

Figure 59. SIHP 50-80-12-XXXXX (T-02), Feature 21 fire hydrant (view to northwest).

Quonset Huts

Features 20 and 34 (Figure 60 through Figure 63) are complete Quonset huts and **Feature 19**, immediately south of Feature 20, is likely a Quonset hut concrete foundation. The two complete Quonset huts were built for storage and office space in 1944, a date that corresponds to construction at the MCAS Ewa base that transitioned to the Navy Construction Battalions or Seabees (Yoklavich 1997:220).

All three Quonset huts and foundation measured roughly 30 m long × 14 m wide and the complete Quonset huts (Features 20 and 34) are constructed of metal sheeting on top of a concrete slab. Feature 20 (Building 1506) was vacant during the current survey. Feature 34 (Building 1523) is currently used by the leaseholder, Mr. Franklin Souza, and was not entered during the survey. The two complete Quonset huts are in good structural condition. The Feature 19 concrete foundation is in good condition but represents a remnant component of a building no longer in place.

Pyrotechnics Magazine

Feature 5 or Building 1525 (Figure 64) is an “Armco Hut” pyrotechnics storage magazine built in 1944 (Yoklavich 1997:229). The magazine is in remnant (poor) condition and is currently characterized by a dilapidated metal building, collapsed roof, and front façade with vented double doors. The remaining portion of the structure measures 15 m (N/S) × 7.5 m (E/W) and 3.5 m high.

Stone Masonry Enclosure

Feature 36 (Figure 65) is a rectangular stone enclosure, located 2.0 m west of Feature 35 air raid shelter and immediately east of Feature 57 revetment. The structure likely formed a foundation and base wall for a small building. The wall is composed of a mixture of basalt and limestone rubble (large cobbles and small boulders) and cement mortar placed on top of a concrete slab. Stone rubble covers the floor of the enclosure. The enclosure measures 2 m (N/S) × 5 m (E/W) and a maximum of 0.2 m high. The wall is 0.3 m thick. Consultation with MCAS Ewa historian John Bond suggests that Feature 36 is a former latrine used by military personnel while working in the area. The structure is in fair condition and only contains the lower portion of the building walls.

Figure 60. SIHP 50-80-12-XXXXX (T-02), Feature 20 Quonset hut (view to east).

Figure 61. SIHP 50-80-12-XXXXX (T-02), Feature 20 building interior (view to east).

Figure 62. SIHP 50-80-12-XXXXX (T-02), Feature 34 Quonset hut (view to west-northwest).

Figure 63. SIHP 50-80-12-XXXXX (T-02), Feature 19 likely Quonset hut concrete foundation (view to southwest).

Figure 64. SIHP 50-80-12-XXXXX (T-02), Feature 5 pyrotechnics magazine (view to south).

Figure 65. SIHP 50-80-12-XXXXX (T-02), Feature 36 rectangular stone enclosure (view to north).

Limestone Structures
Feature 17 (Figure 66 and Figure 67) is a C-shaped wall composed of piled limestone cobbles and small to medium boulders. The feature is built into the east edge of the Feature 22 revetment. It measures 2 m (N/S) × 1 m (E/W) with a maximum height of 0.6 m. The feature is in good condition. Feature 17 postdates the revetment, and thus is interpreted as a military training feature.

Feature 18 (Figure 68 and Figure 69) is a limestone mound located in a heavily disturbed area evidenced by abundant bulldozer push piles, with aircraft revetments and Quonset huts on all sides. A concentration of limestone pits (T-03) is also in this area. The mound is 1.1 m in diameter and 0.2 m high. It is constructed of piled cobbles and small boulders. Feature 18 is in good condition. It is interpreted as a possible U.S. military land clearing feature.

Limestone Quarry
Feature 59 (Figure 70 and Figure 71) is a limestone quarry located at the center of Parcel 38. The quarry measures approximately 185 m (N/S) × 130 m (E/W) and descends to around 5 m (16 ft) at its deepest point. An access descends into the quarry from Moffet Street on the east side of the quarry. The aircraft revetments are retained by blocks of limestone likely derived from the quarry. The quarry is in good condition in the sense that it clearly looks like a quarried area.

Feature 8 (Figure 72 and Figure 73) is a large berm of limestone rubble and debris (including rusted metal items) that overlaps the southeastern boundary of the project area in Parcel 38. The berm is covered with a dense, high grass and measures approximately 43 m (NE/SW) long × 4 to 8 m wide with a maximum height of 1.5 m. The feature is in fair to good condition. The berm is likely the result of extensive land clearing on the southeast side of the project area.

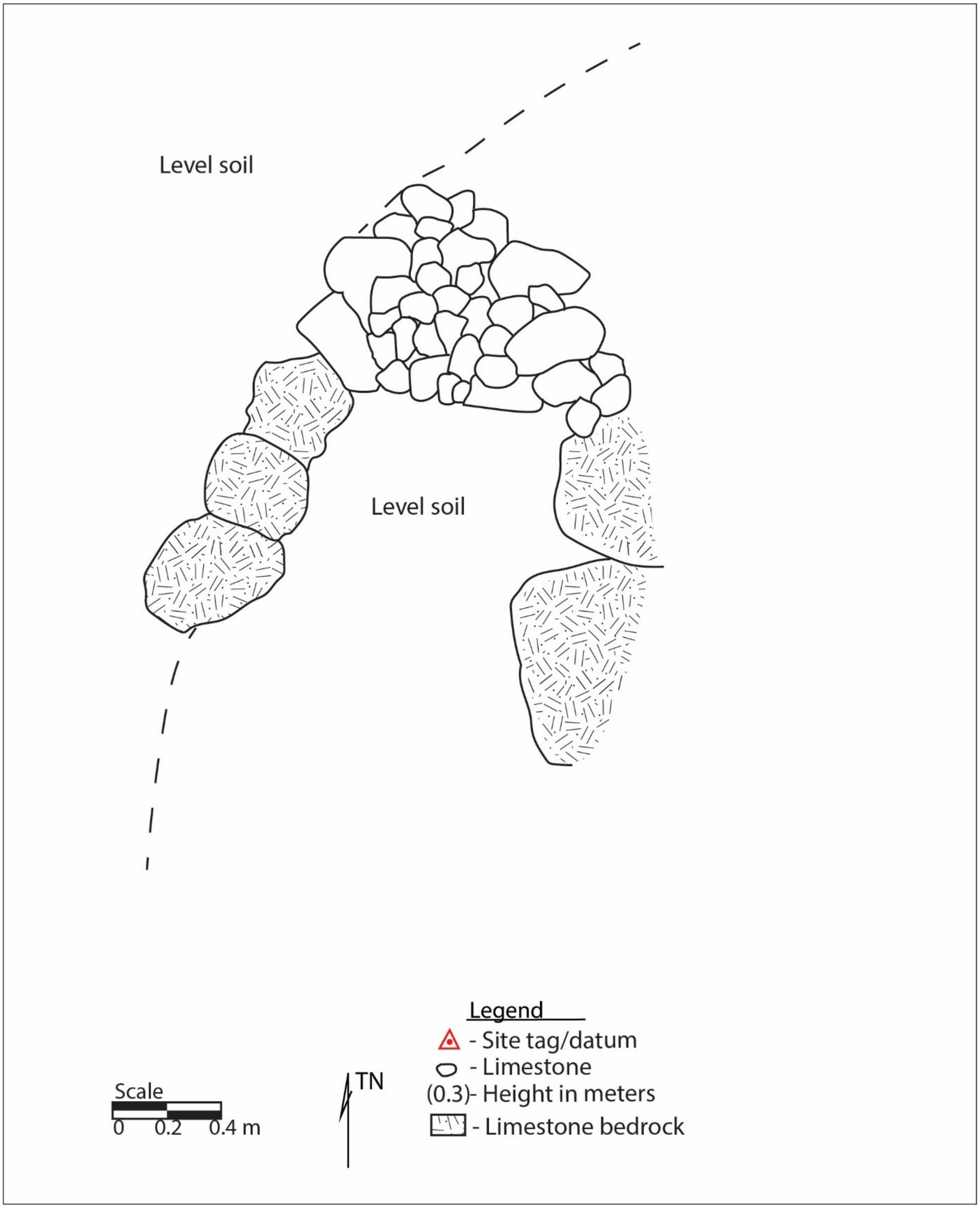

Figure 66. Plan-view map of SIHP 50-80-12-XXXXX (T-02), Feature 17 C-shaped wall.

Figure 67. SIHP 50-80-12-XXXXX (T-02), Feature 17 C-shaped wall (view to west).

Figure 68. SIHP 50-80-12-XXXXX (T-02), Feature 18 mound (view to northwest).

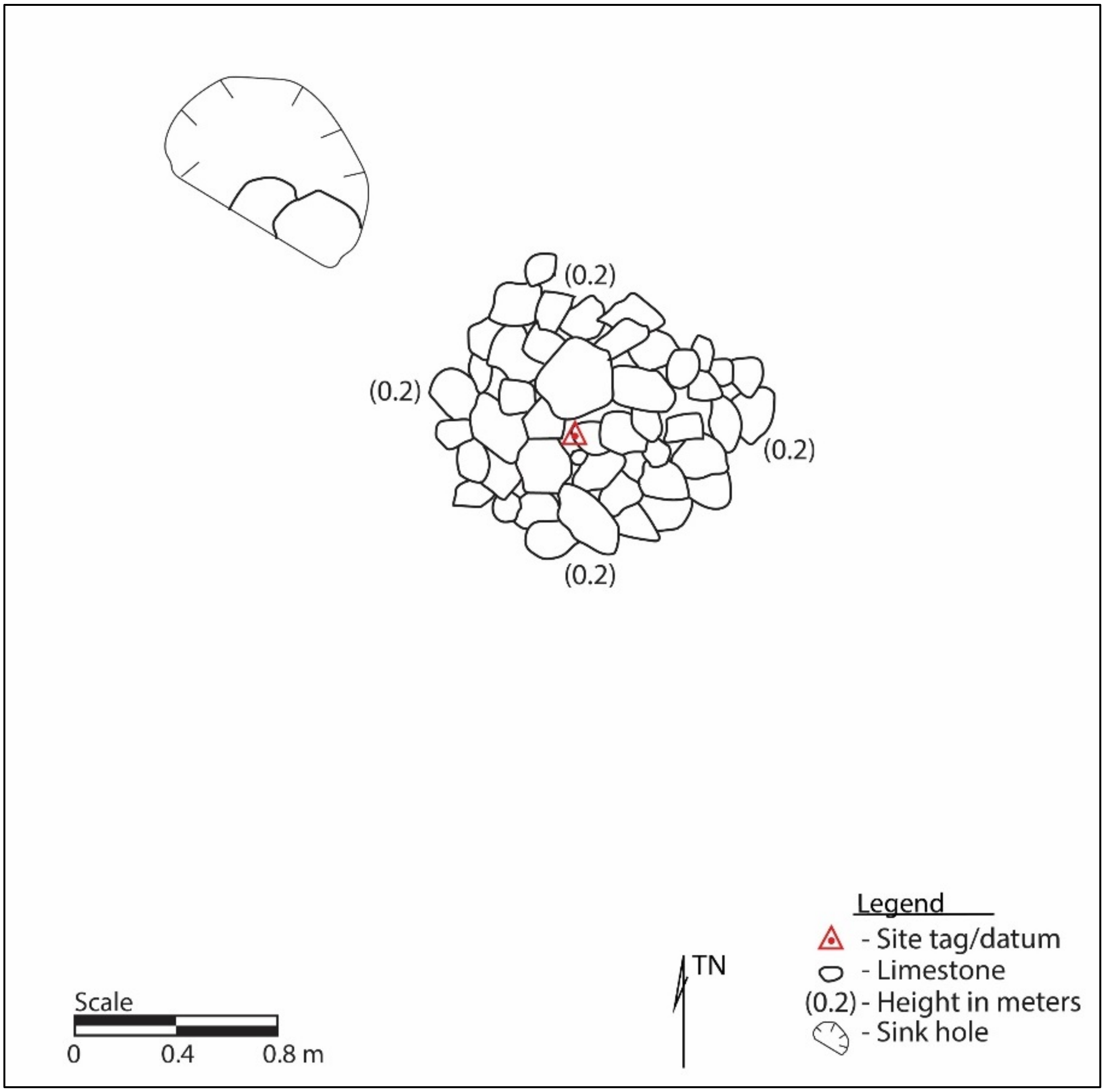

Figure 69. Plan-view map of SIHP 50-80-12-XXXXX (T-02), Feature 18 mound.

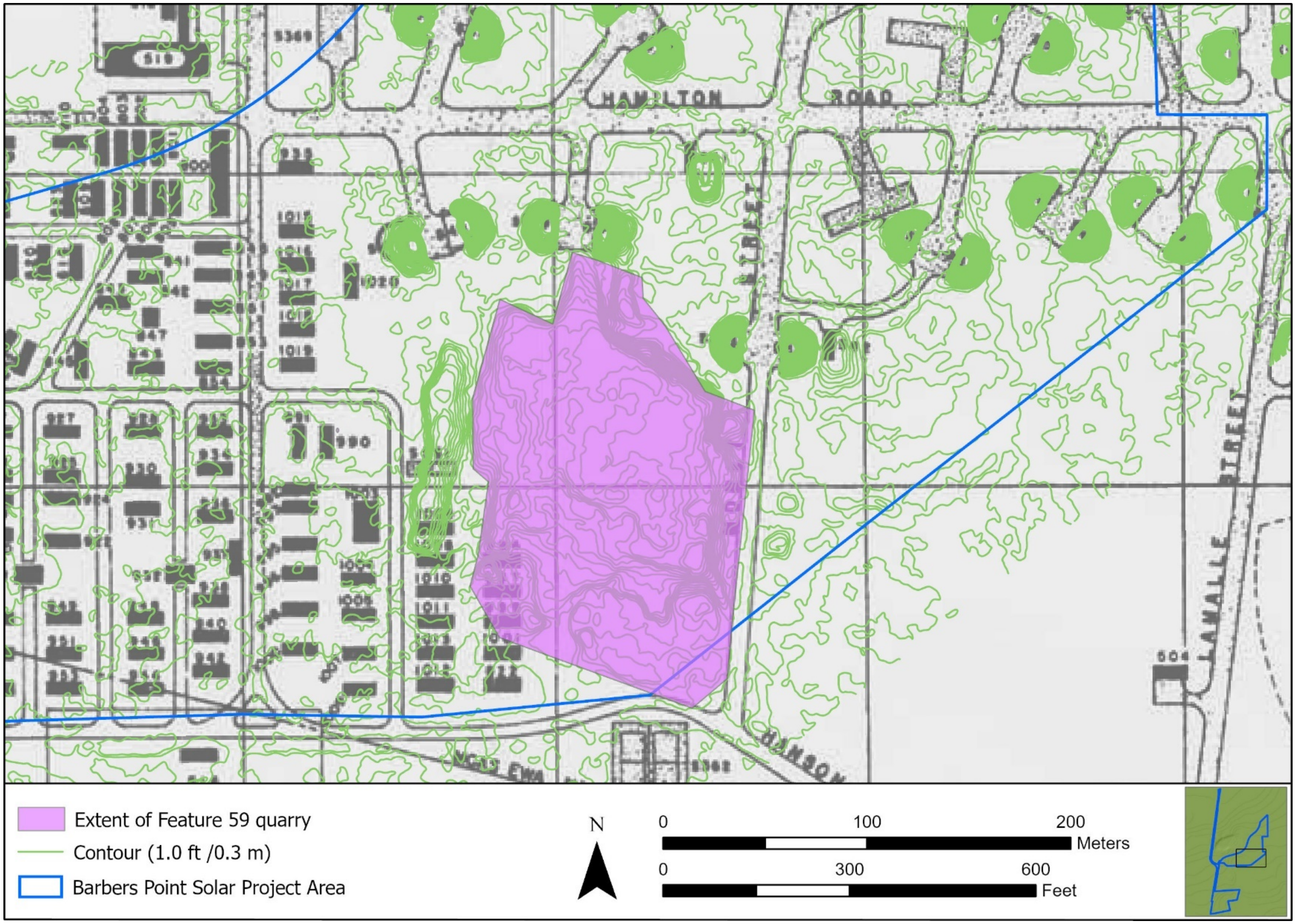

Figure 70. SIHP 50-80-12-XXXXX (T-02), Feature 59 quarry, overlaid on contours created from LiDAR data, 2019, and MCAS Ewa map (U.S. Navy 1948).

Figure 71. Overview of SIHP 50-80-12-XXXXX (T-02), Feature 59 quarry edge. Crewmember is next to quarried limestone block (view to southwest).

Figure 72. SIHP 50-80-12-XXXXX (T-02), Feature 8 berm, overlaid on contours created from LiDAR data, 2019, and MCAS Ewa map (U.S. Navy 1948).

Figure 73. SIHP 50-80-12-XXXXX (T-02), Feature 8 berm under grass (view to southwest).

SIHP No.: 50-80-12-XXXXX
TEMPORARY NO.: T-03
Site Type: Unmodified and Modified Limestone Pits and Mounds
No. of Features: 160
Dimensions: 210 m (NW/SE) × 970 m (NE/SW)
Condition: Fair to Poor
Possible Age: Undetermined/Pre-Contact–Early Post-Contact Era
Possible Function: Undetermined/Agricultural
Significance: d
Recommended Treatment: Preservation/Data Recovery (If Impacted)
Previous Investigation: Presence noted but not recorded during archaeological survey (Tuggle and Tomonari-Tuggle 1997)

SIHP 50-80-12-XXXXX consists of three modified limestone pits (Features 96, 116, and 153) and 157 unmodified limestone pits (Features 1–95, 97–115, 117–152, and 154–160). Feature 160 pit was below the current surface and was identified during excavation of T-05 (see Appendix C). The site features are distributed across Parcel 38 within and just south of the former U.S. Navy Seabee Camp (SIHP 50-80-12-05099) and the area containing revetments and related buildings and infrastructure (Site T-02).

The surrounding terrain, as well as many of the limestone pits, was adversely impacted by development of the WWII-era revetment complex and the U.S. Navy Seabee Camp, including the latter facility's demolition. This is evidenced by many of the limestone pits being mechanically filled with soil, limestone debris, residential refuse (e.g., beverage containers), vehicle parts, metal barrels and sheets, demolished utility pipes, and paint cans, among other military-related items. Although limestone pits were previously noted by Tuggle and Tomonari-Tuggle (1997) at SIHP -05099, none were documented during Tuggle and Tomonari-Tuggle's survey.

The modified and unmodified limestone pits range from 0.5 to 5 m wide to 0.6 to 8 m long and between 0.2 m and a maximum of 8 m in depth. A tabulated description (Table 3) and photographs (Figure 78 through Figure 242) are provided for all but one limestone pit (Feature 86), which was not photographed due to the presence of swarming bees from a hive inside the pit feature. During the current investigation, scaled plan maps were drafted for the modified pits.

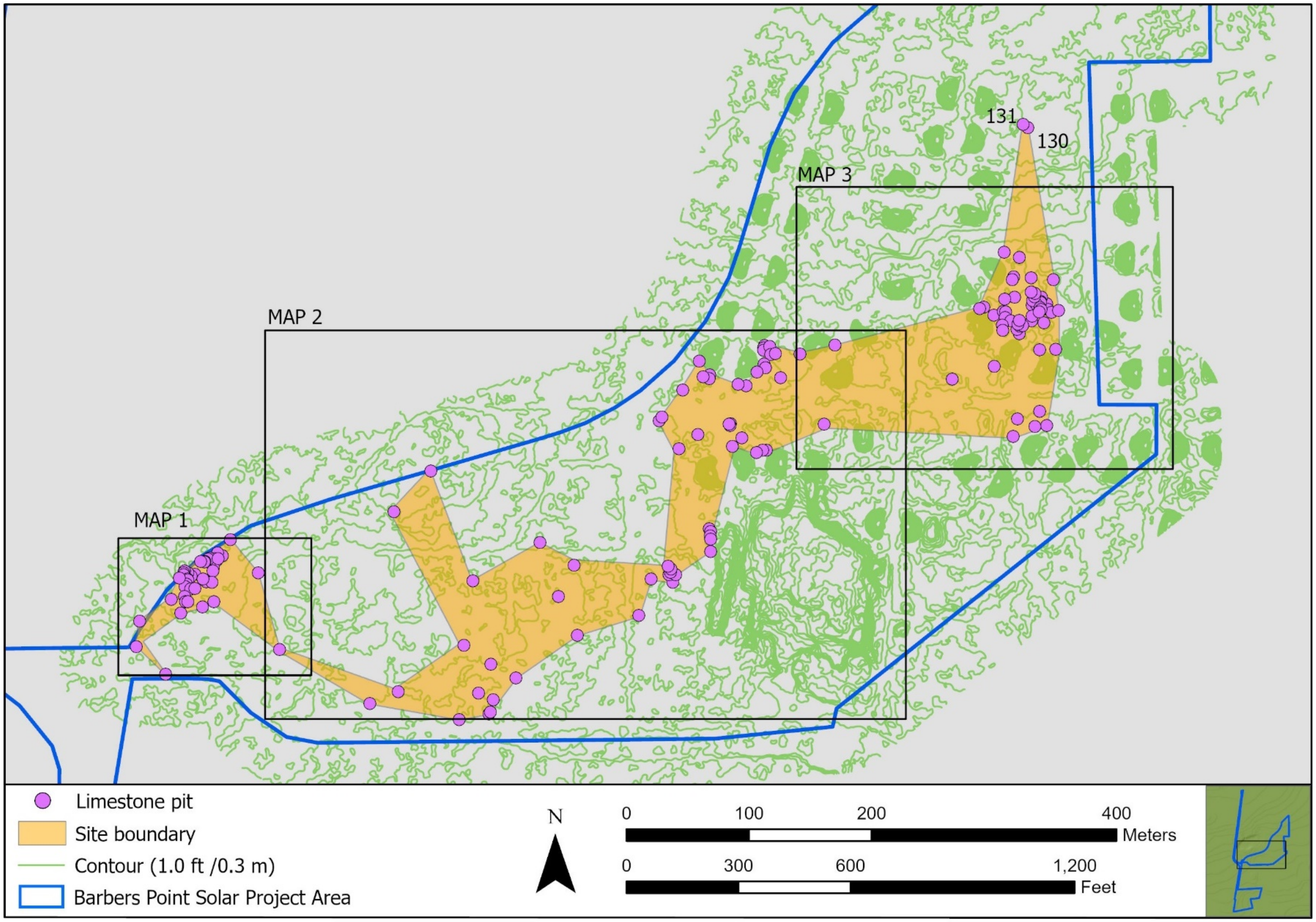

Figure 74. SIHP 50-80-12-XXXXX (T-03), showing overview of feature distribution and Map 1 through 3 insets (see following three figures).

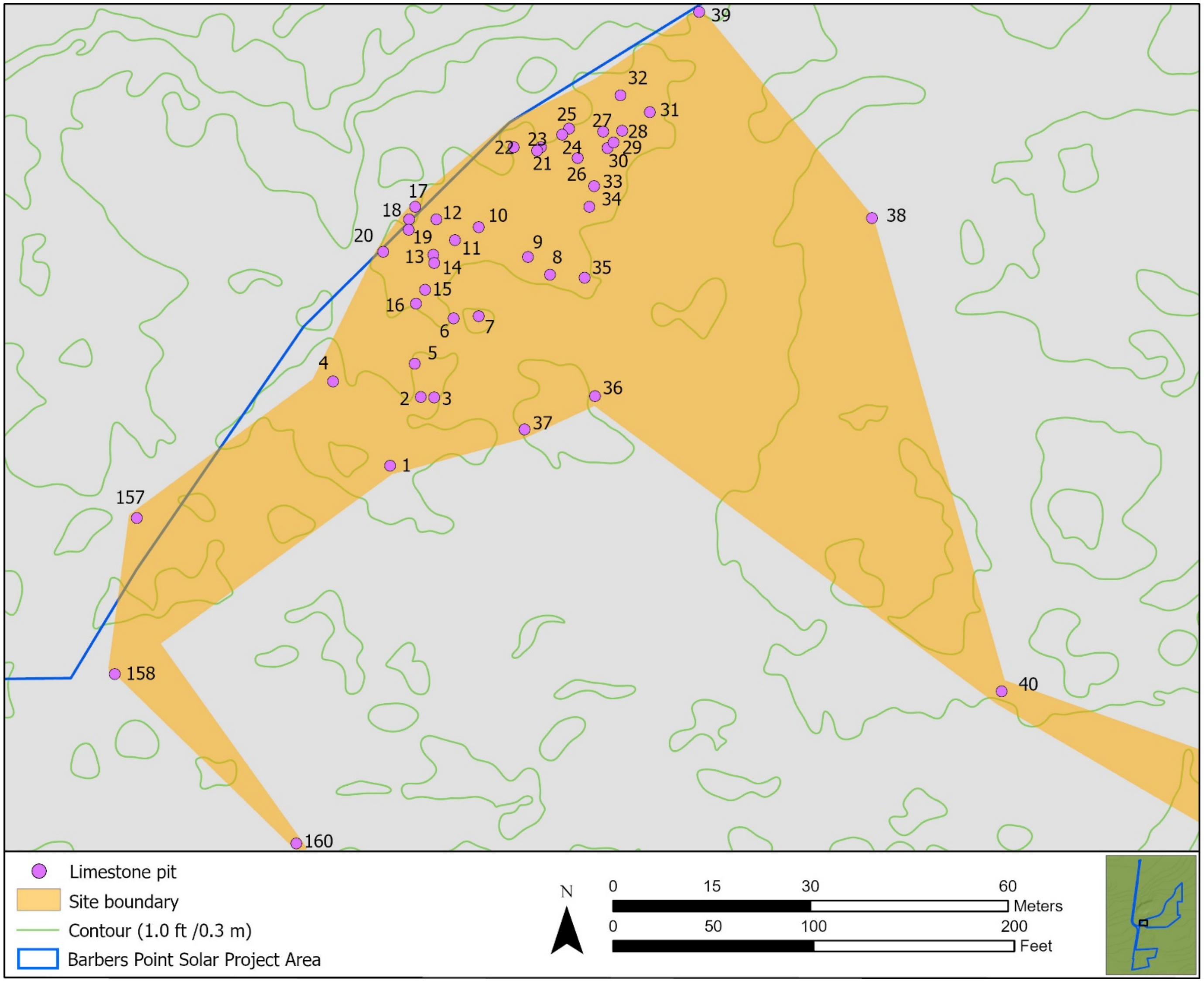

Figure 75. SIHP 50-80-12-XXXXX (T-03), Map 1, limestone pits overlaid on contour created from aerial LiDAR data, 2019.

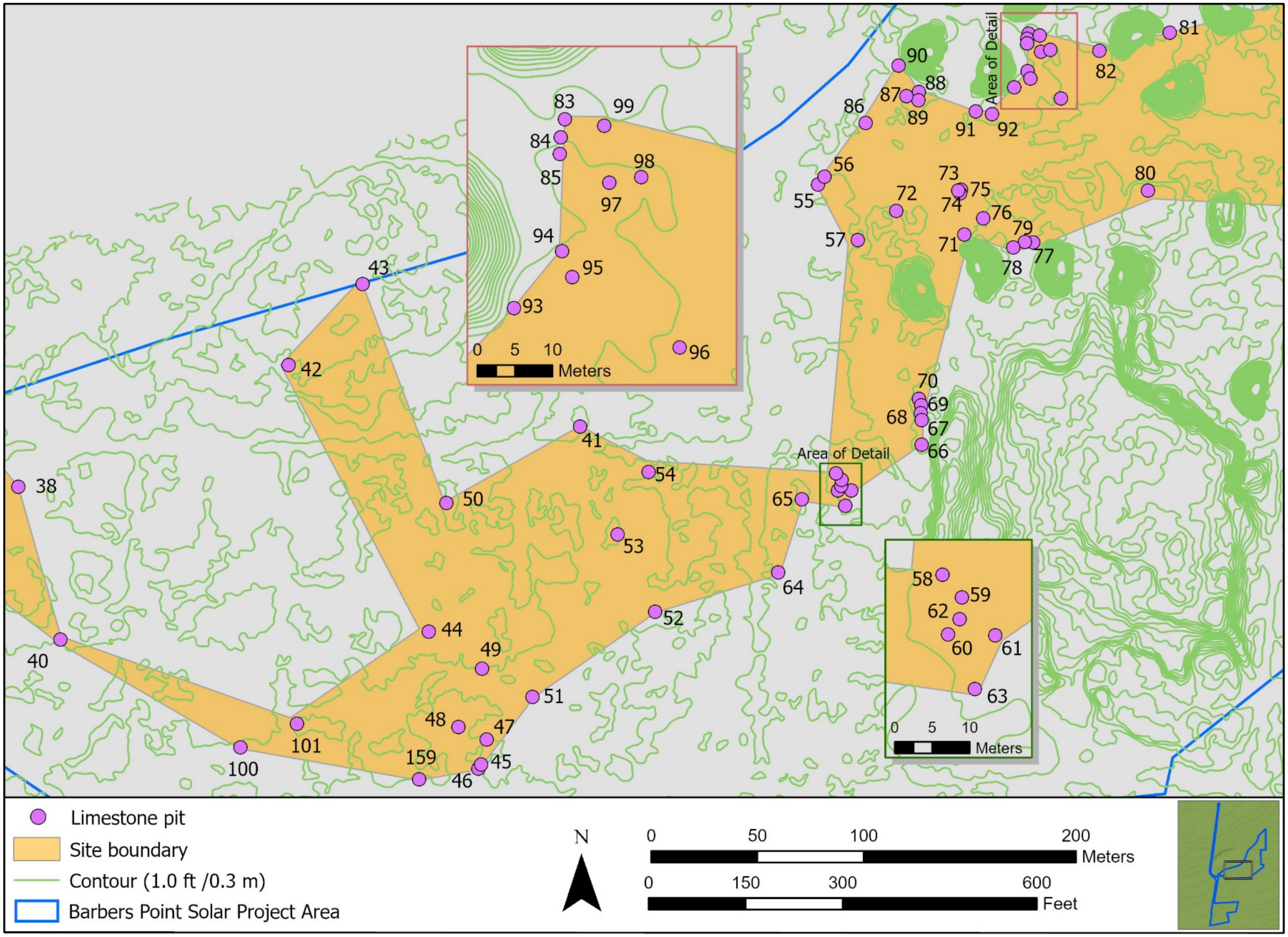

Figure 76. SIHP 50-80-12-XXXXX (T-03), Map 2, limestone pits overlaid on contour created from aerial LiDAR data, 2019.

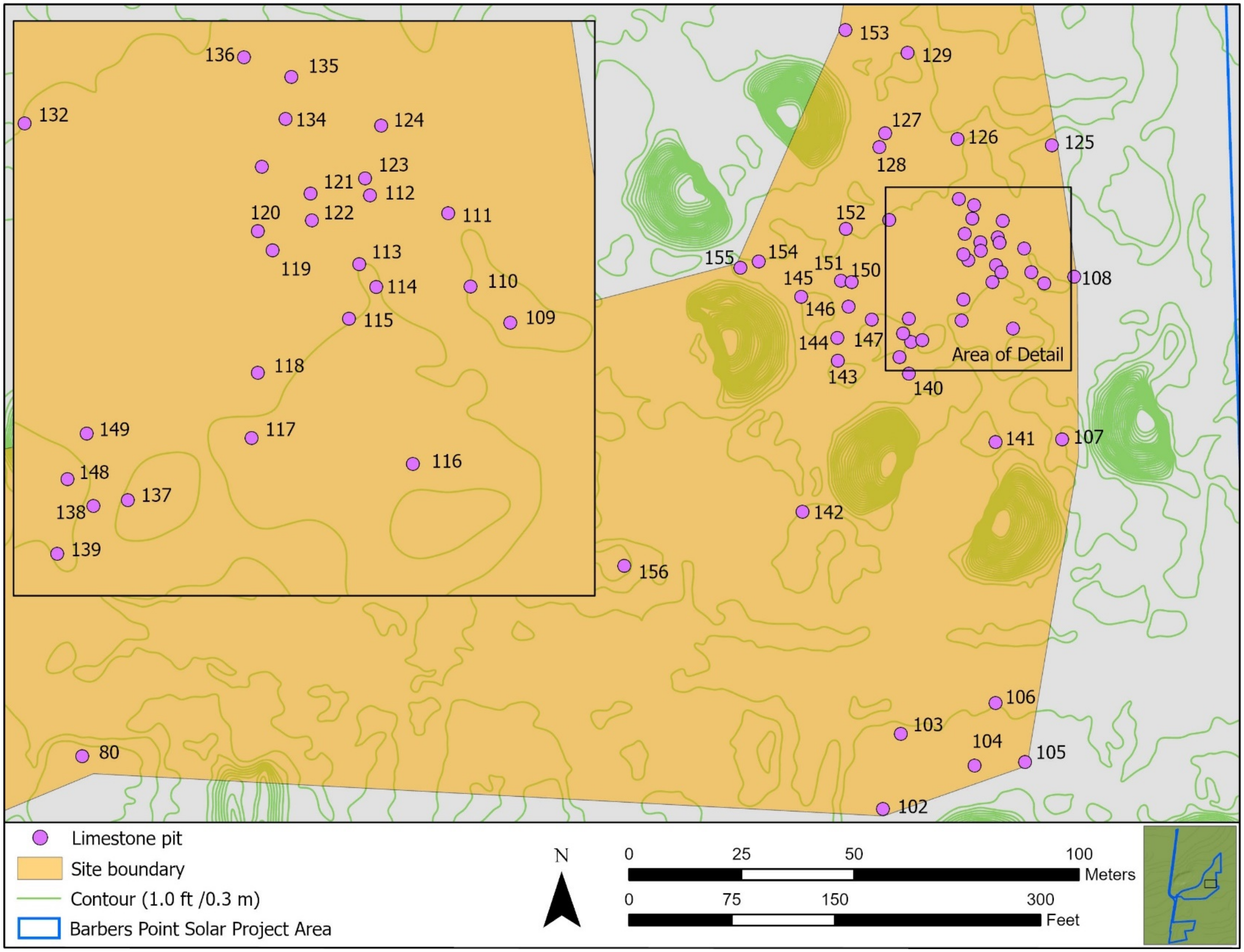

Figure 77. SIHP 50-80-12-XXXXX (T-03), Map 3, limestone pits overlaid on contour created from aerial LiDAR data, 2019.

Table 3. SIHP 50-80-12-XXXXX (T-03) Limestone Pit Descriptions

Feature No.	Field No.	Width	Length	Depth	Stone-filled	Soil-filled	Additional Contents
1	T-137	0.9	1.65	0.7	X	–	Concrete pipe
2	T-138	0.7	1.2	0.8	–	X	Barbed-wire fencing
3	T-139	1.2	1.4	0.6	X	–	Barbed wire
4	T-140	1.4	2.7	1.1	X	–	Bottles
5	T-142	1.1	2.5	1.3	X	–	Metal trash
6	T-144	1	1	2.1	X	–	Bottles
7	T-145	1.7	2.7	1.5	X	–	Bottles
8	T-146	1.2	1.7	4	X	–	Bottles/metal
9	T-147	1.1	2.1	3	X	X	Bottles
10	T-148	0.6	1.6	0.8	X	–	2 open metal cans
11	T-149	0.9	2.1	0.9	X	X	–
12	T-150	0.8	1.8	1	–	X	Bottles, metal
13	T-151	0.6	1.2	1.6	X	–	Metal and bottles
14	T-152	1.1	1.5	1.1	X	–	–
15	T-153	0.9	0.9	0.5	X	–	–
16	T-154	1.1	1.1	1.1	–	X	–
17	T-155	0.7	1.2	0.6	–	X	–
18	T-156	0.6	1.3	1	X	X	Bottles
19	T-157	1.2	2	1.7	X	X	–
20	T-158	1.6	1.9	1	X	–	Metal
21	T-159	1	1	1	X	X	Pipe across
22	T-160	2.5	4.5	0.8	X	–	Filled with concrete
23	T-161	0.7	1	1	X	X	–
24	T-162	1	1.3	1.3	X	X	Barbed wire
25	T-163	0.8	1.7	1.3	X	–	–
26	T-164	1.7	1.8	1.4	–	X	–
27	T-165	0.7	0.7	1.8	X	–	–
28	T-166	0.7	1	1.4	X	–	–
29	T-167	0.6	0.8	1.6	X	X	–
30	T-168	0.5	0.7	1.2	X	X	–
31	T-169	0.8	0.8	0.5	X	–	Paint cans
32	T-170	5	5.7	0.6	X	X	Cans
33	T-171	0.7	2	0.8	–	X	–
34	T-172	1.1	1.2	0.7	X	–	Wooden planks, branches, and metal
35	T-174	0.6	1	0.8	–	–	Cans and metal
36	T-176	1	2	2.5	X	X	–
37	T-177	0.7	1.4	0.5	X	–	Bees
38	T-178	1	1	1.4	X	–	–
39	T-180	1.3	1.6	0.4	X	–	Wood
40	T-182	0.7	0.8	0.4	X	X	–
41	T-185	0.8	0.8	0.8	–	X	Roots over opening
42	T-195	0.8	1.1	0.4	X	–	–
43	T-198	2	2.5	0.8	–	X	–
44	T-199	1.7	1.4	0.7	–	X	Wood covering opening
45	T-201	1.6	2.7	0.4	–	X	–
46	T-202	1.2	1.2	0.5	X	–	Concrete signpost
47	T-203	1.4	1.4	0.5	X	–	–
48	T-204	0.6	0.6	0.3	–	X	–

Feature No.	Field No.	Width	Length	Depth	Stone-filled	Soil-filled	Additional Contents
49	T-205	2	2.1	0.8	–	X	–
50	T-207	1	1	0.5	–	X	–
51	T-211	0.9	0.9	0.2	–	X	–
52	T-214	0.6	0.7	0.6	X	–	–
53	T-215	0.9	1.8	1.4	X	–	Bottle on top
54	T-216	1	2.3	1	X	X	–
55	T-225	0.9	0.9	0.2	X	X	–
56	T-226	0.9	0.9	0.4	X	X	–
57	T-228	1	1	0.2	X	–	–
58	T-229	1.4	2.1	0.4	X	X	–
59	T-230	0.9	2.3	0.4	X	X	Metal and *kiawe* branches
60	T-231	0.6	0.6	0.9	X	X	Plastic cone; possible speaker
61	T-232	1.7	1.3	0.3	X	X	–
62	T-233	1.1	1.1	0.8	X	X	–
63	T-234	0.7	1.8	0.9	X	X	Boulder at bottom
64	T-239	0.7	0.8	0.4	X	–	–
65	T-240	1	0.6	0.8	–	X	–
66	T-241	2	2.2	2	X	–	Metal pipes, wood, and tree trunk
67	T-242	1.2	1.4	0.9	–	X	–
68	T-243	0.9	1.5	1.2	–	X	–
69	T-244	2.4	3.3	0.4	X	X	Metal cable and sheet inside
70	T-245	2	2.1	0.8	X	X	Metal sheet
71	T-249	1	1	0.5	X	–	–
72	T-250	0.9	0.9	0.2	X	X	–
73	T-251	0.6	0.7	0.6	–	X	–
74	T-252	0.9	1.8	1.4	X	–	–
75	T-253	1	2.3	1	X	X	Banyan tree growing inside
76	T-254	0.9	0.9	0.2	X	X	–
77	T-255	0.9	0.9	0.4	–	X	–
78	T-256	1.0	1.0	0.2	X	X	Large boulder in opening
79	T-257	1.4	2.1	0.4	X	X	–
80	T-261	0.9	2.3	0.4	X	X	–
81	T-425	0.7	1.2	0.3	X	X	–
82	T-427	0.75	1.8	0.4	X	X	–
83	T-434	0.8	1.6	0.5	X	–	–
84	T-435	1.1	1.1	0.3	X	–	Asphalt
85	T-436	1.3	1.4	0.3	X	X	Asphalt
86	T-437	1.5	2.0	0.75	X	–	Bee’s nest
87	T-438	1.4	1.8	0.6	X	X	–
88	T-439	2.4	1.3	2.3	X	X	Metal debris, gas tank
89	T-440	1.2	1.7	0.8	X	X	Metal debris
90	T-441	2.3	2.3	2.9	–	–	Metal material
91	T-442	1.8	2.6	2.9	–	X	–
92	T-443	1.3	1.2	0.4	X	X	–
93	T-444	0.7	1.0	0.9	X	X	–
94	T-445	0.7	0.9	0.8	X	–	–
95	T-446	0.4	1.4	2.9	X	–	–

Feature No.	Field No.	Width	Length	Depth	Stone-filled	Soil-filled	Additional Contents
96	T-447	1.2	1.4	2.6	–	X	Includes Features 96.2 and 96.3 mounds
97	T-448	2.3	2.4	0.8	X	X	–
98	T-449	1.2	1	0.5	X	X	–
99	T-450	0.6	0.9	1.1	X	X	–
100	T-600	0.9	1.0	0.2	X	X	Mechanically filled with soil and limestone
101	T-601	1.1	1.8	0.5	–	X	–
102	T-291	1.2	1.2	4	X	X	Bees
103	T-294	1.7	1.7	0.5	X	X	Overhang
104	T-296	0.9	2.1	1.2	X	X	–
105	T-297	1.2	0.7	0.2	X	X	–
106	T-323	1	1.7	0.5	X	–	–
107	T-326	2.4	5.1	1	X	X	Shallow overhang
108	T-328	1.1	1.1	0.9	–	X	–
109	T-330	0.9	0.9	0.7	–	X	–
110	T-331	1	0.7	0.9	–	X	–
111	T-332	2.2	4.5	1.3	X	–	Bridge between two openings
112	T-334	0.8	1.8	0.7	X	–	Dura-glass bottle
113.1	T-336A	1.3	1.3	1.7	X	X	Tire in floor; 3 openings, connected single cavern
113.2	T-336B	1.2	1.5	1	X	X	3 openings; connected by single cavern
113.3	T-336C	0.7	0.9	1.6	X	X	3 openings; connected by single cavern
114	T-337	1.2	0.7	0.6	X	X	–
115	T-338	0.9	0.7	0.7	X	X	Modern trash inside
116	T-339	4.0	8.0	0.8	–	X	Modified along outside edge (see description above)
117	T-341	1.6	1.6	3.3	X	X	Large banyan inside
118	T-342	2	2.1	0.8	–	X	0.75 m high overhang west side
119	T-344	1.1	1.1	0.5	–	X	–
120	T-345	1.8	0.9	0.6	–	X	–
121	T-346	1.1	1.1	0.6	X	X	–
122	T-347	0.8	3.4	0.3	–	–	–
123	T-348	0.8	0.75	1.2	–	–	–
124	T-349	1.9	1.9	1.7	X	X	–
125	T-351	0.8	0.6	0.6	X	–	Old post and net inside
126	T-352	0.8	0.9	0.4	–	X	–
127	T-353	1.3	2.2	1.4	X	–	Large *noni* tree inside
128	T-354	1.5	1.7	1.15	X	X	Large boulder inside
129	T-355	0.8	1.1	0.6	X	–	–
130	T-359	0.9	0.6	0.3	X	–	–
131	T-360	0.9	0.75	0.5	X	–	–
132	T-362	0.5	0.8	1.3	X	–	–
133	T-365	1.3	3	1.2	X	X	Good excavation potential
134	T-366	1	1.5	0.3	–	X	–
135	T-367	1.2	1.4	0.7	X	–	–

Feature No.	Field No.	Width	Length	Depth	Stone-filled	Soil-filled	Additional Contents
136	T-369	1.5	1.3	0.6	–	X	Coke bottle inside
137	T-370	0.8	1.1	1.25	–	X	–
138	T-371	1.7	2.1	0.6	–	X	Thick grass
139	T-372	0.6	0.9	1.3	X	–	–
140	T-373	0.8	0.7	1	X	X	Metal cans inside
141	T-375	3	2.3	0.75	X	X	Cables inside
142	T-380	1.8	2.15	1.2	X	–	Concrete block inside
143	T-382	0.7	1.3	2.5	X	X	–
144	T-385	1.4	1.6	0.3	X	X	–
145	T-386	2.2	1.2	4.3	X	X	Very deep pit
146	T-387	1.35	1.8	0.7	X	X	–
147	T-388	1.1	1.5	0.7	–	X	–
148	T-389	1.3	1.7	0.5	X	X	–
149	T-390	0.8	1.2	0.3	–	X	–
150	T-391	1.4	0.9	1.7	X	X	–
151	T-392	0.7	1	0.7	–	X	–
152	T-393	0.8	0.9	0.8	X	X	–
153	T-394	1.1	2.75	0.3	X	–	Wall on northeast edge (see description above)
154	T-404	2	2.7	0.8	X	–	–
155	T-405	1.5	1.15	0.9	X	–	Glass and metal inside
156	T-410	1.1	1.2	1.2	X	X	Glass bottles inside
157	T-620	1.6	2.0	1.1	–	X	–
158	T-621	1.4	1.6	1.6	–	X	–
159	T-197	1.8	1.8	1.5	X	–	Difficult to excavate
160	T-05	2.5	0.7	0.9	–	X	Identified in T-05 excavation

Modified Limestone Pits
Feature 96.1 (Figure 172 through Figure 175, p. 109–111) is a limestone pit with two adjacent mounds (Feature 96.2 and 92.3). **Feature 96.2** is a limestone mound that is immediately north of the Feature 96.1 pit and is constructed of piled limestone cobbles and small boulders. It measures 3 m (NE/SW) long × 2 m (NW/SE) wide and is 0.3 m high. **Feature 96.3** is a mound that is 1.5 m southeast of the Feature 96.1 pit and consists of a slightly rectangular mound of soil and limestone cobbles and boulders bordered by piled limestone cobbles and small boulders. It is 4 m (NW/SE) long × 2 m (NE/SW) wide and a maximum 0.8 m high. Separated by a 0.5 m gap, the Feature 96.3 mound continues roughly 2 m southeast. The mounds are likely related to military development of the nearby aircraft revetments and associated administrative buildings.

Feature 116 (Figure 197 through Figure 199, p. 122–123) is a large, modified limestone pit located in the southeastern corner of a dense pit concentration in the northeast corner of Site T-03. The feature is the largest limestone pit recorded in the project area, measuring 4 m (N/S) wide × 8 m (E/W) long and 0.8 m deep. The eastern end of the pit feature ascends 0.4 m below the rest of the sink floor, suggesting this portion may have been excavated for quarry material used during construction of the surrounding revetments. This eastern recessed area contains a 0.6 m high overhang extending 0.4 m into the south wall of the pit. The pit floor is relatively level and composed of soil and a few *koa haole* (*Leucaena leucocephala*) trees. A rough wall of cobbles and small boulders is aligned 3.5 m (E/W) along the north edge of the pit. The wall is approximately 0.5 m wide and 0.7 m above the pit floor and 0.2 m on the back or north side. An alignment of six small limestone boulders located 1 m south of the pit's southern edge is 1.5 m (E/W) long × 0.3 m wide and 0.1 to 0.3 m high.

The function of Feature 116 is dubious because of its unusually large opening and possible quarried area on the eastern end. If the feature was modified during the pre-Contact or early post-Contact era, it probably functioned as an agricultural feature and is in fair condition.

Feature 153 (Figure 236 and Figure 237, p. 142) is a modified limestone pit 42 m northwest of the main pit concentration. The pit feature is 1.1 m (N/S) × 2.75 m (E/W) and 0.3 m deep. A rough concentration of piled limestone cobbles and small boulders is on the northeast side of the pit. The modification is 2.5 m long × 0.5 to 1 m wide and 0.2 m high. The feature possibly functioned as a pre-Contact or early post-Contact agricultural feature.

Figure 78. SIHP 50-80-12-XXXXX (T-03), Feature 1 pit (view to northwest).

Figure 79. SIHP 50-80-12-XXXXX (T-03), Feature 2 pit (view to southeast).

Figure 80. SIHP 50-80-12-XXXXX (T-03), Feature 3 pit (view to northeast).

Figure 81. SIHP 50-80-12-XXXXX (T-03), Feature 4 pit (view to west).

Figure 82. SIHP 50-80-12-XXXXX (T-03), Feature 5 pit (view to northwest).

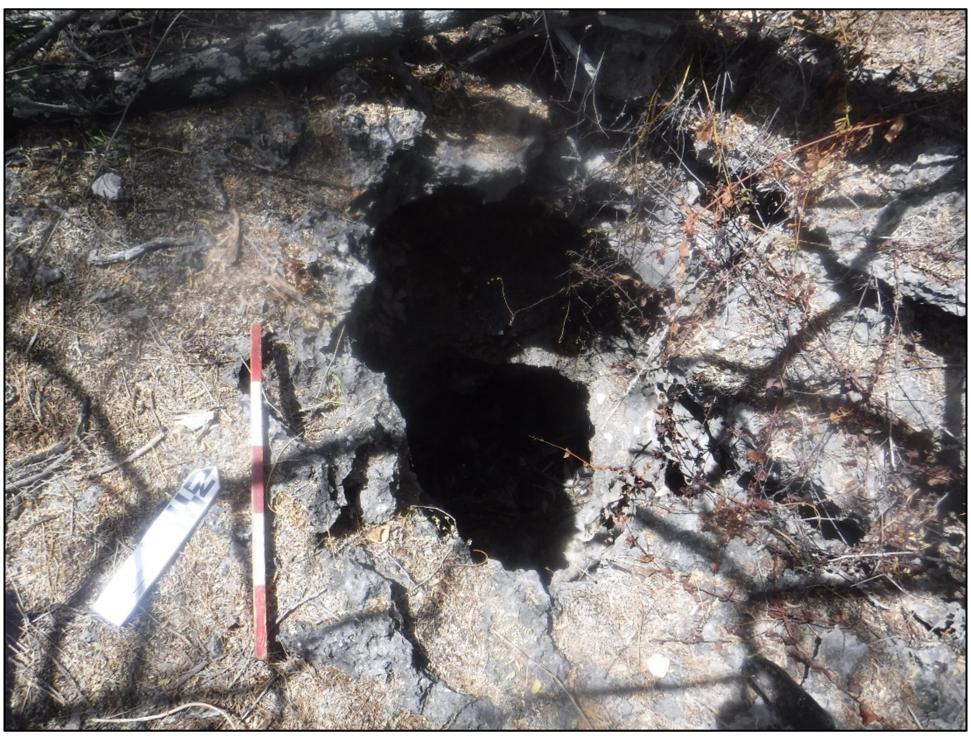

Figure 83. SIHP 50-80-12-XXXXX (T-03), Feature 6 pit (view to northwest).

Figure 84. SIHP 50-80-12-XXXXX (T-03), Feature 7 pit (view to southeast).

Figure 85. SIHP 50-80-12-XXXXX (T-03), Feature 8 pit (view to northeast).

Figure 86. SIHP 50-80-12-XXXXX (T-03), Feature 9 pit (view to southeast).

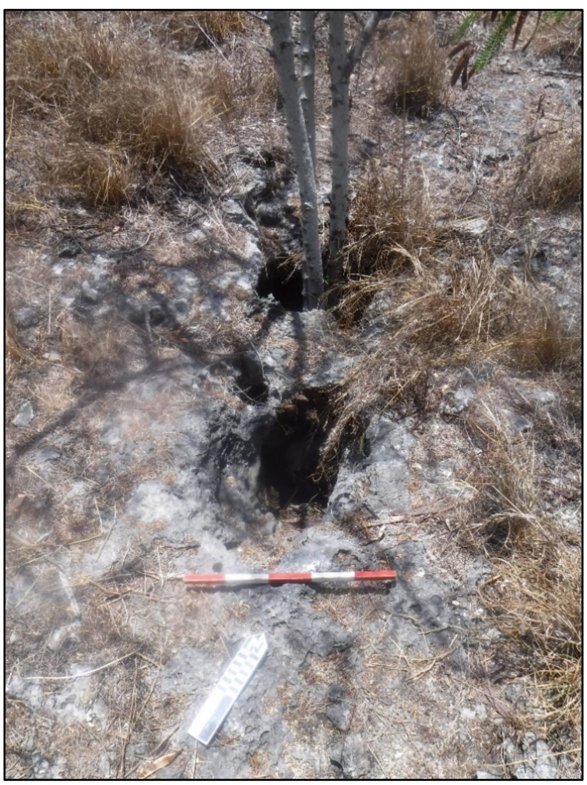

Figure 87. SIHP 50-80-12-XXXXX (T-03), Feature 10 pit (view to northwest).

Figure 88. SIHP 50-80-12-XXXXX (T-03), Feature 11 pit (view to southwest).

Figure 89. SIHP 50-80-12-XXXXX (T-03), Feature 12 pit (view to north).

Figure 90. SIHP 50-80-12-XXXXX (T-03), Feature 13 pit (view to northwest).

Figure 91. SIHP 50-80-12-XXXXX (T-03), Feature 14 pit (view to northeast).

Figure 92. SIHP 50-80-12-XXXXX (T-03), Feature 15 pit (view to west).

Figure 93. SIHP 50-80-12-XXXXX (T-03), Feature 16 pit (view to northwest).

Figure 94. SIHP 50-80-12-XXXXX (T-03), Feature 17 pit (view to east).

Figure 95. SIHP 50-80-12-XXXXX (T-03), Feature 18 pit (view to northwest).

Figure 96. SIHP 50-80-12-XXXXX (T-03), Feature 19 pit (view to northwest).

Figure 97. SIHP 50-80-12-XXXXX (T-03), Feature 20 pit (view to southeast).

Figure 98. SIHP 50-80-12-XXXXX (T-03), Feature 21 pit (view to northwest).

Figure 99. SIHP 50-80-12-XXXXX (T-03), Feature 22 pit (view to southeast).

Figure 100. SIHP 50-80-12-XXXXX (T-03), Feature 23 pit (view to northwest).

Figure 101. SIHP 50-80-12-XXXXX (T-03), Feature 24 pit (view to northeast).

Figure 102. SIHP 50-80-12-XXXXX (T-03), Feature 25 pit (view to west).

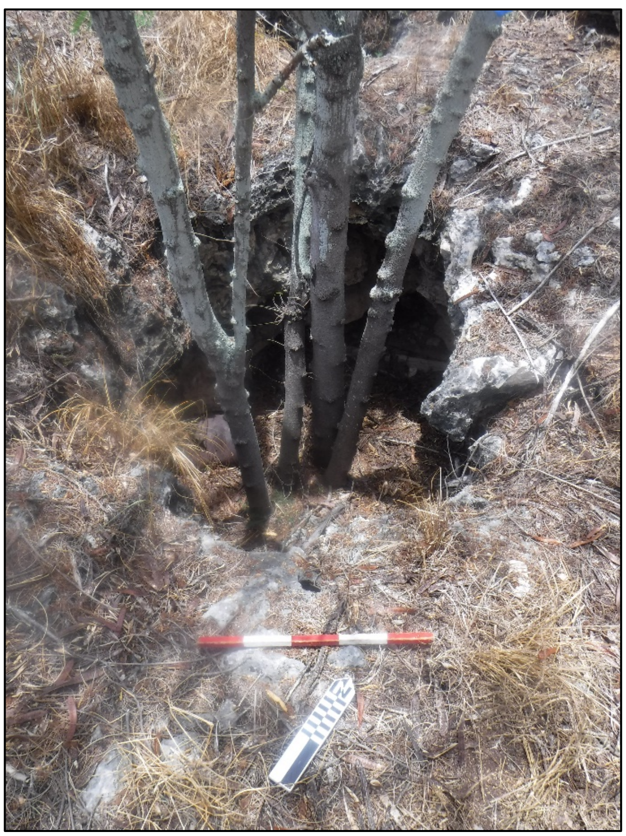

Figure 103. SIHP 50-80-12-XXXXX (T-03), Feature 26 pit (view to northwest).

Figure 104. SIHP 50-80-12-XXXXX (T-03), Feature 27 pit (view to southeast).

Figure 105. SIHP 50-80-12-XXXXX (T-03), Feature 28 pit (view to southeast).

Figure 106. SIHP 50-80-12-XXXXX (T-03), Feature 29 pit (view to southwest).

Figure 107. SIHP 50-80-12-XXXXX (T-03), Feature 30 pit (view to north).

Figure 108. SIHP 50-80-12-XXXXX (T-03), Feature 31 pit (view to northeast).

Figure 109. SIHP 50-80-12-XXXXX (T-03), Feature 32 pit (view to northwest).

Figure 110. SIHP 50-80-12-XXXXX (T-03), Feature 33 pit (view to northeast).

Figure 111. SIHP 50-80-12-XXXXX (T-03), Feature 34 pit (view to east).

Figure 112. SIHP 50-80-12-XXXXX (T-03), Feature 35 pit (view to southeast).

Figure 113. SIHP 50-80-12-XXXXX (T-03), Feature 36 pit (view to northwest).

Figure 114. SIHP 50-80-12-XXXXX (T-03), Feature 37 pit (view to west).

Figure 115. SIHP 50-80-12-XXXXX (T-03), Feature 38 pit (view to west).

Figure 116. SIHP 50-80-12-XXXXX (T-03), Feature 39 pit (view to southwest).

Figure 117. SIHP 50-80-12-XXXXX (T-03), Feature 40 pit (view to northwest).

Figure 118. SIHP 50-80-12-XXXXX (T-03), Feature 41 pit (view to east).

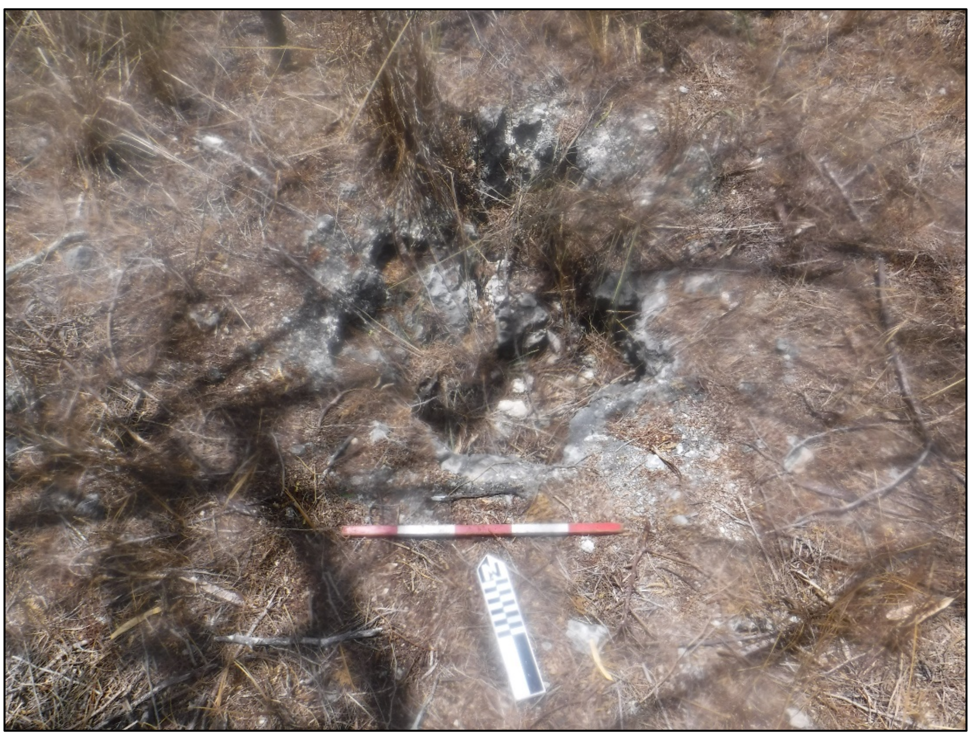

Figure 119. SIHP 50-80-12-XXXXX (T-03), Feature 42 pit (view to northeast).

Figure 120. SIHP 50-80-12-XXXXX (T-03), Feature 43 pit (view to northwest).

Figure 121. SIHP 50-80-12-XXXXX (T-03), Feature 44 pit (view to southeast).

Figure 122. SIHP 50-80-12-XXXXX (T-03), Feature 45 pit (view to northwest).

Figure 123. SIHP 50-80-12-XXXXX (T-03), Feature 46 pit (view to northwest).

Figure 124. SIHP 50-80-12-XXXXX (T-03), Feature 47 pit (view to east).

Figure 125. SIHP 50-80-12-XXXXX (T-03), Feature 48 pit (view to north).

Figure 126. SIHP 50-80-12-XXXXX (T-03), Feature 49 pit (view to southwest).

Figure 127. SIHP 50-80-12-XXXXX (T-03), Feature 50 pit (view to southeast).

Figure 128. SIHP 50-80-12-XXXXX (T-03), Feature 51 pit (view to northeast).

Figure 129. SIHP 50-80-12-XXXXX (T-03), Feature 52 pit (view to south).

Figure 130. SIHP 50-80-12-XXXXX (T-03), Feature 53 pit (view to north).

Figure 131. SIHP 50-80-12-XXXXX (T-03), Feature 54 pit (view to southwest).

Figure 132. SIHP 50-80-12-XXXXX (T-03), Feature 55 pit (view to southeast).

Figure 133. SIHP 50-80-12-XXXXX (T-03), Feature 56 pit (view to northwest).

Figure 134. SIHP 50-80-12-XXXXX (T-03), Feature 57 pit (view to north).

Figure 135. SIHP 50-80-12-XXXXX (T-03), Feature 58 pit (view to south).

Figure 136. SIHP 50-80-12-XXXXX (T-03), Feature 59 pit (view to north).

Figure 137. SIHP 50-80-12-XXXXX (T-03), Feature 60 pit (view to southwest).

Figure 138. SIHP 50-80-12-XXXXX (T-03), Feature 61 pit (view to northwest).

Figure 139. SIHP 50-80-12-XXXXX (T-03), Feature 62 pit (view to northwest).

Figure 140. SIHP 50-80-12-XXXXX (T-03), Feature 63 pit (view to southeast).

Figure 141. SIHP 50-80-12-XXXXX (T-03), Feature 64 pit (view to northwest).

Figure 142. SIHP 50-80-12-XXXXX (T-03), Feature 65 pit (view to southeast).

Figure 143. SIHP 50-80-12-XXXXX (T-03), Feature 66 pit (view to south).

Figure 144. SIHP 50-80-12-XXXXX (T-03), Feature 67 pit (view to northeast).

Figure 145. SIHP 50-80-12-XXXXX (T-03), Feature 68 pit (view to east).

Figure 146. SIHP 50-80-12-XXXXX (T-03), Feature 69 pit (view to southeast).

Figure 147. SIHP 50-80-12-XXXXX (T-03), Feature 70 pit (view to northeast).

Figure 148. SIHP 50-80-12-XXXXX (T-03), Feature 71 pit (view to south).

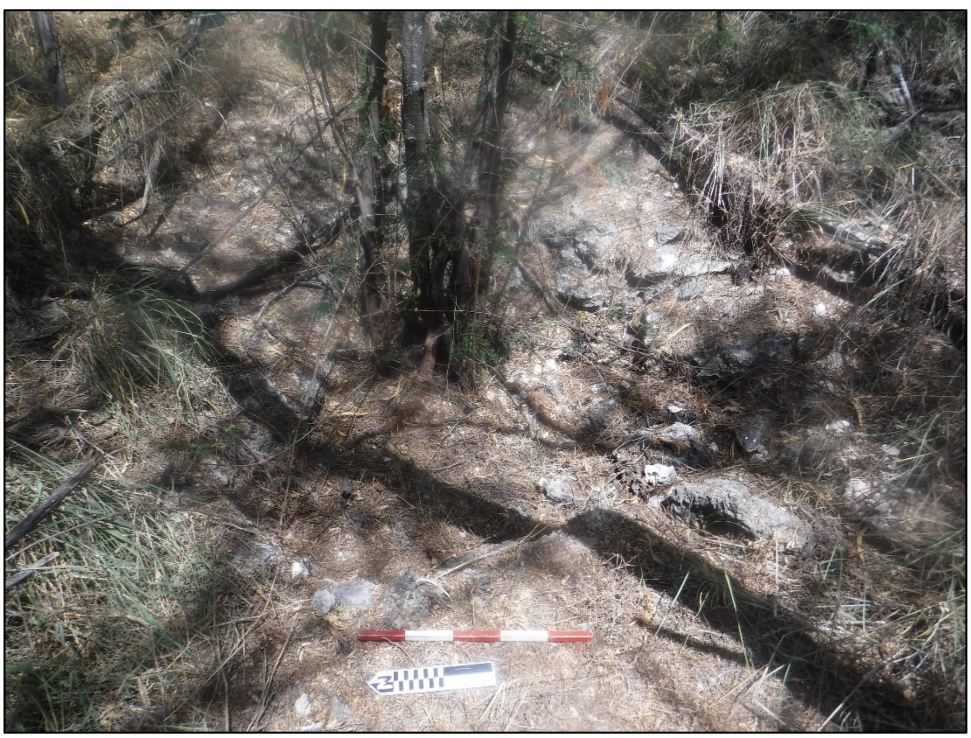

Figure 149. SIHP 50-80-12-XXXXX (T-03), Feature 72 pit (view to east).

Figure 150. SIHP 50-80-12-XXXXX (T-03), Feature 73 pit (view to northeast).

Figure 151. SIHP 50-80-12-XXXXX (T-03), Feature 74 pit (view to north).

Figure 152. SIHP 50-80-12-XXXXX (T-03), Feature 75 pit (view to northeast).

Figure 153. SIHP 50-80-12-XXXXX (T-03), Feature 76 pit (view to southeast).

Figure 154. SIHP 50-80-12-XXXXX (T-03), Feature 77 pit (view to southwest).

Figure 155. SIHP 50-80-12-XXXXX (T-03), Feature 78 pit (view to northeast).

Figure 156. SIHP 50-80-12-XXXXX (T-03), Feature 79 pit (view to southeast).

Figure 157. SIHP 50-80-12-XXXXX (T-03), Feature 80 pit (view to northeast).

Figure 158. SIHP 50-80-12-XXXXX (T-03), Feature 81 pit (view to north).

Figure 159. SIHP 50-80-12-XXXXX (T-03), Feature 82 pit (view to southwest).

Figure 160. SIHP 50-80-12-XXXXX (T-03), Feature 83 pit (view to northwest).

Figure 161. SIHP 50-80-12-XXXXX (T-03), Feature 84 pit (view to northeast).

Figure 162. SIHP 50-80-12-XXXXX (T-03), Feature 85 pit (view to south).

Figure 163. SIHP 50-80-12-XXXXX (T-03), Feature 87 pit (view to southwest).

Figure 164. SIHP 50-80-12-XXXXX (T-03), Feature 88 pit (view to west).

Figure 165. SIHP 50-80-12-XXXXX (T-03), Feature 89 pit (view to west).

Figure 166. SIHP 50-80-12-XXXXX (T-03), Feature 90 pit (view to north).

Figure 167. SIHP 50-80-12-XXXXX (T-03), Feature 91 pit (view to southeast).

Figure 168. SIHP 50-80-12-XXXXX (T-03), Feature 92 pit (view to southwest).

Figure 169. SIHP 50-80-12-XXXXX (T-03), Feature 93 pit (view to southwest).

Figure 170. SIHP 50-80-12-XXXXX (T-03), Feature 94 pit (view to northeast).

Figure 171. SIHP 50-80-12-XXXXX (T-03), Feature 95 pit (view to northeast).

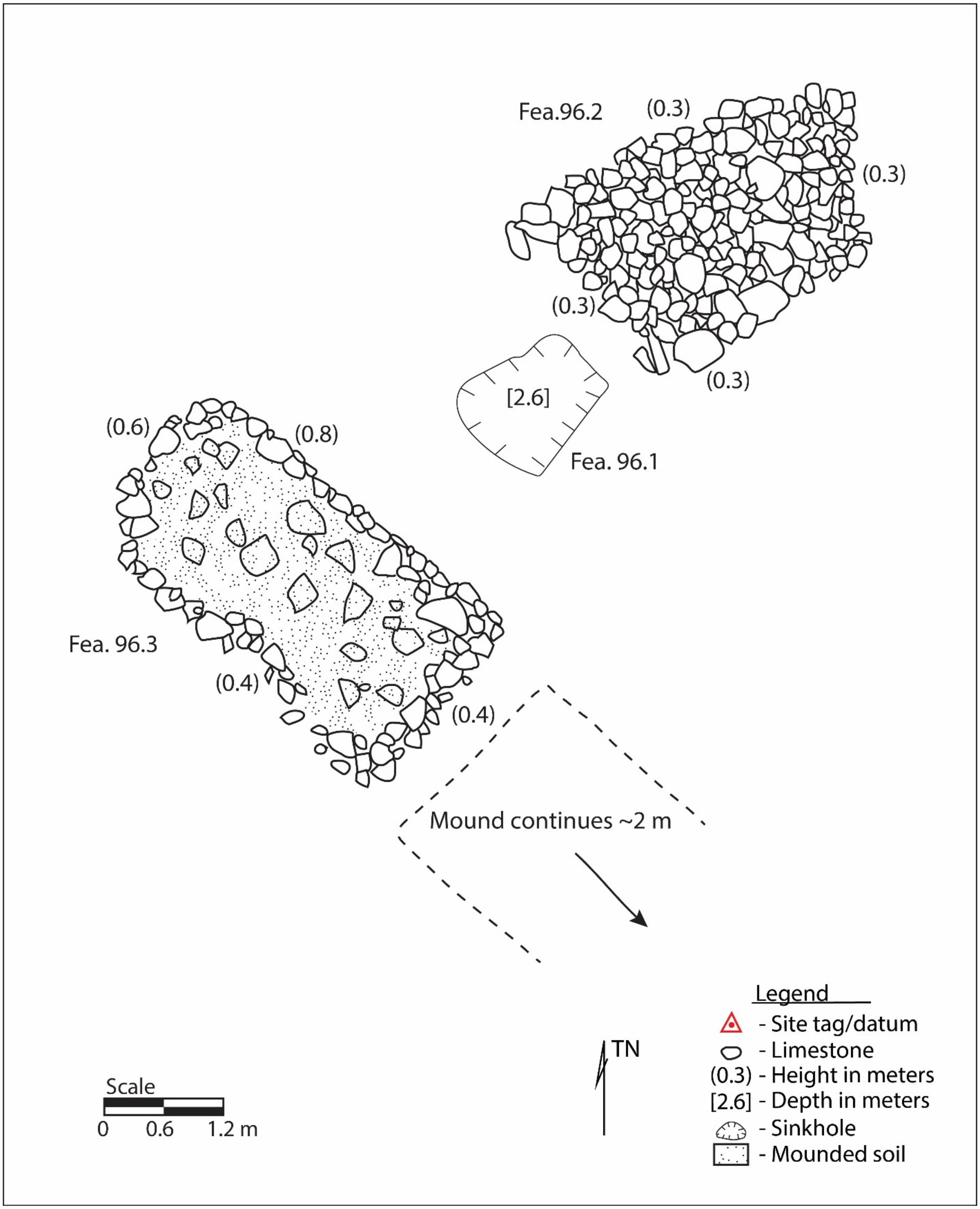

Figure 172. Plan-view map of SIHP 50-80-12-XXXXX (T-03), Features 96.1 through 96.3.

Figure 173. SIHP 50-80-12-XXXXX (T-03), Feature 96.1 pit (view to southeast).

Figure 174. SIHP 50-80-12-XXXXX (T-03), Feature 96.2 mound (view to west).

Figure 175. SIHP 50-80-12-XXXXX (T-03), Feature 96.3 mound (view to southwest).

Figure 176. SIHP 50-80-12-XXXXX (T-03), Feature 97 pit (view to southwest).

Figure 177. SIHP 50-80-12-XXXXX (T-03), Feature 98 pit (view to northeast).

Figure 178. SIHP 50-80-12-XXXXX (T-03), Feature 99 pit (view to southeast).

Figure 179. SIHP 50-80-12-XXXXX (T-03), Feature 100 pit (view to west).

Figure 180. SIHP 50-80-12-XXXXX (T-03), Feature 101 pit (view to southwest).

Figure 181. SIHP 50-80-12-XXXXX (T-03), Feature 102 pit (view to east).

Figure 182. SIHP 50-80-12-XXXXX (T-03), Feature 103 pit (view to west).

Figure 183. SIHP 50-80-12-XXXXX (T-03), Feature 104 pit (view to east).

Figure 184. SIHP 50-80-12-XXXXX (T-03), Feature 105 pit (view south).

Figure 185. SIHP 50-80-12-XXXXX (T-03), Feature 106 pit (view to east).

Figure 186. SIHP 50-80-12-XXXXX (T-03), Feature 107 pit (view to east).

Figure 187. SIHP 50-80-12-XXXXX (T-03), Feature 108 pit (view to east).

Figure 188. SIHP 50-80-12-XXXXX (T-03), Feature 109 pit (view to east).

Figure 189. SIHP 50-80-12-XXXXX (T-03), Feature 110 pit (view to southwest).

Figure 190. SIHP 50-80-12-XXXXX (T-03), Feature 111 pit (view northwest).

Figure 191. SIHP 50-80-12-XXXXX (T-03), Feature 112 pit (view to east).

Figure 192. SIHP 50-80-12-XXXXX (T-03), Feature 113.1 pit (view to north).

Figure 193. SIHP 50-80-12-XXXXX (T-03), Feature 113.2 pit (view to west).

Figure 194. SIHP 50-80-12-XXXXX (T-03), Feature 113.3 pit (view to west).

Figure 195. SIHP 50-80-12-XXXXX (T-03), Feature 114 pit (view to southeast).

Figure 196. SIHP 50-80-12-XXXXX (T-03), Feature 115 pit (view to north).

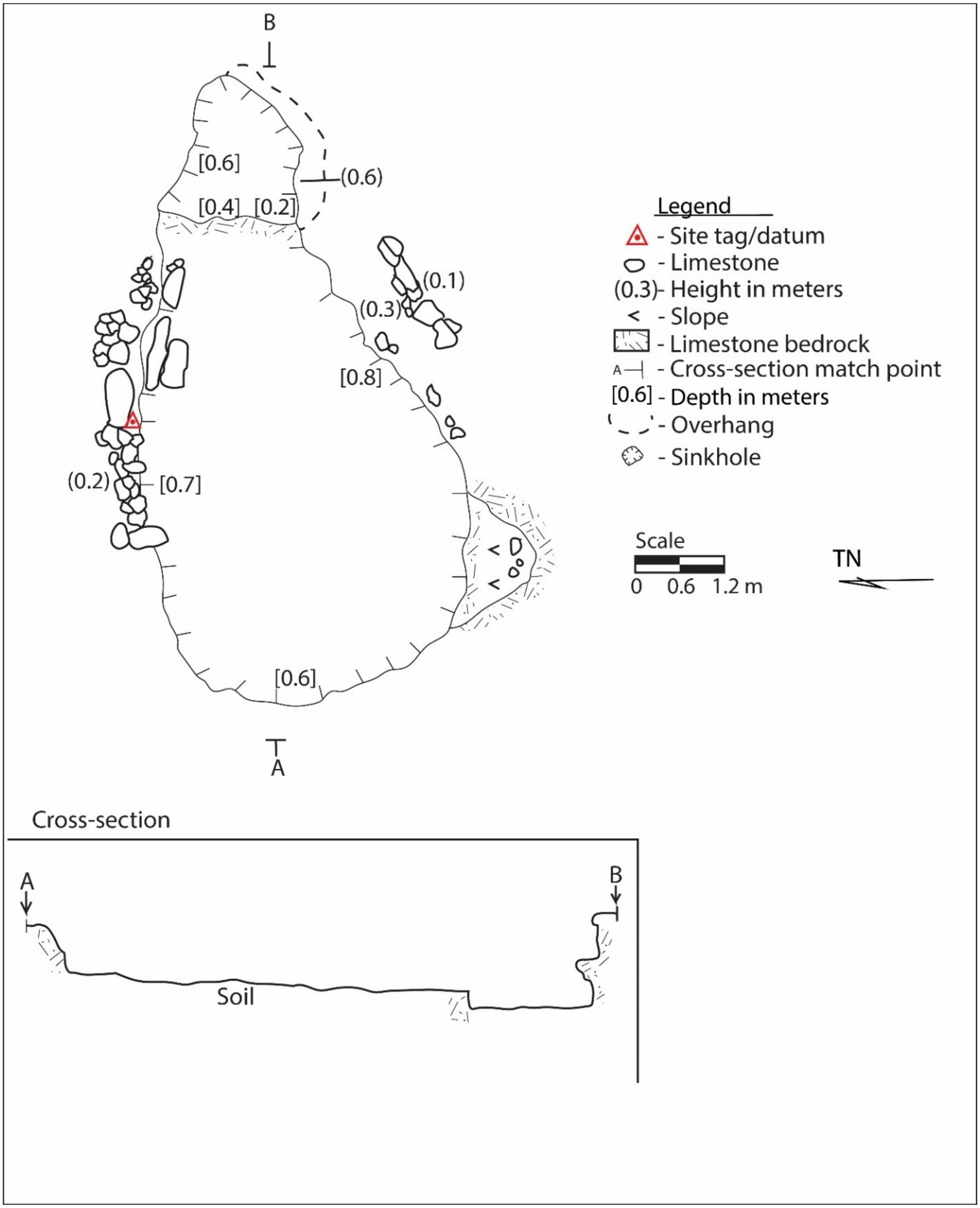

Figure 197. Plan-view map of SIHP 50-80-12-XXXXX (T-03), Feature 116 modified pit.

Figure 198. SIHP 50-80-12-XXXXX (T-03), Feature 116 modified pit (view to northeast).

Figure 199. SIHP 50-80-12-XXXXX (T-03), Feature 116 recessed eastern corner (view to east).

Figure 200. SIHP 50-80-12-XXXXX (T-03), Feature 117 pit (view to northeast).

Figure 201. SIHP 50-80-12-XXXXX (T-03), Feature 118 pit (view to north).

Figure 202. SIHP 50-80-12-XXXXX (T-03), Feature 119 pit (view to northeast).

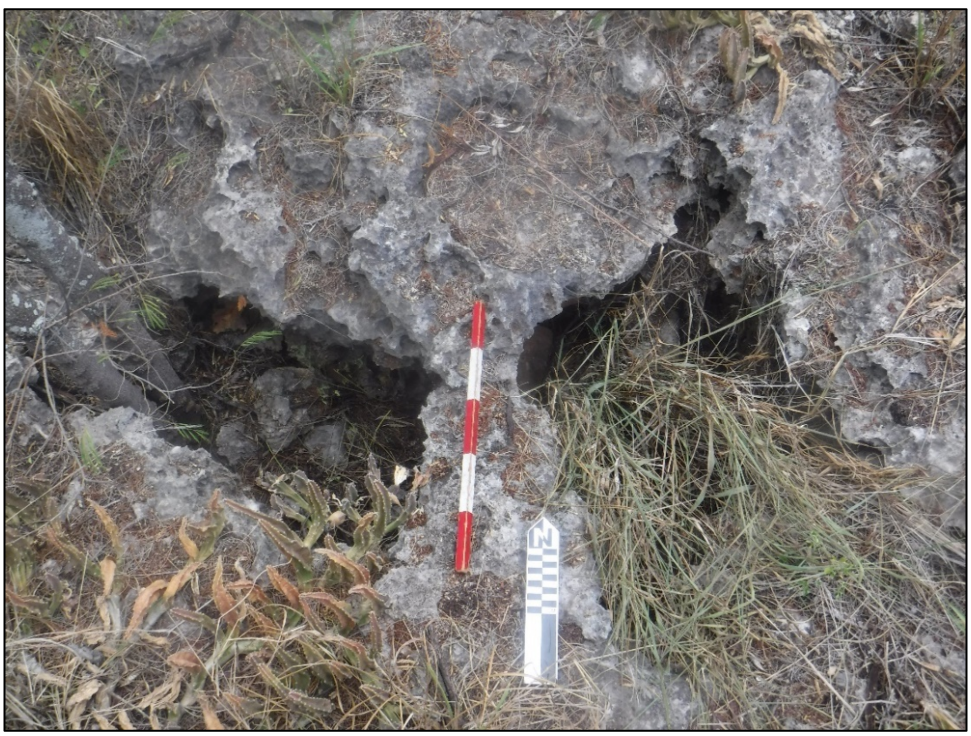

Figure 203. SIHP 50-80-12-XXXXX (T-03), Feature 120 pit (view to north).

Figure 204. SIHP 50-80-12-XXXXX (T-03), Feature 121 pit (view to west).

Figure 205. SIHP 50-80-12-XXXXX (T-03), Feature 122 pit (view to southwest).

Figure 206. SIHP 50-80-12-XXXXX (T-03), Feature 123 pit (view to west).

Figure 207. SIHP 50-80-12-XXXXX (T-03), Feature 124 pit (view to east).

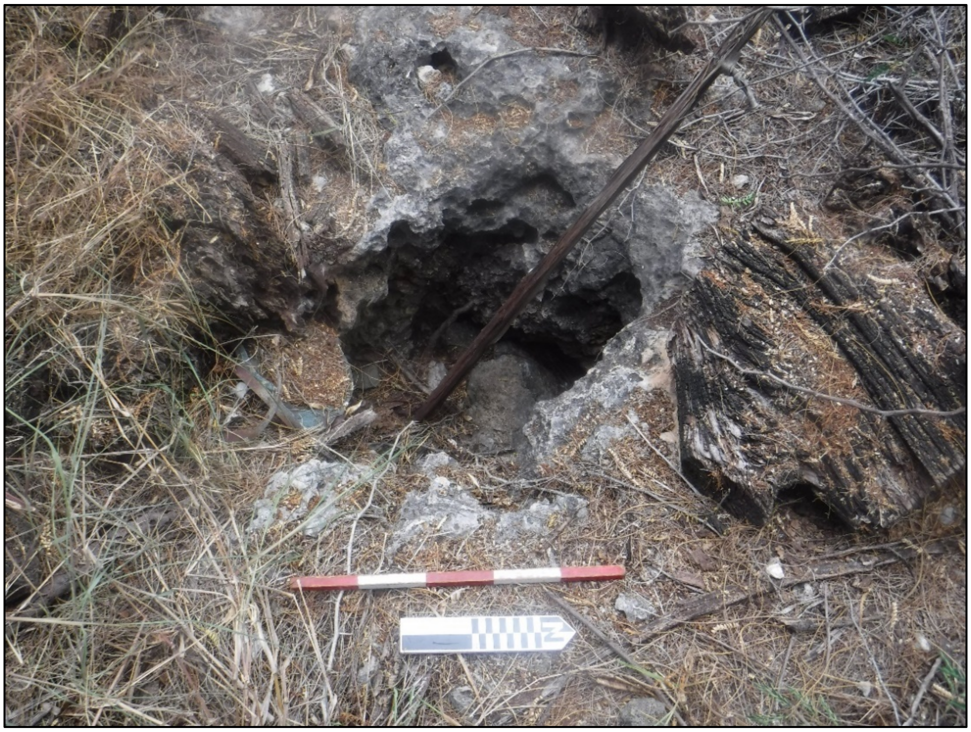

Figure 208. SIHP 50-80-12-XXXXX (T-03), Feature 125 pit (view to west).

Figure 209. SIHP 50-80-12-XXXXX (T-03), Feature 126 pit (view to north).

Figure 210. SIHP 50-80-12-XXXXX (T-03), Feature 127 pit (view to south).

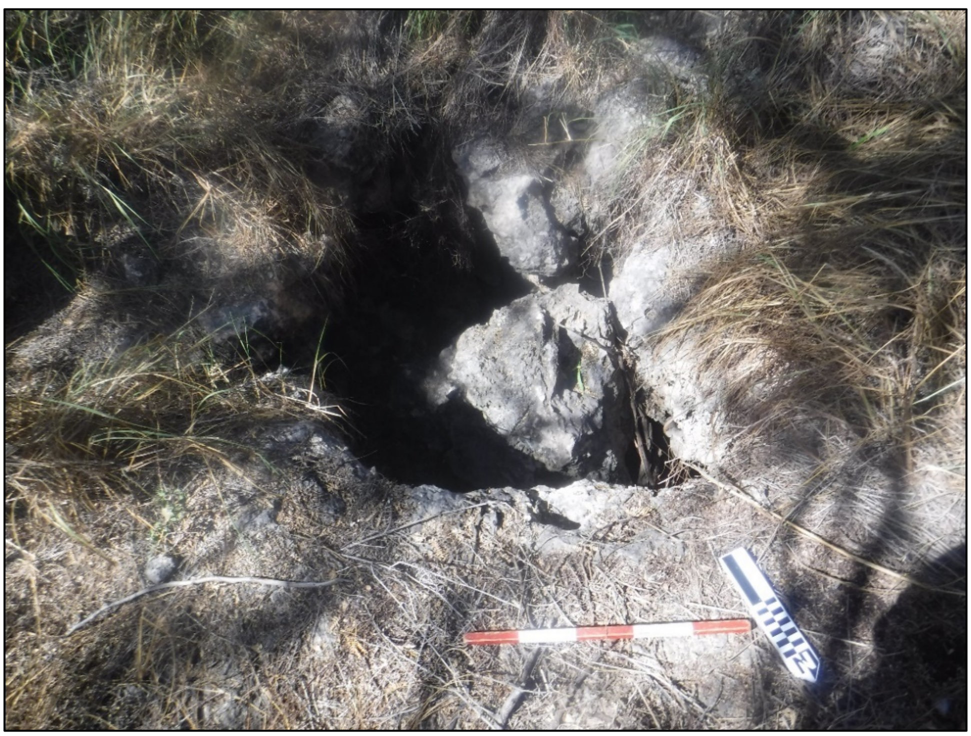

Figure 211. SIHP 50-80-12-XXXXX (T-03), Feature 128 pit (view to southwest).

Figure 212. SIHP 50-80-12-XXXXX (T-03), Feature 129 pit (view to northwest).

Figure 213. SIHP 50-80-12-XXXXX (T-03), Feature 130 pit (view to north).

Figure 214. SIHP 50-80-12-XXXXX (T-03), Feature 131 pit (view to north).

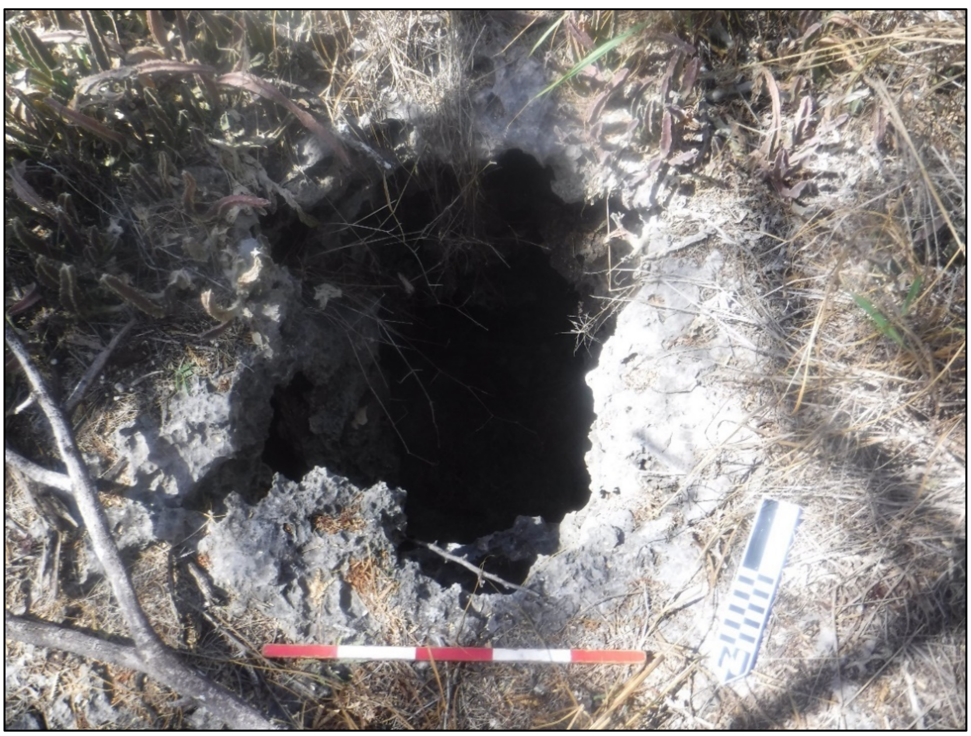

Figure 215. SIHP 50-80-12-XXXXX (T-03), Feature 132 pit (view to south).

Figure 216. SIHP 50-80-12-XXXXX (T-03), Feature 133 pit (view to northeast).

Figure 217. SIHP 50-80-12-XXXXX (T-03), Feature 134 pit (view to east).

Figure 218. SIHP 50-80-12-XXXXX (T-03), Feature 135 pit (view to northwest).

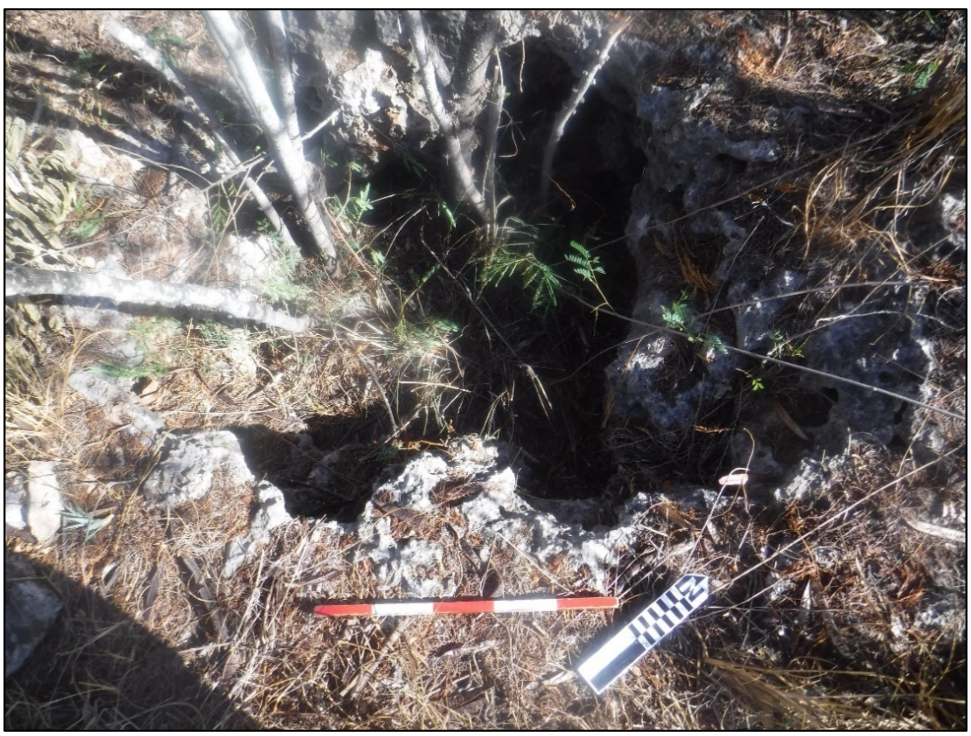

Figure 219. SIHP 50-80-12-XXXXX (T-03), Feature 136 pit (view to northwest).

Figure 220. SIHP 50-80-12-XXXXX (T-03), Feature 137 pit (view to north).

Figure 221. SIHP 50-80-12-XXXXX (T-03), Feature 138 pit (view to southeast).

Figure 222. SIHP 50-80-12-XXXXX (T-03), Feature 139 pit (view to south).

Figure 223. SIHP 50-80-12-XXXXX (T-03), Feature 140 pit (view to southeast).

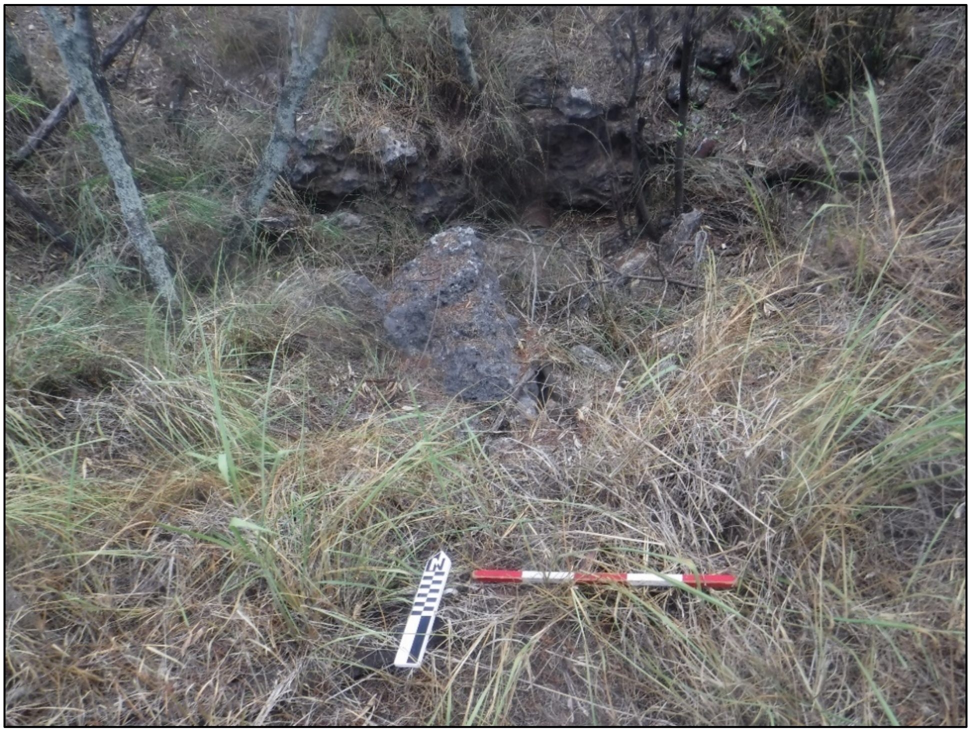

Figure 224. SIHP 50-80-12-XXXXX (T-03), Feature 141 pit (view to north).

Figure 225. SIHP 50-80-12-XXXXX (T-03), Feature 142 pit (view to north).

Figure 226. SIHP 50-80-12-XXXXX (T-03), Feature 143 pit (view to southwest).

Figure 227. SIHP 50-80-12-XXXXX (T-03), Feature 144 pit (view to south).

Figure 228. SIHP 50-80-12-XXXXX (T-03), Feature 145 pit (view to northeast).

Figure 229. SIHP 50-80-12-XXXXX (T-03), Feature 146 pit (view to north).

Figure 230. SIHP 50-80-12-XXXXX (T-03), Feature 147 pit (view to southeast).

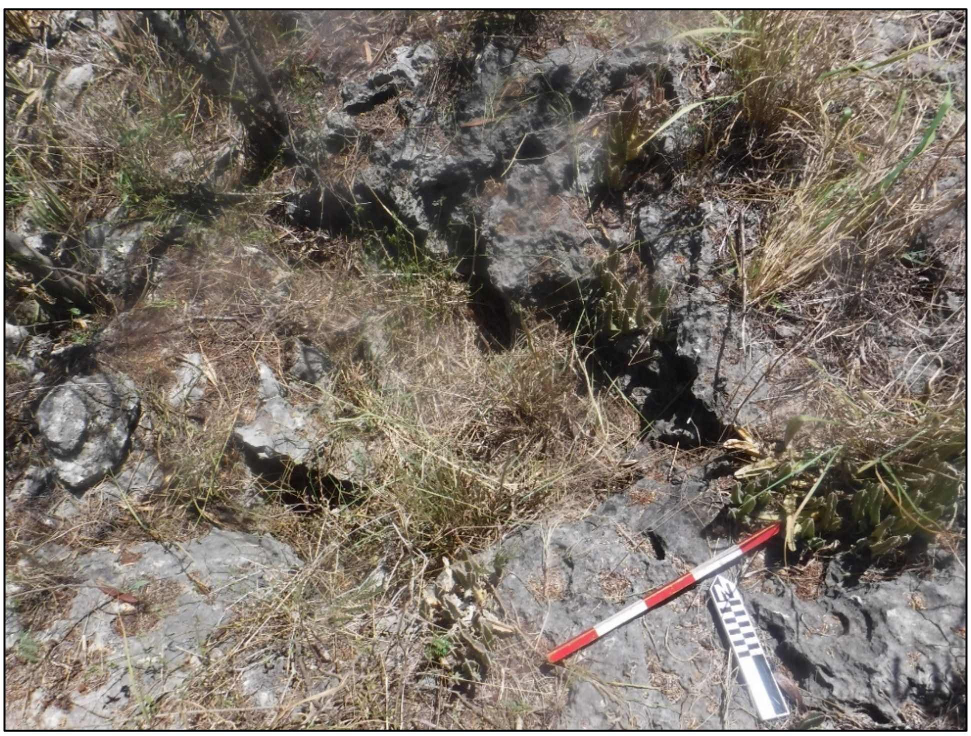

Figure 231. SIHP 50-80-12-XXXXX (T-03), Feature 148 pit (view to northeast).

Figure 232. SIHP 50-80-12-XXXXX (T-03), Feature 149 pit (view to southeast).

Figure 233. SIHP 50-80-12-XXXXX (T-03), Feature 150 pit (view to south).

Figure 234. SIHP 50-80-12-XXXXX (T-03), Feature 151 pit (view to south).

Figure 235. SIHP 50-80-12-XXXXX (T-03), Feature 152 pit (view to north).

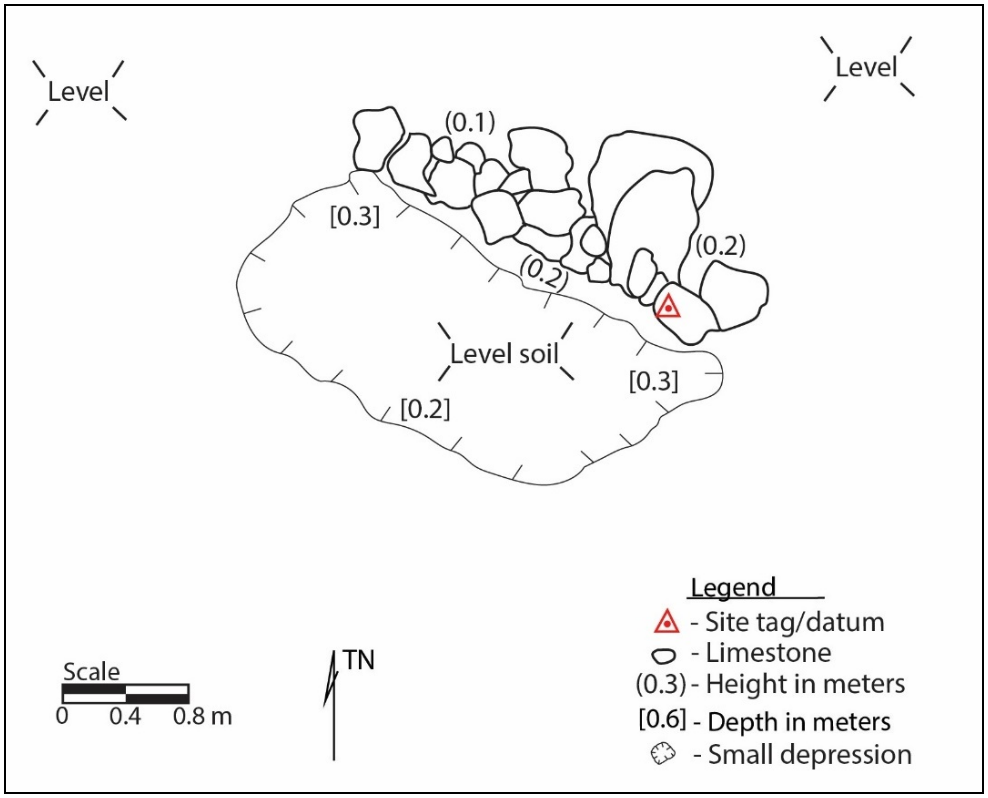

Figure 236. Plan-view map of SIHP 50-80-12-XXXXX (T-03), Feature 153 pit.

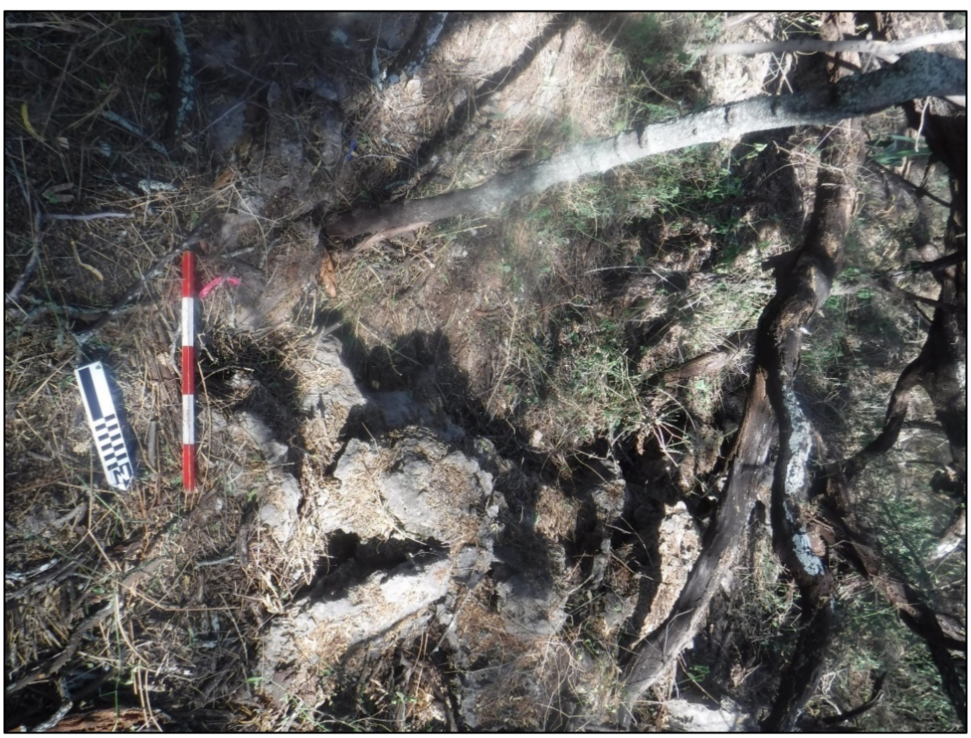

Figure 237. SIHP 50-80-12-XXXXX (T-03), Feature 153 pit (view to south).

Figure 238. SIHP 50-80-12-XXXXX (T-03), Feature 154 pit (view to southwest).

Figure 239. SIHP 50-80-12-XXXXX (T-03), Feature 155 pit (view to northeast).

Figure 240. SIHP 50-80-12-XXXXX (T-03), Feature 156 pit (view to west-northwest).

Figure 241. SIHP 50-80-12-XXXXX (T-03), Feature 157 pit (view to east).

Figure 242. SIHP 50-80-12-XXXXX (T-03), Feature 158 pit (view to north).

Figure 243. SIHP 50-80-12-XXXXX (T-03), Feature 159 pit (view to north).

SIHP No.: 50-80-12-XXXXX
TEMPORARY NO.: T-07
Site Type: L-shaped Wall
No. of Features: 1
Dimensions: 4 m L × 4 m W × 0.5 m H
Condition: Fair to good
Possible Age: Pre-Contact/Early Post-Contact
Possible Function: Permanent Habitation
Significance: d
Recommended Treatment: Preservation
Previous Investigation: Not previously recorded

SIHP 50-80-12-XXXXX (T-07) consists of an L-shaped stone wall located in the center of Parcel 38, about 40 m south of Hamilton Street. The site is within the SIHP 50-80-12-XXXXX (Site T-02) revetments area and is 12 to 14 m north of two revetments (Site T-02, Features 2 and 3). The site is also within SIHP 50-80-12-XXXXX (T-03), a complex of limestone pits including Feature 77 pit, 2.5 m southeast of T-07 (Figure 244). This feature is worth noting here because the interior is spacious enough to have been used as a habitation or storage feature, but it lacks archaeological evidence confirming a traditional Hawaiian function. The T-03, Feature 77 pit is described with a plan map in the Site T-03 description.

The Site T-07 L-shaped wall (Figure 245 through Figure 247) is open on the southeast side. The N/S and E/W axes of the L-shape are 4 m long, 0.5 to 0.9 m wide, and have a maximum height of 0.5 m. The wall is stacked with limestone cobbles and small boulder slabs and faced along the interior wall from 5 to 7 courses. The site has been disturbed by fallen and uprooted *kiawe* (*Prosopis juliflora*) and was also possibly disturbed by construction of the military facility. It is plausible that the site walls extended beyond its current configuration to include the adjacent SIHP 50-80-12-XXXXX (T-03) Feature 37 limestone pit.

SIHP 50-80-12-XXXXX (T-07) likely functioned as a permanent habitation feature used during the pre-Contact or early post-Contact era. This interpretation is based on the stability and formality of the stacked wall and internal space enclosing roughly 20 square meters.

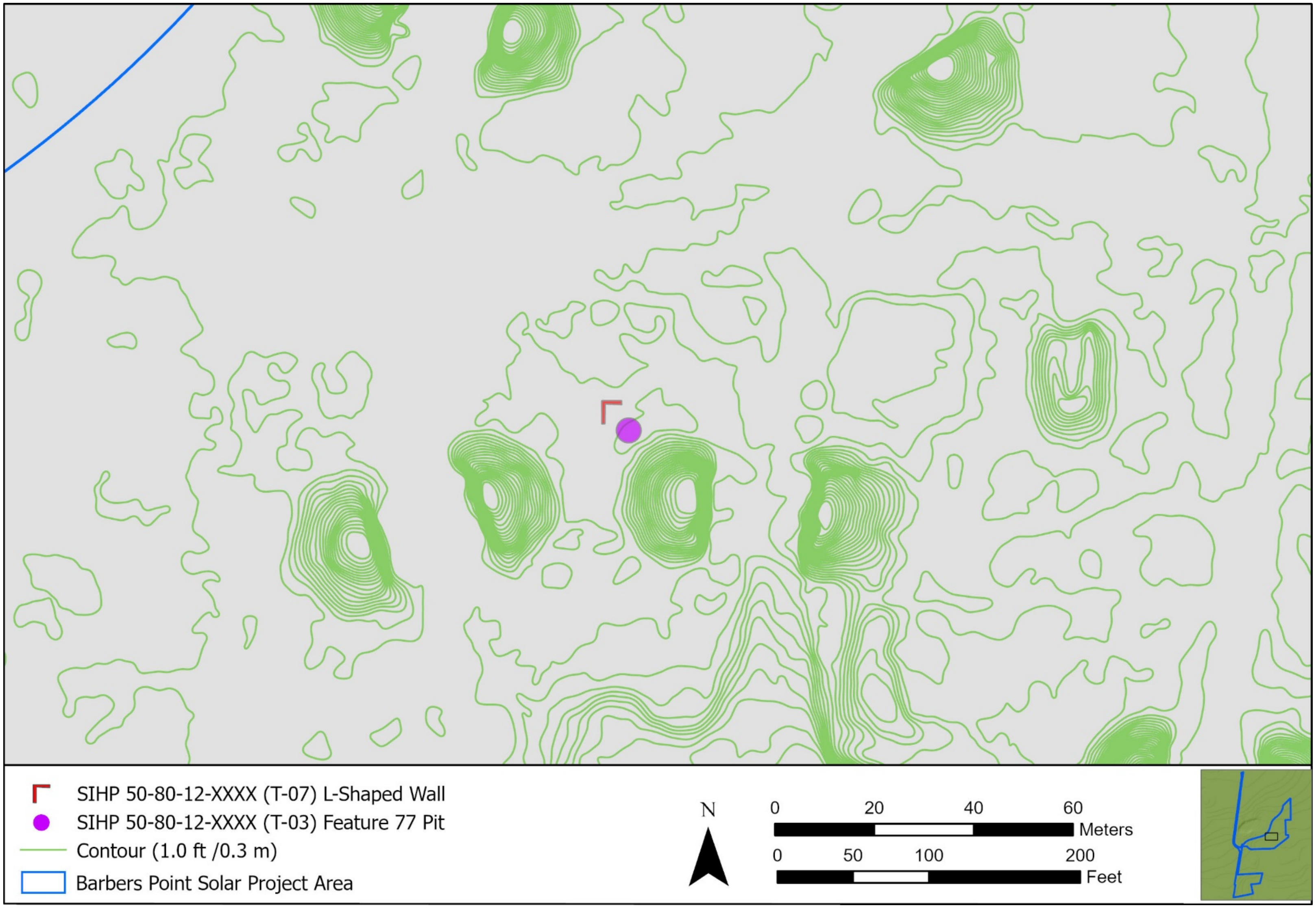

Figure 244. SIHP 50-80-12-XXXXX (T-07) L-shaped wall and 50-80-12-XXXXX (T-03), Feature 77 limestone pit overlaid on contours created from aerial LiDAR data, 2019.

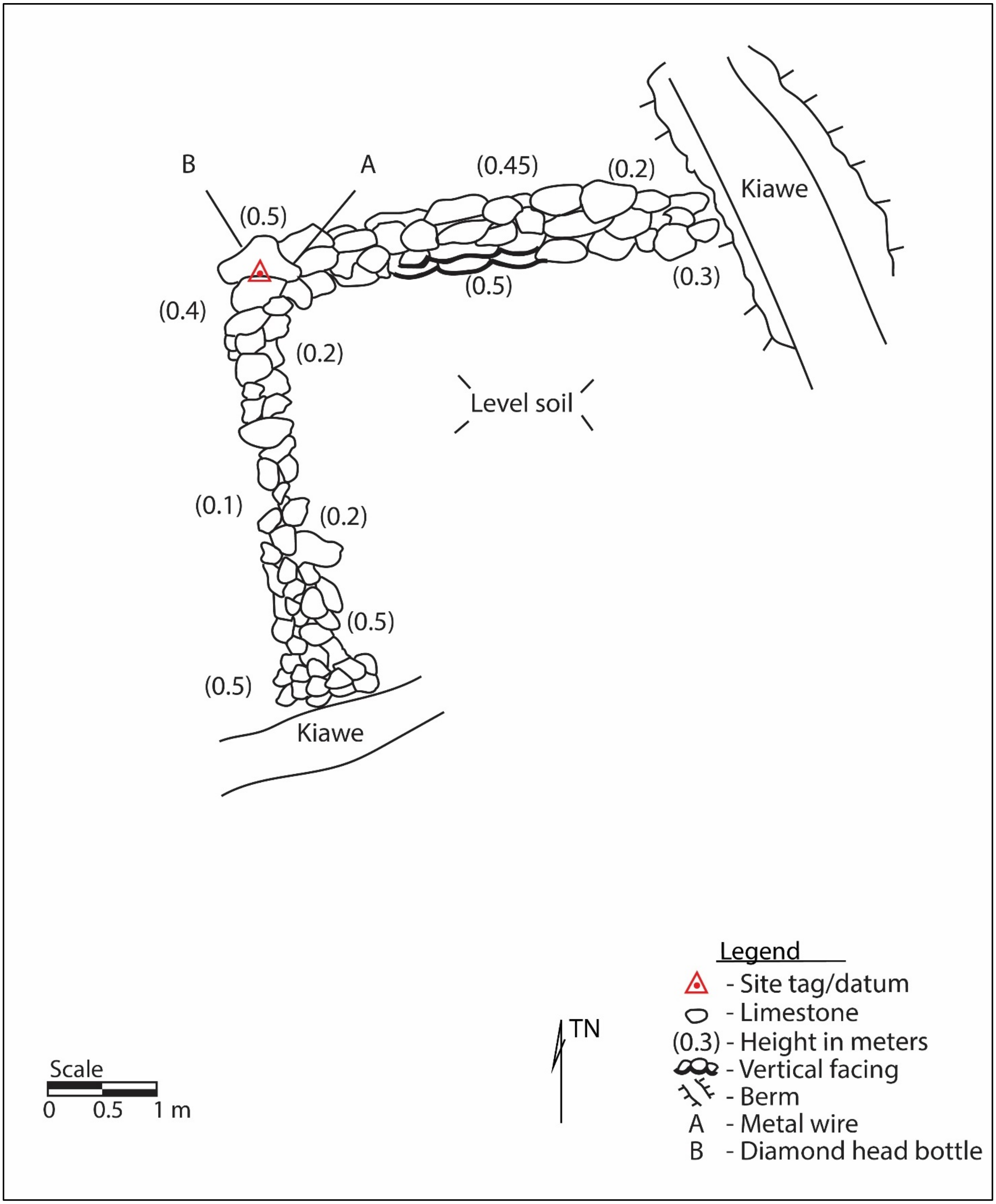

Figure 245. Plan-view map of SIHP 50-80-12-XXXXX (T-07) L-shaped wall.

Figure 246. SIHP 50-80-12-XXXXX (T-07) L-shaped wall (view to north).

Figure 247. SIHP 50-80-12-XXXXX (T-07) vertical facing on L-shaped wall (view to west).

SIHP No.: 50-80-12-XXXXX
TEMPORARY NO.: T-08
Site Type: WWII runway infrastructure
No. of Features: 4
Dimensions: 1,200 m (NE/SW) × 300 m (NW/SE)
Condition: Fair
Possible Age: 1942 through 1945; WWII era
Possible Function: MCAS Ewa infrastructure
Significance: a, d
Recommended Treatment: No Further Work
Previous Investigation: Architectural History Report (Yoklavich 1997), National Register Nomination Forms and field investigation for Ewa Mooring Mast Field (Truluck 2014), and Ewa Plain Battlefield District (Frye and Resnick 2013)

SIHP 50-80-12-XXXXX (T-08; Figure 248) consists of four features (Features 1 through 4) associated with the former MCAS Ewa airfield. The features include east–west trending parking aprons (Feature 1) constructed between 1942 and 1945 (Features 1.1 and1.2, respectively), two plane tie-down plates (Feature 2.1 and 2.2), a rectangular concrete basin (Feature 3), and an excavated ditch (Feature 4). The site is located between Roosevelt Avenue on the northeast and El Rod Road on the south side. The site features are in fair to good condition and portions of the runway and aprons have been impacted by decades of vegetation growth that have broken through the asphalt surfaces.

The Site T-08 features are south of the former MCAS Ewa airfield that was determined eligible by the U.S. Navy to be listed as a site (SIHP 50-80-12-05127) on the National Register of Historic Places (NRHP) for its direct association with the December 7, 1941 Japanese attack on Oʻahu (Truluck 2014). In 2016, the site was listed on the NRHP as a district and named the Ewa Plain Battlefield Historic District (Frye and Resnick 2013). The district was then designated SIHP 50-80-12-8025 in the Hawaiʻi Register of Historic Places. These four Site T-08 features are outside the boundary of the historic district and were not included as contributing elements of the district.

Feature 1 refers to two parking aprons of the MCAS Ewa airfield built between 1942 (northern apron) and 1944 (southern apron; see Figure 248. These construction dates are suggested based on a chronology of historic aerial photographs (NRHP nomination form, Truluck 2014:Map 7). However, the Kalaeloa Renewable Energy Park Environmental Assessment (Commander, Navy Region Hawaii 2012) suggests the more northern runway, referred to as Runway 8, was built in 1944. Figure 249 and Figure 250 provide current photographs of the asphalt surface of the more northern 1942 apron visible within the project area. The feature is in fair to poor condition.

Feature 2 consists of two ringed metal plates once serving as plane tie-downs on the Feature 1's southern 1944 apron. The tie-downs are spaced 10 m apart and are set in a 0.5 m square concrete slab placed flush with the apron surface (see Figure 251 and Figure 252). The feature components are in good condition.

Figure 248. Plan-view map of Site T-08 WWII runway infrastructure overlaid on MCAS Ewa map (U.S. Navy 1948).

Figure 249. Site 50-80-12-XXXXX (T-08), Feature 1, showing portion of 1942 apron in project area (view to northwest).

Figure 250. Site 50-80-12-XXXXX (T-08), Feature 1, showing portion of 1942 apron on eastern boundary of project area with the Kalaeloa Renewable Energy Park (KREP) facility in background (view to east).

Feature 3 is a concrete rectangular basin constructed below the ground surface on the south side of the Feature 1's northern 1942 parking apron (Figure 253 and Figure 254). The box measures 1.5 m square and is 0.4 m deep. It contains a concrete and cement brick and mortar interior wall with a two-tiered concrete edge along its surface. Feature 3 is a possible utility box likely associated with surrounding MCAS Ewa airfield. The feature is in good condition.

Feature 4 consists of a linear ditch bound on the northeast and southwest sides by two parallel limestone rubble and soil berms. The ditch feature was constructed in a graded surface and aligned southwest, from the edge of the Feature 1's northern 1942 apron to the project boundary marked by the adjacent Kalaeloa Renewable Energy Park facility fence. The ditch measures 36 m long (NW/SE) × 0.8 m wide and is 0.4 m deep. The berms bounding the ditch range between 0.5 and 1 m wide and rise a maximum 0.2 m high. The ditch is in fair to good condition and possibly functioned to channel water from the adjacent airfield surface.

Figure 251. Site 50-80-12-XXXXX (T-08), northwestern Feature 2 plane tie-downs (view to southwest).

Figure 252. Site 50-80-12-XXXXX (T-08), southeastern Feature 2 plane tie-downs (view to southwest).

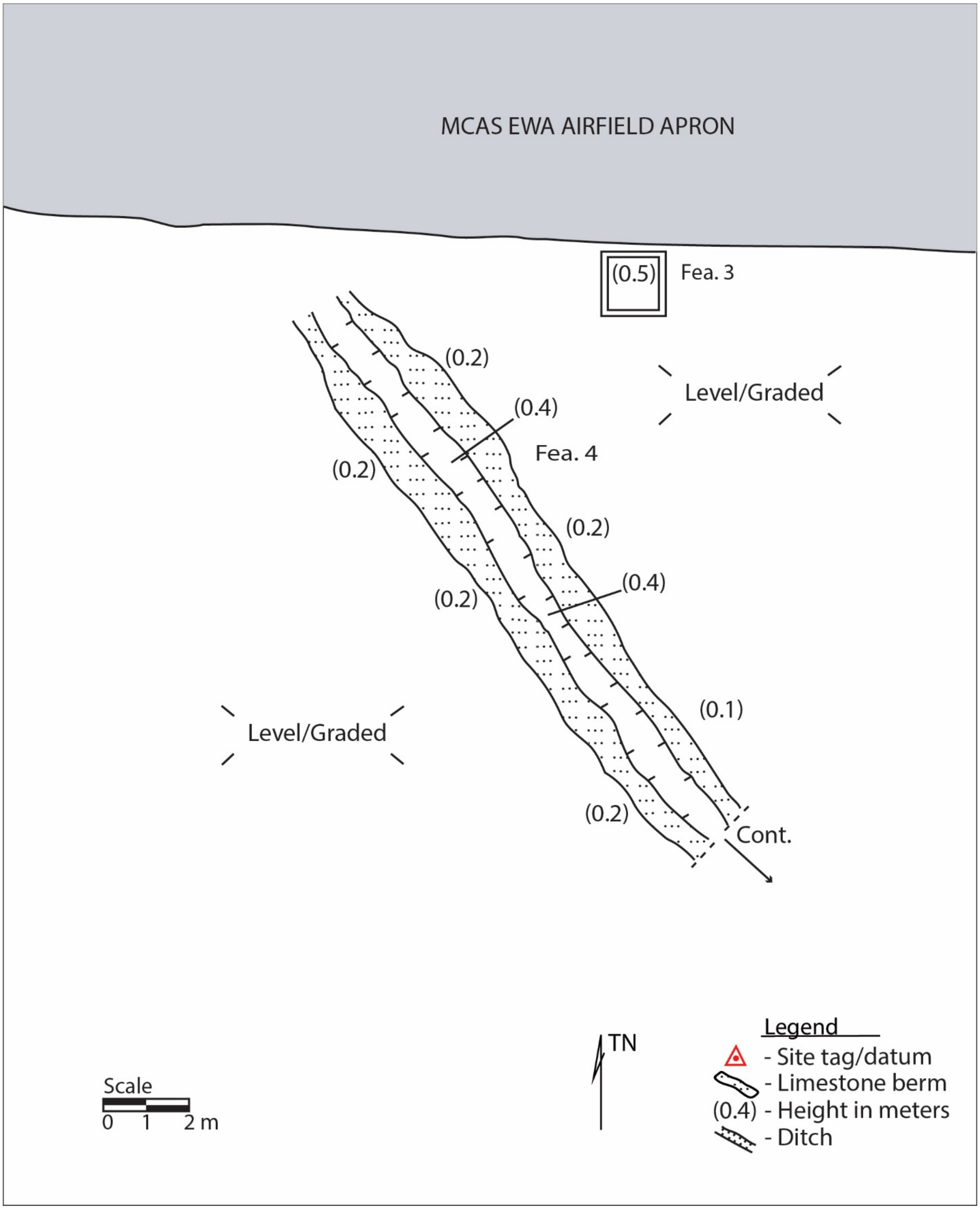

Figure 253. Plan-view map of SIHP 50-80-12-XXXXX (T-08), Feature 3 concrete box and Feature 4 ditch.

Figure 254. SIHP 50-80-12-XXXXX (T-08), Feature 3 concrete box (view to north).

Figure 255. SIHP 50-80-12-XXXXX (T-08), Feature 4 ditch (view to southeast).

SIHP No.: 50-80-12-XXXXX
TEMPORARY NO.: T-09
Site Type: Complex of concrete structures and associated poles and wiring
No. of Features: 5
Dimensions: 216 m (N/S) × 5 m (E/W)
Condition: Good
Possible Age: WWII (1942)
Possible Function: U.S. military building foundation (1) and above-ground covers (4), one of which has above-ground wiring and poles.
Significance: a, c, d
Recommended Treatment: Preservation/No Further Work
Previous Investigation: Mason Architects (2018)

SIHP 50-80-12-XXXXX (T-09) consists of six concrete structures (Features 1 through 5) located on the west side of Coral Sea Road. This includes four above-ground concrete structures, one of which has wooden poles and electrical wiring near it, as well as a concrete foundation, Feature 1. Based on their location and shape, Features 2 and 4 are covers that likely provide entry to below-grade octagonal concrete chambers. These chambers appear to have been documented by Mason Architects in 2018 but were not assigned SIHP numbers. They were built in 1942. Mason Architects assessed them as significant and determined that they were eligible for listing on the NHRP under criterion A and C for providing protected routes for communication lines during WWII (Mason Architects 2018:A-4). They were assessed as having good integrity overall, with "somewhat diminished integrity of setting and materials due to deterioration and loss" (Mason Architects 2018:A-4). Features 3 and 5 are above-ground covers that likely provide access to subsurface utilities.

Feature 1 (Figure 256 and Figure 257) is a partly buried concrete slab with only its western edge visible. The slab is 3.2 m (N/S) × 1.8 m (E/W) by 0.4 m high on the west side. A small hole is at the center of the slab. A black mesh is piled on the north corner. The surface feature is in good condition.

Feature 2 is located 5.9 m east of Feature 1. The concrete structure is octagonal and a portion of it is no longer present. It measures 1.07 m in diameter and contains a metal cover with a diameter of 85 cm that is 10 cm below the concrete rim. The metal cover is painted yellow and has two threaded handles that are welded onto it. Two holes are also visible on the eastern portion of the cover near one of the threaded handles. Based on its location and previous information provided by Mason Architects (2018), Feature 2 provides access to a below-grade octagonal concrete chamber, which was not assessed during the current investigation. The surface feature is in good condition.

Feature 3 is a round concrete structure located 6.5 m west of Coral Sea Road. The structure is 80 cm in diameter and contains a concrete cover that measures 50 cm in diameter and is set into the concrete rim. The cover has a metal handle and is made of concrete that incorporates subangular basalt pebbles. Feature 3 is located approximately 4 m southwest of Feature 4 and likely provides access to an underground utility, which was not assessed during the current investigation. The surface feature is in good condition.

Feature 4 is an octagonal concrete structure that measures 1.01 m in diameter and is 12 cm high. It has a concrete lid that is painted yellow with the number "95" painted in its center with white spray paint. The concrete is made with subangular basalt pebbles and is 2.6 m west of the asphalt edge of Coral Sea Road. Two metal handles are inset in the concrete lid and the inset measures 18 cm long by 5 cm wide by 2 cm deep. The handles are intact and functional. Two wooden poles with crossbeams, wiring, and three steel poles are adjacent to the concrete structure. The central steel pole has a diameter of 6 cm and bears a manufacturer's mark of

"Jones & Laughlin 4" on it. It has a curved shape approximately half-way up the pole. The steel poles on either side of it are straight and have a diameter of 5.5 cm. They have no visible markings on them. The two wooden poles are graduated with a maximum diameter of 28 cm at the base. They measure approximately 7 m high. They are braced with square bolts and washers with two 4" by 4" cross-beams connecting them, and bolts are present where a third cross beam is no longer present. Cabling extends from the top of the poles north along Coral Sea Road for 123 m before terminating at a single graduated wooden pole. Based on its location and previous information provided by Mason Architects (2018), Feature 4 includes access to a below-grade octagonal concrete chamber and supporting above-ground communications wiring. The below-grade chamber was not assessed during the current investigation. The surface feature is in good condition.

Feature 5 is a concrete structure that measures 1.6 m in diameter and 0.3 m high. An interior concrete lid is 84 cm in diameter and has inset areas where handles were once located in the concrete surface. The structure and cover are made of concrete with subangular basalt pebbles and rebar, which is visible in the cover. The structure is 4.1 m west of the asphalt edge of Coral Sea Road. Feature 5 likely provides access to underground utilities, which were not assessed during the current investigation. The surface feature is in good condition.

Feature 6 is a concrete structure located 7.0 m east of Coral Sea Road. The structure consists of a concrete slab with a 0.2 m-high and 0.15 m wide curbing on the feature's south, east, and north side. Overall, the structure is 4.9 m (N/S) by 3.8 m (E/W). A dirt road is aligned E/W on the south side of the feature. The feature lies southwest of a fenced-in structure that was interpreted by Mason Architects (2018) as a vehicle ramp. Although no mention of Feature 6 is made in Mason Architect's 2018 report, it is likely associated and might have functioned as a structure foundation.

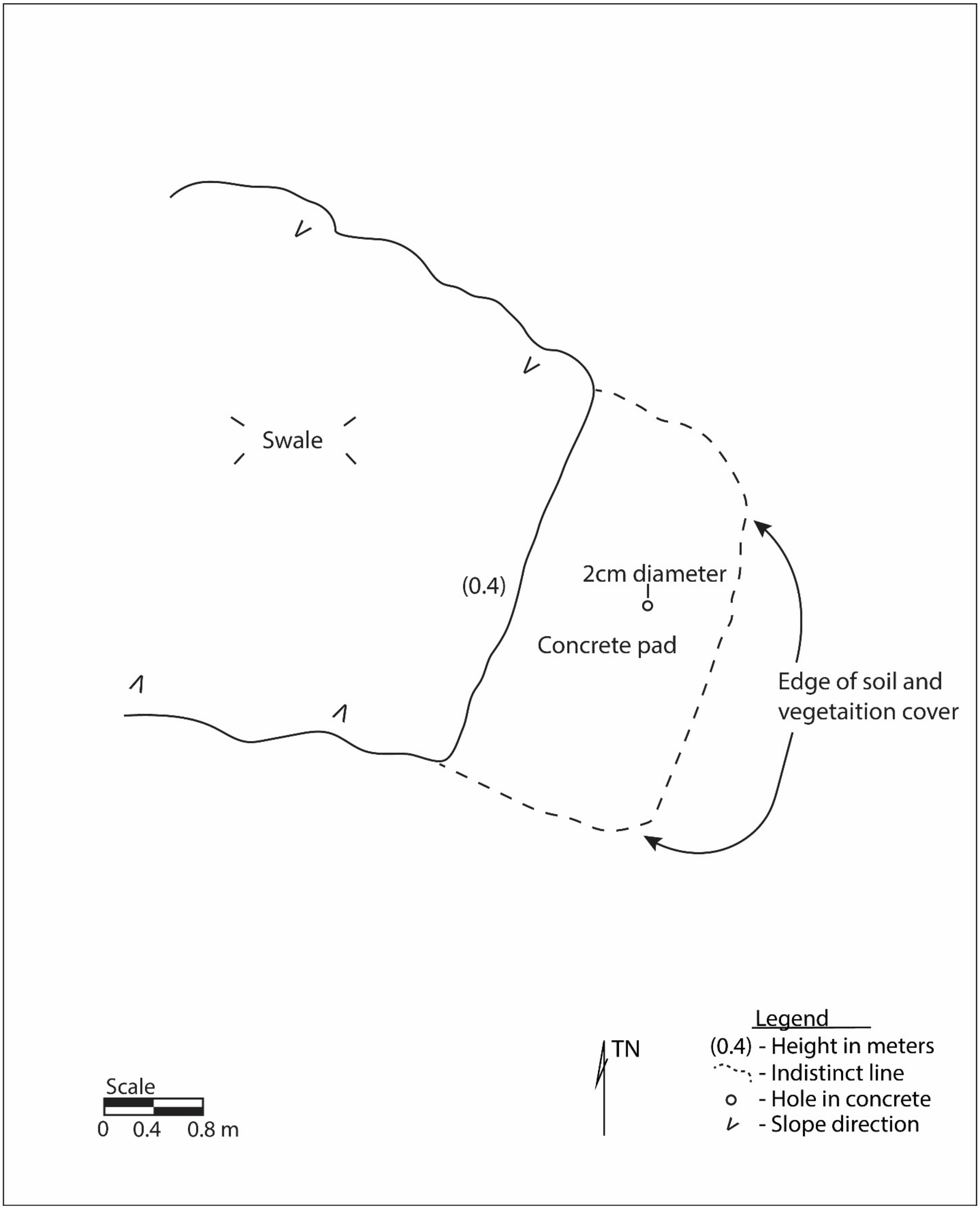

Figure 256. Plan-view map of SIHP 50-80-12-XXXXX (T-09) Feature 1, concrete structure.

Figure 257. SIHP 50-80-12-XXXXX (T-09) Feature 1 concrete slab (view to east).

Figure 258. SIHP 50-80-12-XXXXX (T-09) Feature 2 concrete structure (view to west).

Figure 259. SIHP 50-80-12-XXXXX (T-09) Feature 3 concrete structure (view to southwest).

Figure 260. SIHP 50-80-12-XXXXX (T-09) Feature 4 concrete structure with pipes and poles (view to east).

Figure 261. SIHP 50-80-12-XXXXX (T-09) Feature 4 concrete structure with adjacent wooden poles and wiring (view to southeast).

Figure 262. SIHP 50-80-12-XXXXX (T-09) Feature 5 concrete structure (view to west).

Figure 263. SIHP 50-80-12-XXXXX (T-09) Feature 6 concrete building foundation (view to northeast).

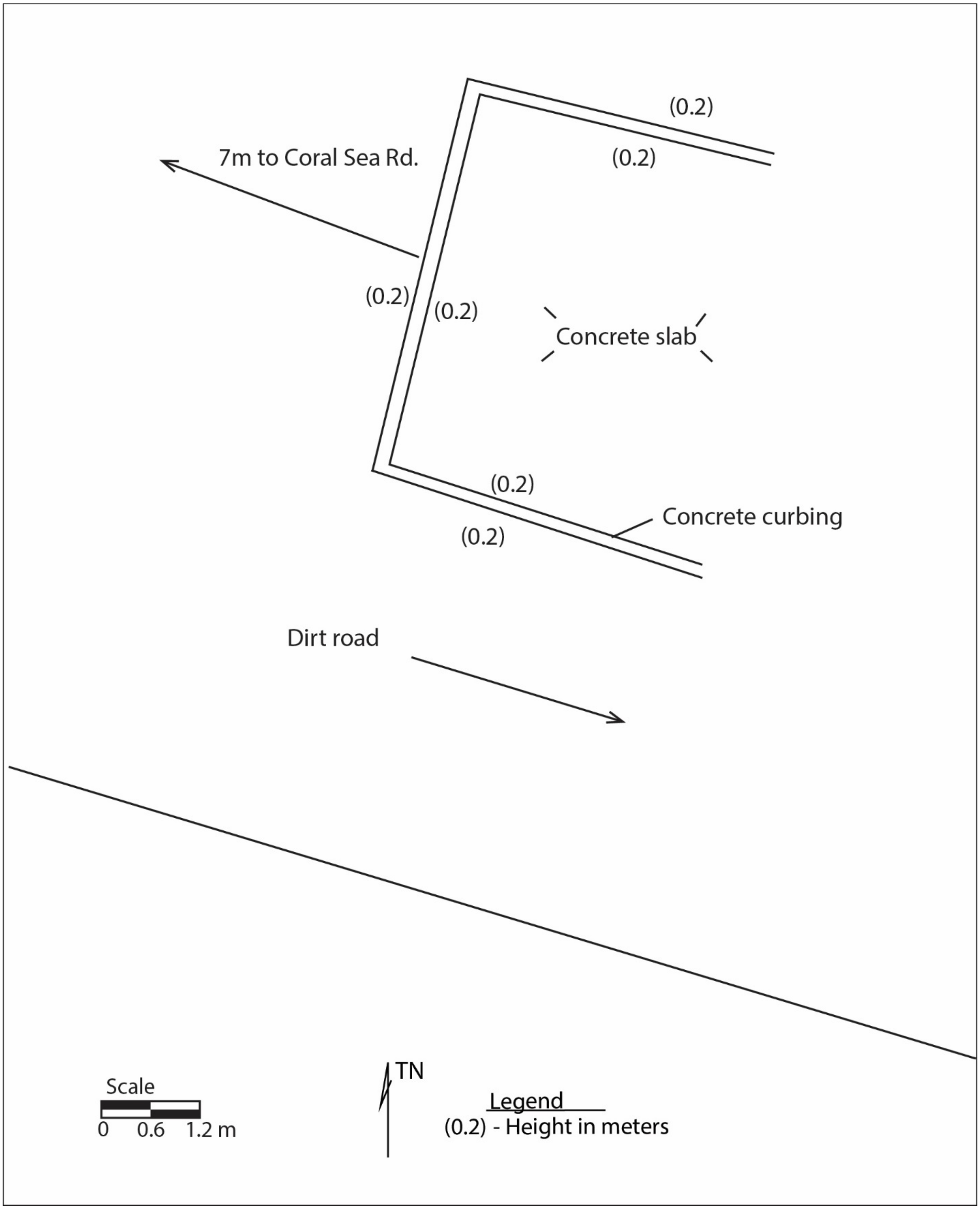

Figure 264. Plan-view map of SIHP 50-80-12-XXXXX (T-09), Feature 6 concrete building foundation.

SIHP No.: 50-80-12-XXXXX
TEMPORARY NO.: T-10
Site Type: Possible limestone pit
No. of Features: 1
Dimensions: 1.0 m (E/W) x 1.4 m (N/S)
Condition: Poor
Possible Age: Undetermined
Possible Function: Undetermined
Significance: d
Recommended Treatment: Data Recovery
Previous Investigation: None

SIHP 50-80-12-XXXXX (T-10; Figure 265) consists of a possible limestone pit located on the north side of a utility pole and 1.0 m south of a utility box, on the west side of Coral Sea Road.

The possible pit is defined by a circular depression measuring 1.0 m (E/W) x 1.4 m x 0.4 m deep. A PVC-lined utility pipe is in the south side of the feature. The possible natural pit might have been used for installation of the adjacent utility pole. The possible feature has fair to poor excavation potential.

Figure 265. SIHP 50-80-12-XXXXX (T-10) possible limestone pit (view to east).

SIHP No.: 50-80-12-XXXXX
TEMPORARY NO.: T-11
Site Type: Possible limestone pit
No. of Features: 1
Dimensions:
Condition: Poor
Possible Age: Undetermined
Possible Function: Undetermined
Significance: d
Recommended Treatment: Data Recovery
Previous Investigation: None

SIHP 50-80-12-XXXXX (T-11; Figure 266) consists of a possible limestone pit located on the north side of a utility pole and 1.0 m south of a utility box, on the west side of Coral Sea Road.

The possible pit is defined by a circular grass-covered depression measuring 0.7 m in diameter and 0.15 m deep. The possible feature has fair excavation potential.

Figure 266. SIHP 50-80-12-XXXXX (T-11) possible limestone pit (view to south).

SIHP No.: 50-80-12-XXXXX
TEMPORARY NO.: T-12
Site Type: Habitation cultural deposit
No. of Features: 1
Dimensions: 2.0 m (N/S) × 1.0 m (E/W)
Condition: Fair; truncated by land disturbances
Possible Age: Pre-Contact/early post-Contact era
Possible Function: Habitation
Significance: d
Recommended Treatment: Data Recovery
Previous Investigation: None

T-12 consists of a remnant cultural layer located between 80 and 110 cm below surface in the central portion of Test Trench 4 (Figure 267). The cultural layer consists of a charcoal-stained, gravelly silt loam that yielded charcoal, *kukui* (*Aleurites moluccana*; candlenut tree) endocarp, a volcanic glass scraper, faunal bone (small mammal, fish), sea urchin (Echinoidea spp.), crab (Carpiliidae spp.), and marine mollusks (Isognomonidae spp., Lucinidae spp., Mytiliidae spp., Pteriidae spp., Cypraeidae spp., *Nerita picea*, Patellidae spp., Thaididae spp., Trochidae spp., and Turbinidae spp.).

The remnant cultural layer was the upper portion of a natural (in situ) stratigraphy that lies below disturbed soils and fill episodes associated with underground utilities and construction of the adjacent Coral Sea Road. The cultural layer is likely associated with a traditional Hawaiian habitation site that existed at this location prior to historic and modern development of the area.

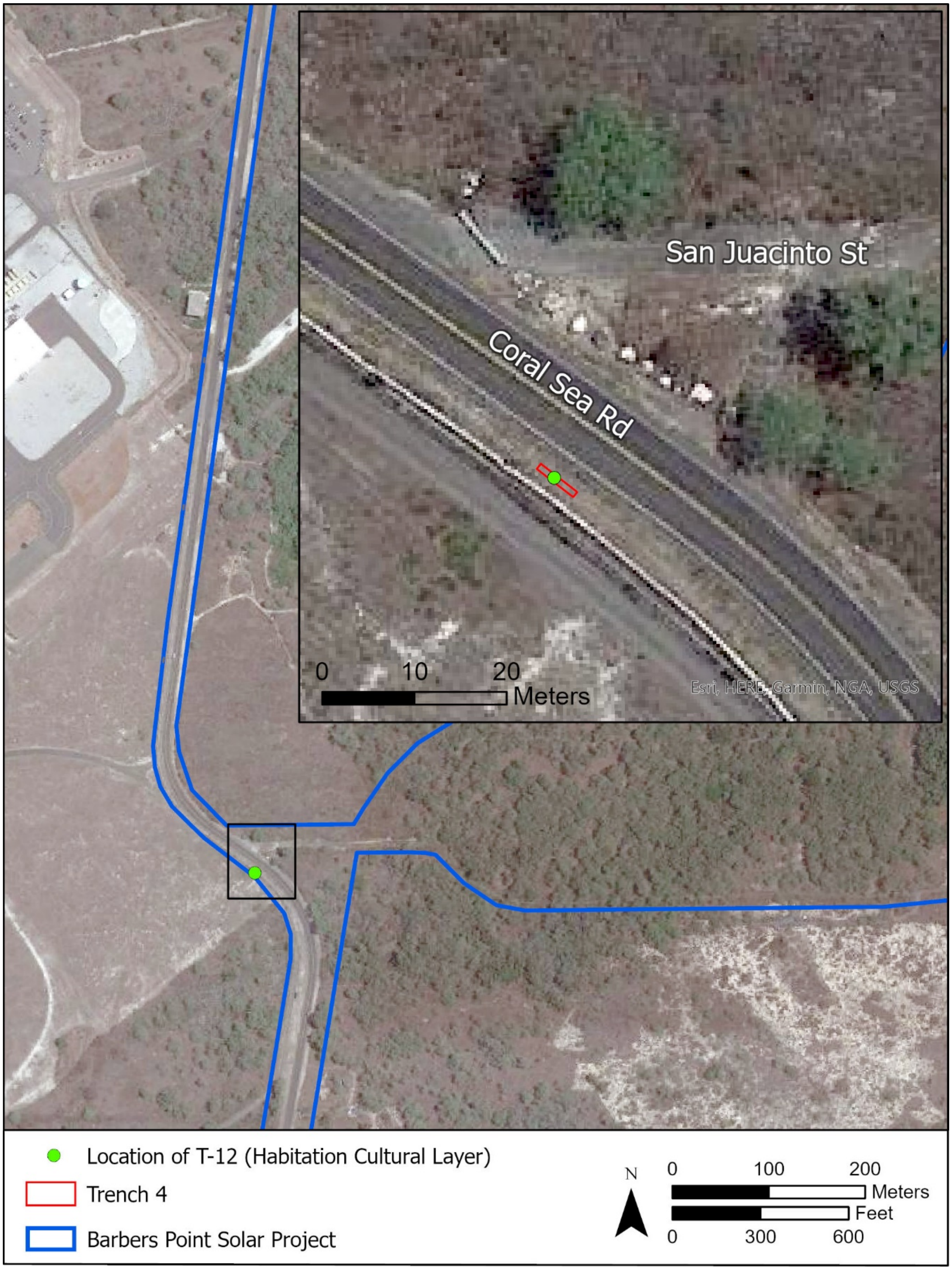

Figure 267. Location of SIHP 50-80-12-XXXX (T-12) cultural layer in Trench 4 (Google 2019 imagery).

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ARCHAEOLOGICAL INVENTORY SURVEY OF THE PROPOSED BARBERS POINT SOLAR PROJECT IN THE AHUPUAʻA OF HONOULIULI, DISTRICT OF ʻEWA, ISLAND OF OʻAHU

[TMK: (1) 9-1-013:038; (1) 9-1-013:040; AND (1) 9-1-016:027 (POR.)]

APPENDIX C:

DESCRIPTIONS OF TEST TRENCHES

CULTURAL RESOURCES CONSULTANTS

Hawaiʻi Office:
Kailua, Oʻahu

California Offices:
Bay Area
Sierra/Central Valley

Pacific Legacy: Exploring the past, informing the present, enriching the future.

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DRAFT

ARCHAEOLOGICAL INVENTORY SURVEY OF THE PROPOSED BARBERS POINT SOLAR PROJECT IN THE AHUPUAʻA OF HONOULIULI, DISTRICT OF ʻEWA, ISLAND OF OʻAHU

**[TMK: (1) 9-1-013:038;
(1) 9-1-013:040 AND (1) 9-1-016:027 (POR.)]**

APPENDIX C: DESCRIPTIONS OF TEST TRENCHES

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November 2021

PREFACE

This report volume contains descriptions of test trenches excavated along the proposed underground generator-tie line route.

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TRENCH 1

Trench 1 was located 2.65 m west of Coral Sea Road within an area of dense grass and young *koa haole* (*Leucaena*) trees (Figure 1, Figure 2, and Figure 3). It is the northernmost of the nine test trenches. Three stratigraphic layers were observed (Table 1). Layer I was a loose sandy loam containing abundant fine to small roots. Layers II and III were crushed coral fill. Layer II was highly compacted, while Layer III was loose and contained thin layers of densely matted fine roots within the upper portion and at the interface with Layer II. Trench 1 terminated at 64 cm below surface (cmbs) at the top of a buried concrete utility jacket. No cultural material was observed.

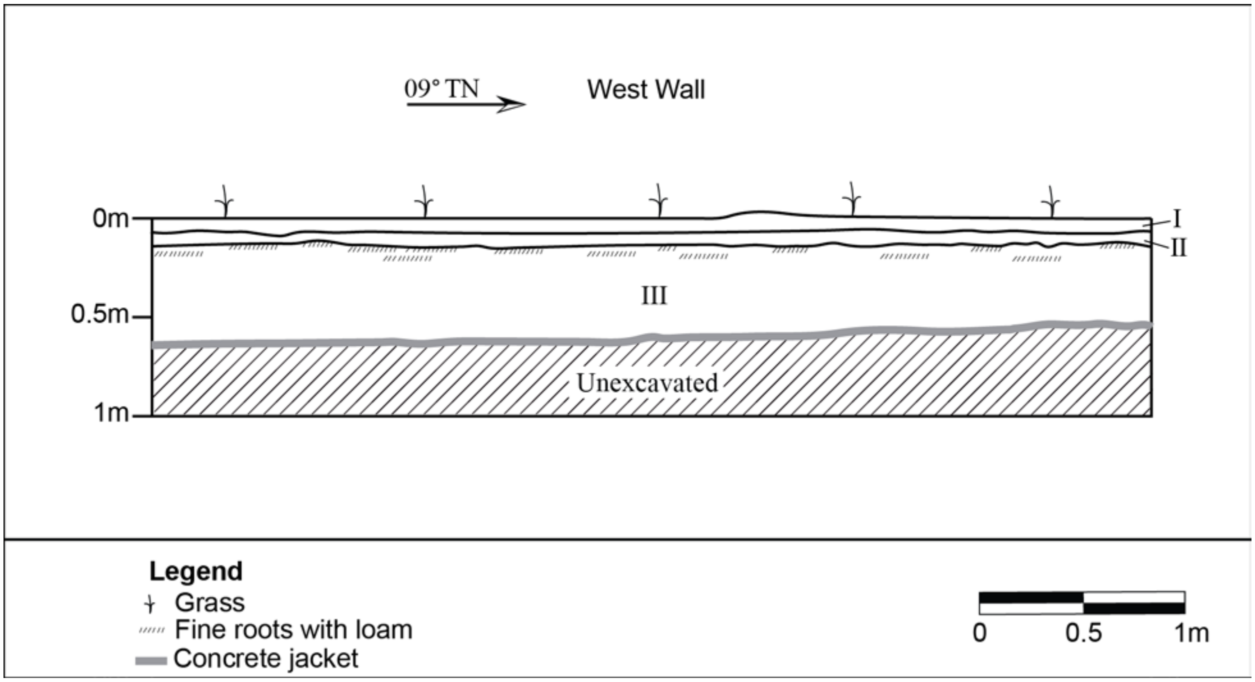

Figure 1. Profile of Trench 1 west wall.

Table 1. Soil Descriptions, Trench 1

Layer	Depth (cmbs)	Description
Layer I	0–9	Grayish brown (10YR 5/2) sandy loam; structureless; loose; non-plastic; abrupt, smooth lower boundary. Topsoil containing abundant fine to small roots.
Layer II	8–15	White (2.5Y 8/1) coral gravel; structureless; loose; non-plastic; very abrupt, smooth lower boundary. Compacted crushed coral fill.
Layer III	13–64	Pinkish white (5YR 8/2) extremely gravelly/cobbly sand; structureless; loose; non-plastic; very abrupt, smooth lower boundary. Crushed coral fill atop a concrete utility jacket. Contained very thin mats of roots with attached loam at the interface with Layer II and within the upper portion.

Figure 2. Trench 1 west wall profile, oblique view (view to southwest).

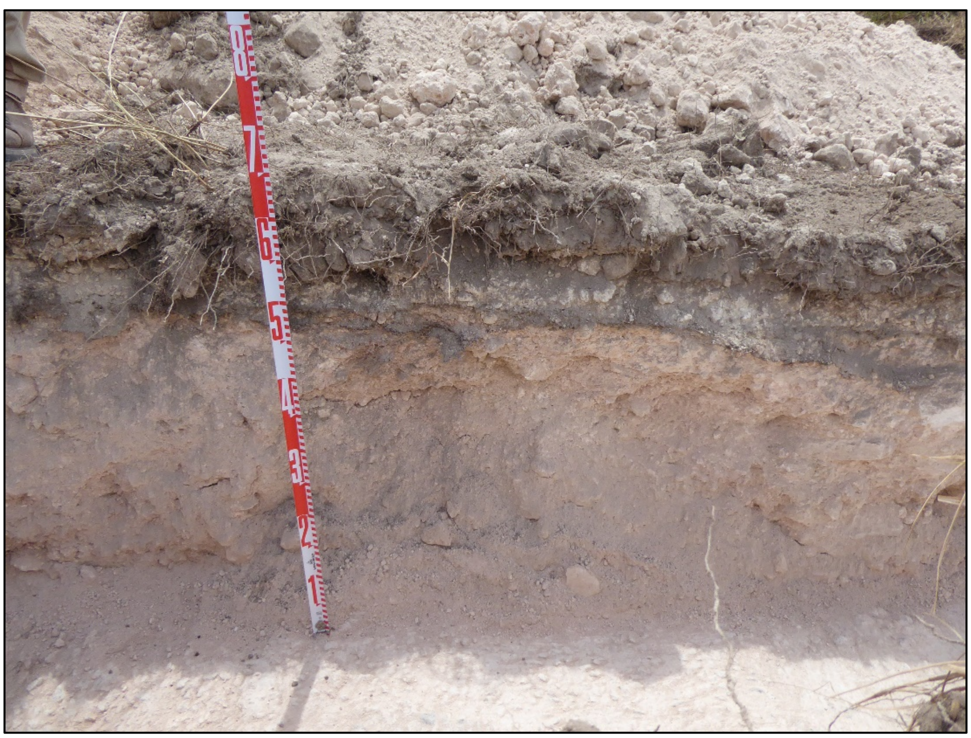

Figure 3. Trench 1, close-up of a portion of the west wall profile (view to west).

TRENCH 2

Trench 2 was located 3 m west of Coral Sea Road within the open shoulder of the road (Figure 4, Figure 5, and Figure 6). Four stratigraphic layers were observed (Table 2). Layer I was a loose gravelly sandy loam topsoil with fine roots. Layers II and III were consistent with Trench 1, comprising a thin layer of white, compacted crushed coral (Layer II) and a thicker layer of slightly darker, loose crushed coral (Layer III) atop a buried concrete utility jacket (Figure 7 and Figure 8). The upper surface of the concrete jacket was roughly textured, with small crevasses and depressions infiltrated by fine roots with accumulating loam soil, Layer IV. Trench 1 terminated at 44 cmbs at the top of the buried concrete utility jacket. No cultural material was observed.

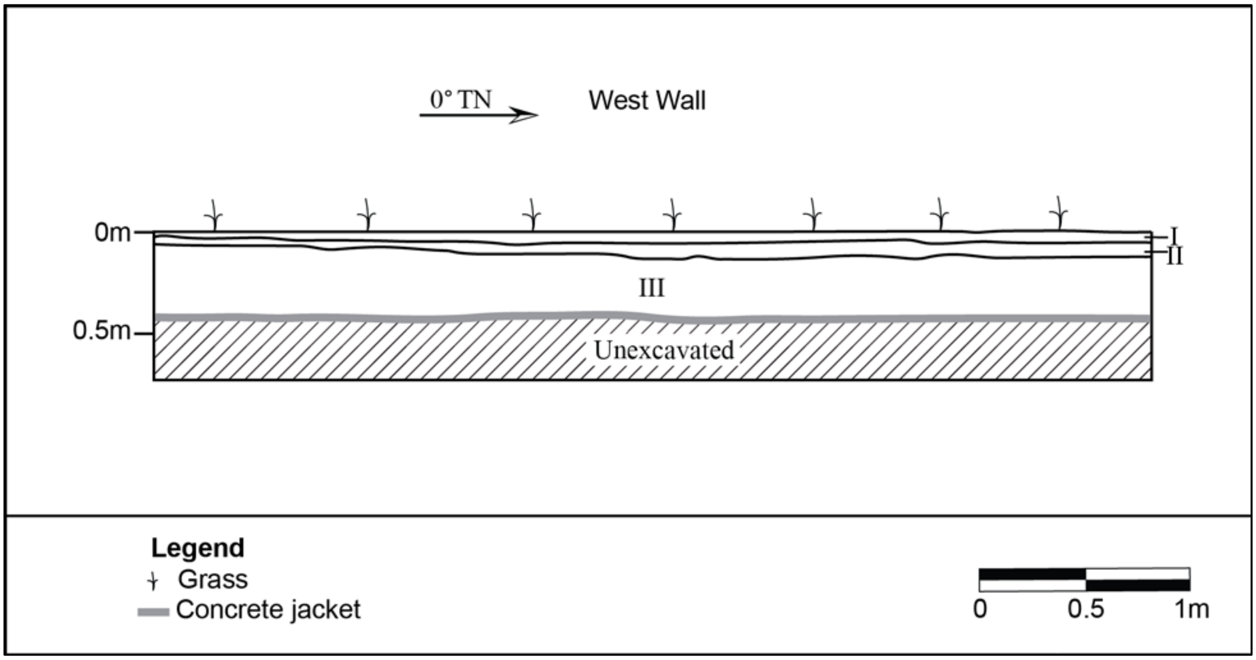

Figure 4. Profile of Trench 2 west wall.

Table 2. Soil Descriptions, Trench 2

Layer	Depth (cmbs)	Description
Layer I	0–5	Gray (10YR 5/1) gravelly sandy loam; structureless; loose; non-plastic; abrupt, smooth lower boundary. Topsoil containing fine roots.
Layer II	3–12	White (10YR 8/1) coral gravel; structureless; loose; non-plastic; very abrupt, smooth lower boundary. Compacted crushed coral fill.
Layer III	7–44	Light brownish gray (10YR 6/2) extremely gravelly/stony sand; structureless; loose; non-plastic; very abrupt, smooth lower boundary. Crushed coral fill atop a concrete utility jacket.
Layer IV	44	Brown (10YR 4/3) silt loam; weak, very fine, granular structure; non-plastic; very abrupt, broken lower boundary. Natural soil associated with root action within the crevasses and slight depressions of the concrete utility jacket.

Figure 5. Trench 2 west wall profile, oblique view (view to north).

Figure 6. Trench 2, close-up of trench floor, showing the concrete utility jacket with accumulating soil (Layer IV) (view to east).

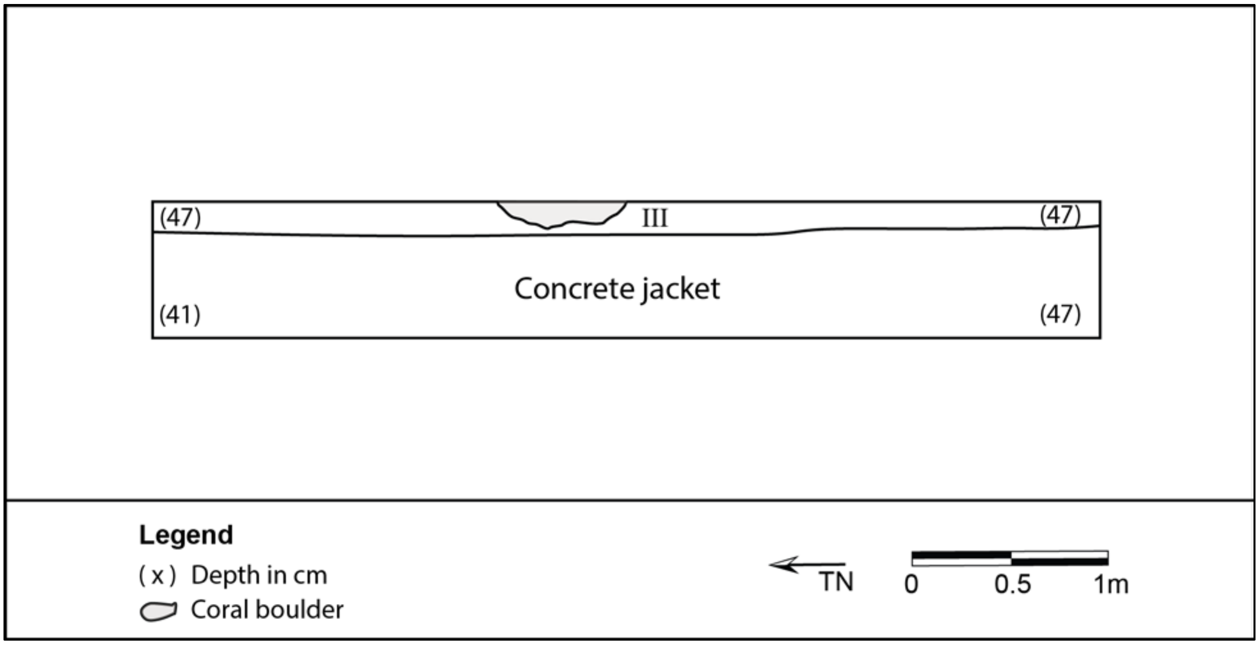

Figure 7. Plan view of concrete utility jacket within trench floor.

Figure 8. Trench 2, concrete utility jacket oriented north-south within the trench floor (view to north).

TRENCH 3

Trench 3 was located 2.1 m west of Coral Sea Road within the open shoulder of the road (Figure 9, Figure 10, and Figure 11). Four stratigraphic layers were observed (Table 3). Layers I, II, and III were consistent with the Trench 2 stratigraphy, comprised of a gravelly sandy loam topsoil and two layers of crushed coral. At the base of Layer III, the concrete utility jacket was again encountered, extending somewhat diagonally across the trench floor in a roughly northwest-southeast orientation. In order to explore the stratigraphy outside the utility corridor, the north end of the trench was expanded 40 cm to the east, for a maximum width of 1.1 m (Figure 12 and Figure 13). Below the Layer III crushed coral within the east wall was a deposit of very fine, natural silt loam containing a tabular coral boulder and fine roots. Trench 3 terminated at 80 cmbs along the east profile wall, at 70 cmbs atop the concrete utility jacket footing at the north end of the trench, and at 45 cmbs atop the concrete jacket in the remainder of the trench. A 1932 Bireley's glass soda bottle was collected from Layer III.

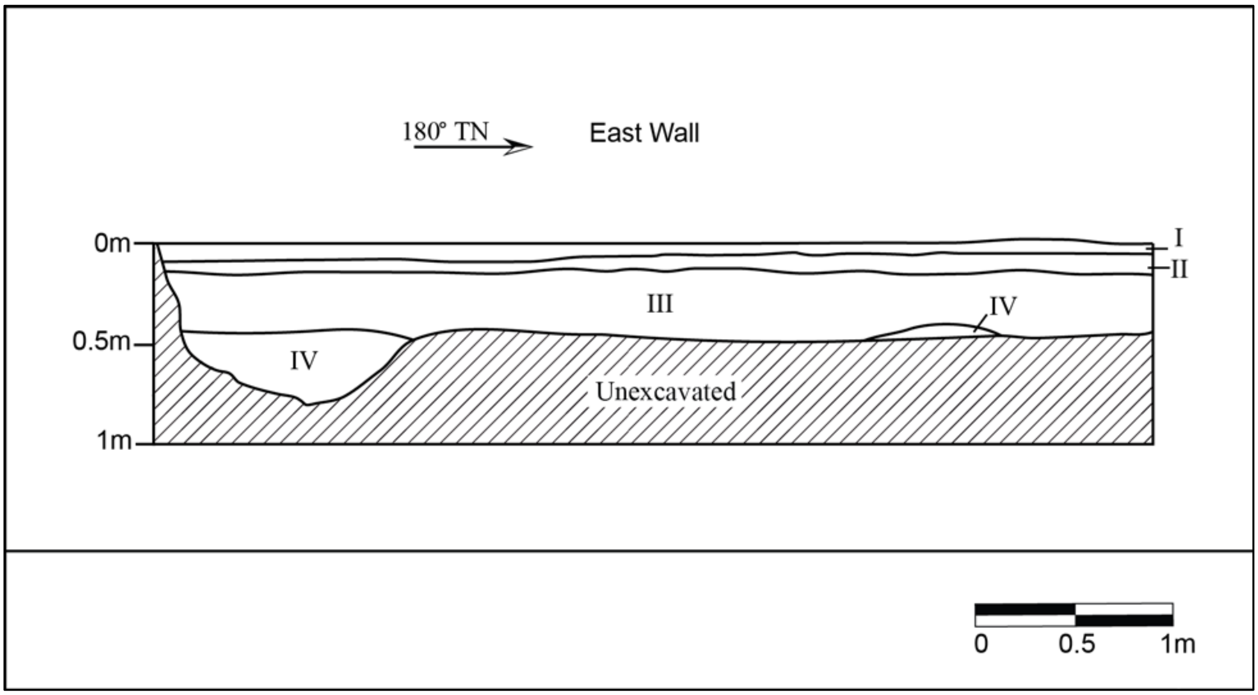

Figure 9. Profile of Trench 3 east wall.

Table 3. Soil Descriptions, Trench 3

Layer	Depth (cmbs)	Description
Layer I	0–9	Gray (10YR 5/1). Gravelly sandy loam; structureless; loose; non-plastic; abrupt, smooth lower boundary. Topsoil containing fine roots.
Layer II	5–15	White (10YR 8/1). Coral gravel; structureless; loose; non-plastic; very abrupt, smooth lower boundary. Compacted crushed coral fill.
Layer III	13–49	Light brownish gray (10YR 6/2). Extremely gravelly/stony sand; structureless; loose; non-plastic; very abrupt, smooth lower boundary. Crushed coral fill atop a concrete utility jacket. Contained many fine roots and an intact glass soda bottle.
Layer IV	41–80	Very pale brown (10YR 7/4). Silt loam; weak, very fine, granular structure; loose; non-plastic; lower boundary not reached. Very fine, homogenous natural soil. Contained few fine roots and a tabular coral boulder.

Figure 10. Trench 3, east wall profile, oblique view (view to southeast).

Figure 11. Trench 3, close-up of the expanded north end of the east wall profile (view to east).

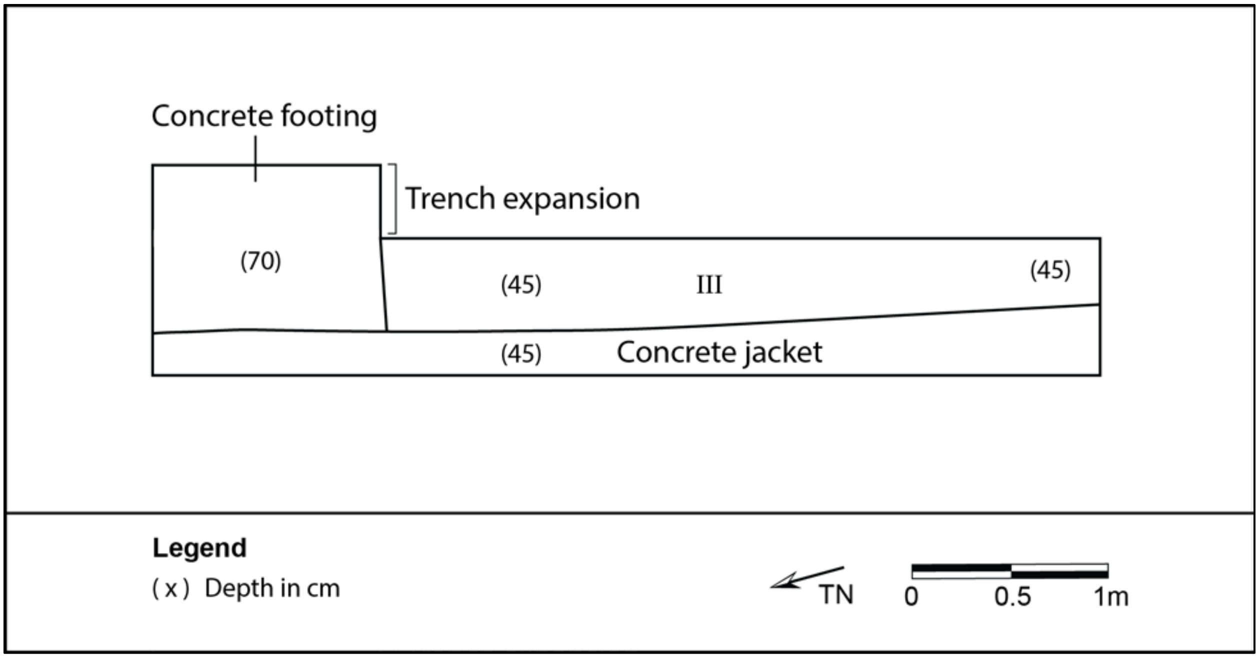

Figure 12. Plan view of concrete utility jacket within trench floor.

Figure 13. Trench 3, showing a concrete utility jacket oriented northwest-southeast within the trench floor (view to north).

TRENCH 4

Trench 4 was located 2.5 m west of Coral Sea Road within the open shoulder of the road (Figure 14 and Figure 15). Five stratigraphic layers were observed (Table 4). Layers I, II, and III were consistent with Trench 1–3 stratigraphy, with a sandy loam topsoil and two layers of crushed coral fill. Layer IV was a charcoal-stained, gravelly silt loam cultural layer encountered within the northwest portion of Trench 4 (Figure 16 and Figure 17). The cultural layer, interpreted as a component of Site T-12, was minimally 20 cm thick, extending from 83 cmbs to at least 103 cmbs. Layer IV possibly extended beyond the bounds of the trench to the northeast, northwest, and southwest. A 60.5-liter sample of Layer IV from 80–103 cmbs was screened in the field and all observed cultural material was collected. Cultural material included a volcanic glass scraper (Artifact 1), charcoal, *kukui* (*Aleurites moluccana*; candlenut tree) endocarp, faunal bone (small mammal, fish), sea urchin (Echinoidea spp.), crab (Carpiliidae spp.), and marine mollusks (Isognomonidae spp., Lucinidae spp., Mytiliidae spp., Pteriidae spp., Cypraeidae spp., *Nerita picea*, Patellidae spp., Thaididae spp., Trochidae spp., and Turbinidae spp.). Layer V was similar to Layer IV within Trench 3, consisting of a very fine, light yellowish brown natural silt loam. It contained fine roots and no other inclusions. Layer V was minimally 65 cm thick, extending from 95 cmbs to at least 159 cmbs within the southeast portion of the trench. Due to unstable sidewalls, excavation ceased at this level; the coral shelf was not reached at this depth. In order to stabilize the sidewalls and to preserve the Site T-12 cultural layer (Layer IV) for possible future data recovery, the northeast portion of the trench was not excavated below 103 cmbs.

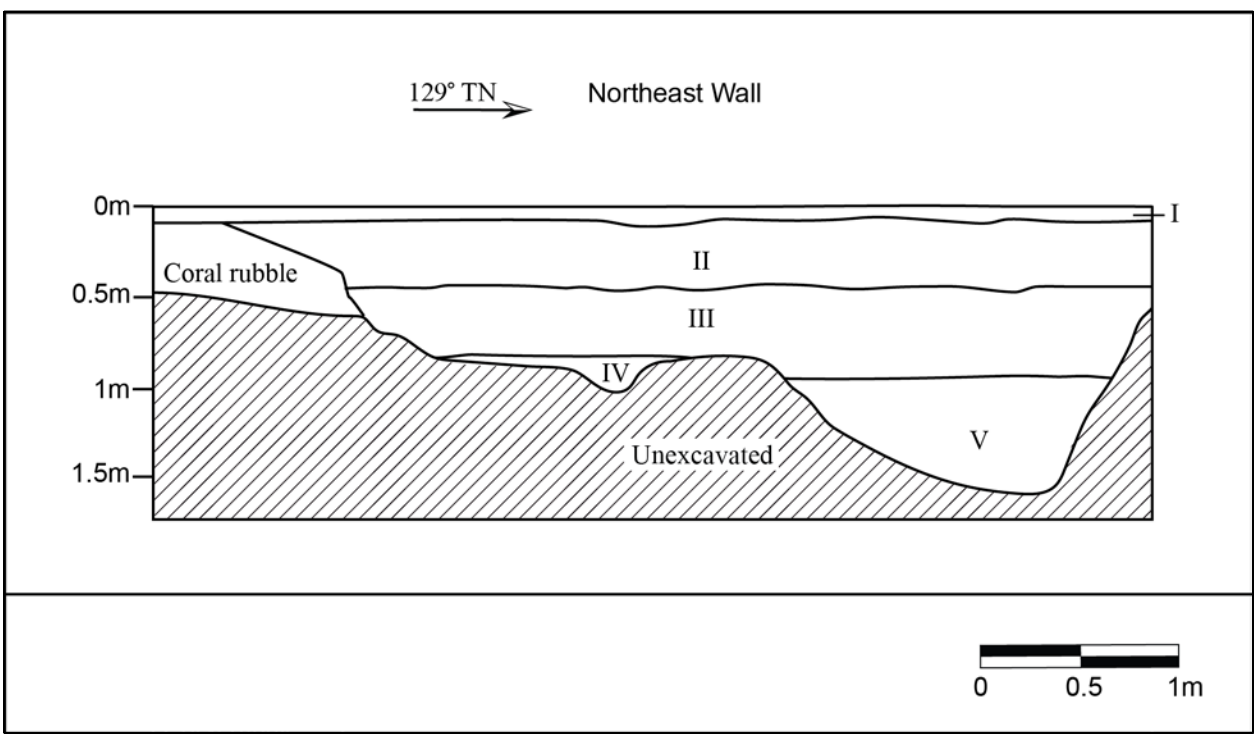

Figure 14. Profile of Trench 4 northeast wall.

Table 4. Soil Descriptions, Trench 4

Layer	Depth (cmbs)	Description
Layer I	0–9	Light brownish gray (10YR 6/4) sandy loam; structureless; loose; non-plastic; abrupt, smooth lower boundary. Topsoil containing abundant fine to small roots.
Layer II	6–45	Pinkish white (7.5YR 8/2) coral gravel; structureless; loose; non-plastic; very abrupt, smooth lower boundary. Crushed coral fill.
Layer III	45–95	Light gray (10YR 7/1) extremely gravelly/stony sand; structureless; loose; non-plastic; very abrupt, smooth lower boundary. Crushed coral fill with matrix of loamy sand.
Layer IV	83–103	Grayish brown (10YR 5/2) gravelly silt loam; weak, very fine, granular structure; loose; non-plastic; lower boundary not reached. Site T-12, charcoal-stained cultural layer. Contained charcoal, *kukui* endocarp, faunal (fish, small mammal) bone, and marine mollusks.
Layer V	95–159	Light yellowish brown (10YR 6/4) silt loam; weak, very fine, granular structure; loose; non-plastic; lower boundary not reached. Very fine, homogenous natural soil. Contained few fine roots. No cultural material was observed.

Figure 15. Trench 4 east wall profile, oblique view (view to southeast).

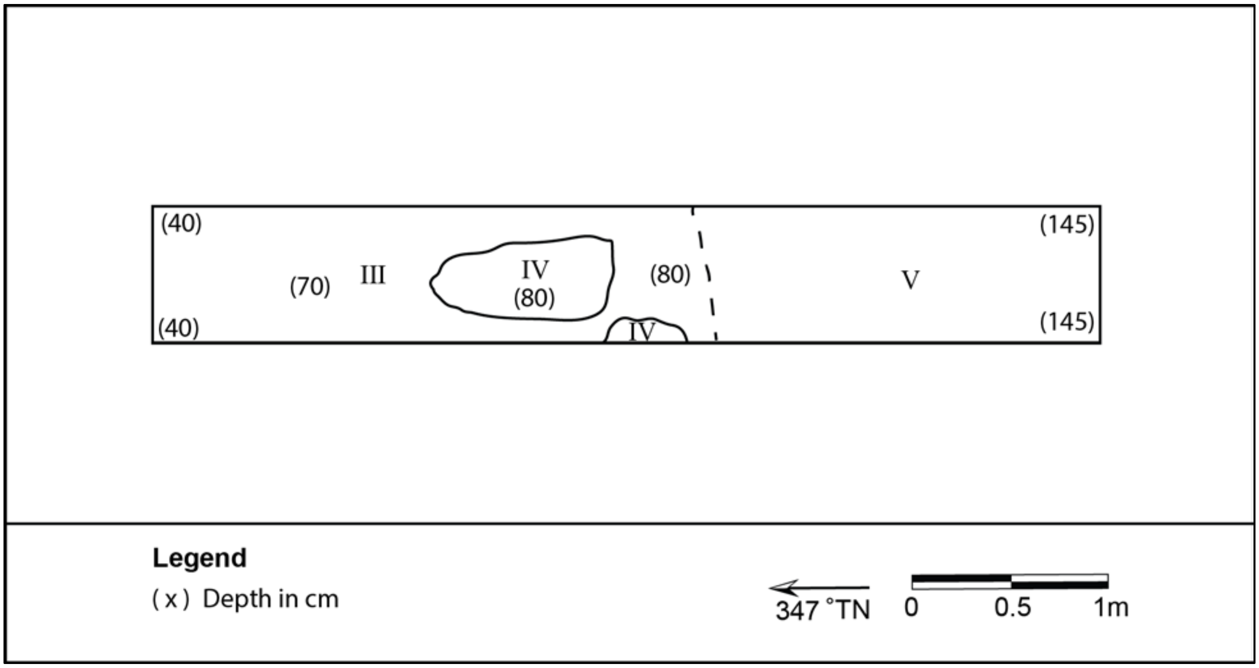

Figure 16. Plan view of Trench 4, showing Layer IV (Site T-12 cultural layer) within the trench floor at 80 cmbs.

Figure 17. Trench 4, close-up of Site T-12 charcoal-stained cultural layer, Layer IV (view to southwest).

TRENCH 5

Trench 5 was located 2.4 m south of the previous San Juacinto Street and approximately 125 m east of Coral Sea Road (Figure 18, Figure 19, and Figure 20). The trench environment consisted of a dense ground cover of grass and young *koa haole* trees along with large modern trash items (e.g., old mattresses, car tires). Four stratigraphic layers were observed (Table 5). Layer I was the current topsoil of gravelly sandy loam, containing leaf matter, grasses, and roots. Layer II consisted of a crushed coral fill. Layer III was a relatively thick deposit of natural, very fine, yellowish brown silt loam. The deposit infilled a deep depression within the coral shelf in the east half of the trench. In the west half of the trench, a slightly darker yellowish brown silt loam deposit, Layer IV, infilled a natural pit feature (Figure 21 and Figure 22). The unmodified pit feature, a component of Site T-03 (Feature 160), appeared to be hourglass-shaped, with a large coral shelf bulkhead on the east side. The aperture of the pit feature measured 60 cm wide; however, the interior widened significantly, with the coral shelf forming overhangs. At the base of excavation, the pit feature measured minimally 1.19 m wide and extended in all directions. A shovel test probe through Layer IV within the pit feature extended to 1.45 m below surface but did not reach the pit feature floor. Excavation was halted at this depth due to soil compaction and limited maneuverability. The coral shelf bulkhead within the central portion of the trench was partially removed by the excavator in order to verify that it was not coral boulder fill. One soil sample each of Layers III and IV was collected.

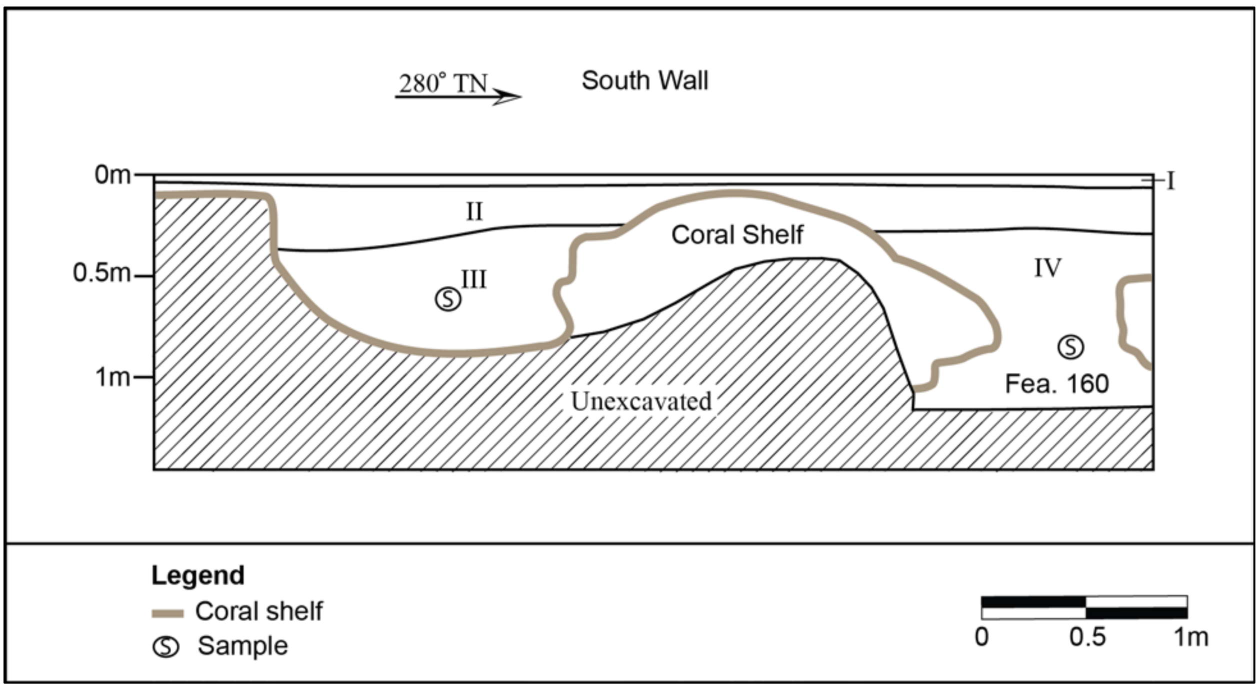

Figure 18. Profile of Trench 5 south wall.

Table 5. Soil Descriptions, Trench 5

Layer	Depth (cmbs)	Description
Layer I	0–5	Light brownish gray (10YR 6/2) gravelly sandy loam; structureless; loose; non-plastic; abrupt, smooth lower boundary. Topsoil containing organics and abundant fine to medium roots.
Layer II	5–38	White (10YR 8/1) extremely gravelly loamy sand; structureless; loose; non-plastic; abrupt, smooth lower boundary. Crushed coral fill.
Layer III	25–90	Yellowish brown (10YR 5/4) silt loam; weak, very fine, granular structure; non-plastic; very abrupt, broken/irregular lower boundary. Natural soil within a large depression in the coral shelf. Contained many fine to medium roots. No cultural material observed.
Layer IV	27–145	Dark yellowish brown (10YR 4/4) silt loam; weak, very fine, granular structure; loose; non-plastic; lower boundary not reached. Natural soil within a sinkhole feature (Site T-03 Feature 160). Contained many fine to medium roots. No cultural material observed.
Site T-03 Feature 160	~52–unknown	Natural sinkhole formation within coral shelf. Infilled with fine silt loam (Layer IV). No cultural material observed.

Figure 19. Trench 5 south wall profile, oblique view (view to southeast).

Figure 20. Trench 5, close-up of east portion of the south wall profile (view to south).

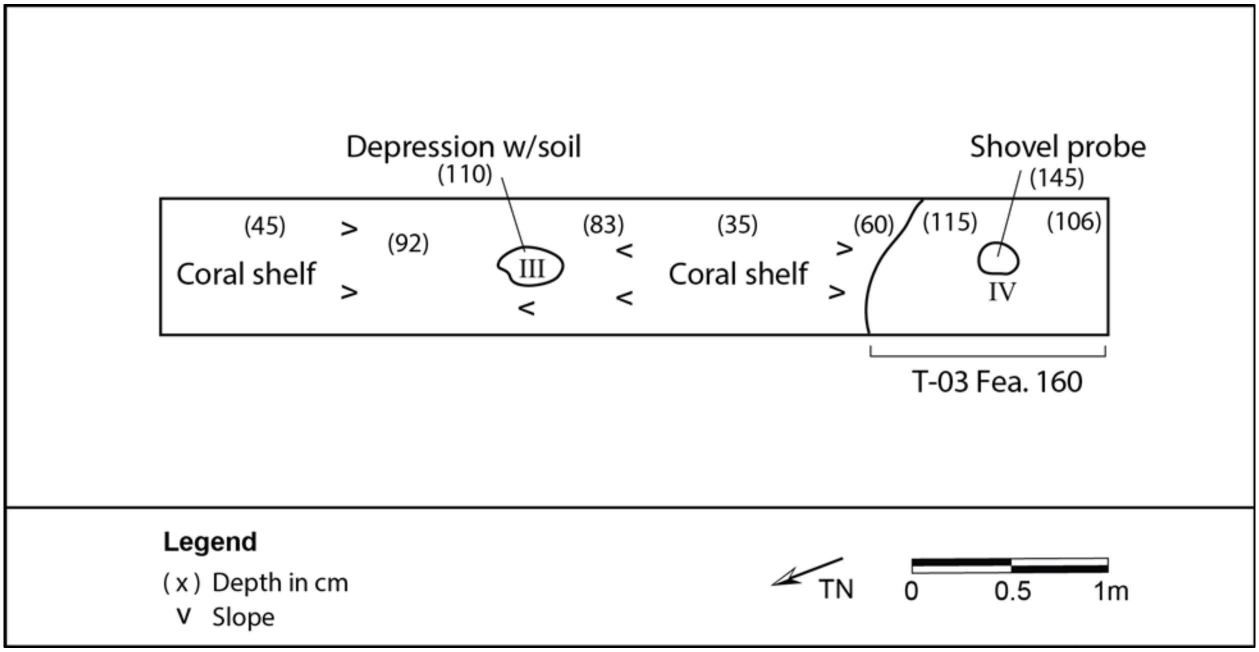

Figure 21. Plan view of Trench 5 at the base of excavation.

Figure 22. Trench 5, close-up of west portion of the south wall profile, showing an infilled sinkhole (Site T-03, Feature 160) (view to south).

TRENCH 6

Trench 6 was located approximately 7 m west of Coral Sea Road within the open shoulder of the road (Figure 23, Figure 24, and Figure 25). Three stratigraphic layers were observed (Table 6). Layer I was a gravelly silt loam topsoil with sparse grass and many fine roots. Layer II consisted of very fine, natural silt loam atop the coral shelf. It contained abundant platy coral inclusions in the central and north portions of the trench. Layer III consisted of very thin, isolated pockets of dark brown loam with dense mats of fine roots located within the surface depressions of the coral shelf. Trench 6 terminated on top of the coral shelf at 23 cmbs. No cultural material was observed.

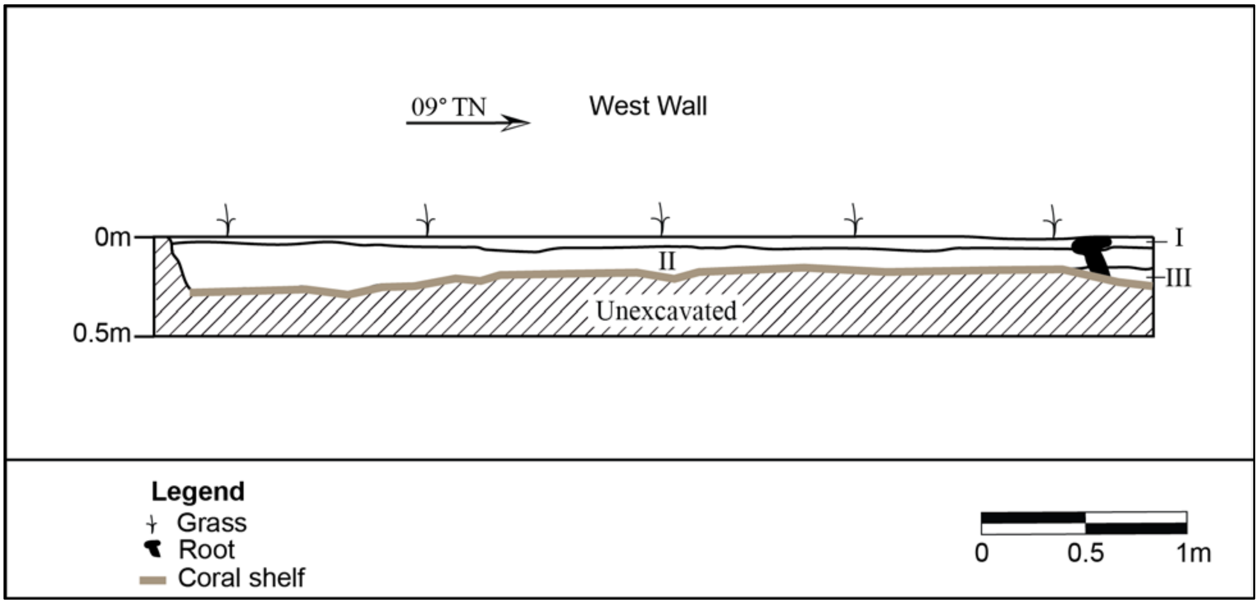

Figure 23. Profile of Trench 6 west wall.

Table 6. Soil Descriptions, Trench 6

Layer	Depth (cmbs)	Description
Layer I	0–6	Light brownish gray (10YR 6/2) gravelly sandy loam; structureless; loose; non-plastic; abrupt, wavy lower boundary. Topsoil containing many fine to medium roots.
Layer II	4–29	Brown (10YR 5/3) extremely stony silt loam; weak, very fine, granular structure; loose; non-plastic; very abrupt, wavy lower boundary. Natural silt loam atop the coral shelf. Contained platy coral inclusions within the central and north portions of the trench. No cultural material observed.
Layer III	15–23	Dark brown (7.5YR 3/3) loam; weak, fine, granular structure; very friable; non-plastic; very abrupt, broken lower boundary. Natural soil within depressions in the coral shelf. Contained dense mats of fine roots. No cultural material observed.

Figure 24. Trench 6 west wall profile, oblique view (view to northwest).

Figure 25. Trench 6, close-up of a portion of the west wall profile (view to west).

TRENCH 7

Trench 7 was located on the west side of Coral Sea Road within the open shoulder of the road (Figure 26, Figure 27, and Figure 28). The three stratigraphic layers observed in Trench 6 were also observed in Trench 7, consisting of gravelly silt loam topsoil (Layer I), very fine natural silt loam (Layer II), and small patches of loam within surface depressions of the coral shelf (Layer III) (Table 7, Figure 29, and Figure 30). Layer II contained more coral cobbles/stones than silt loam matrix within Trench 7. Trench 7 terminated on top of the coral shelf at 45 cmbs. No cultural material was observed.

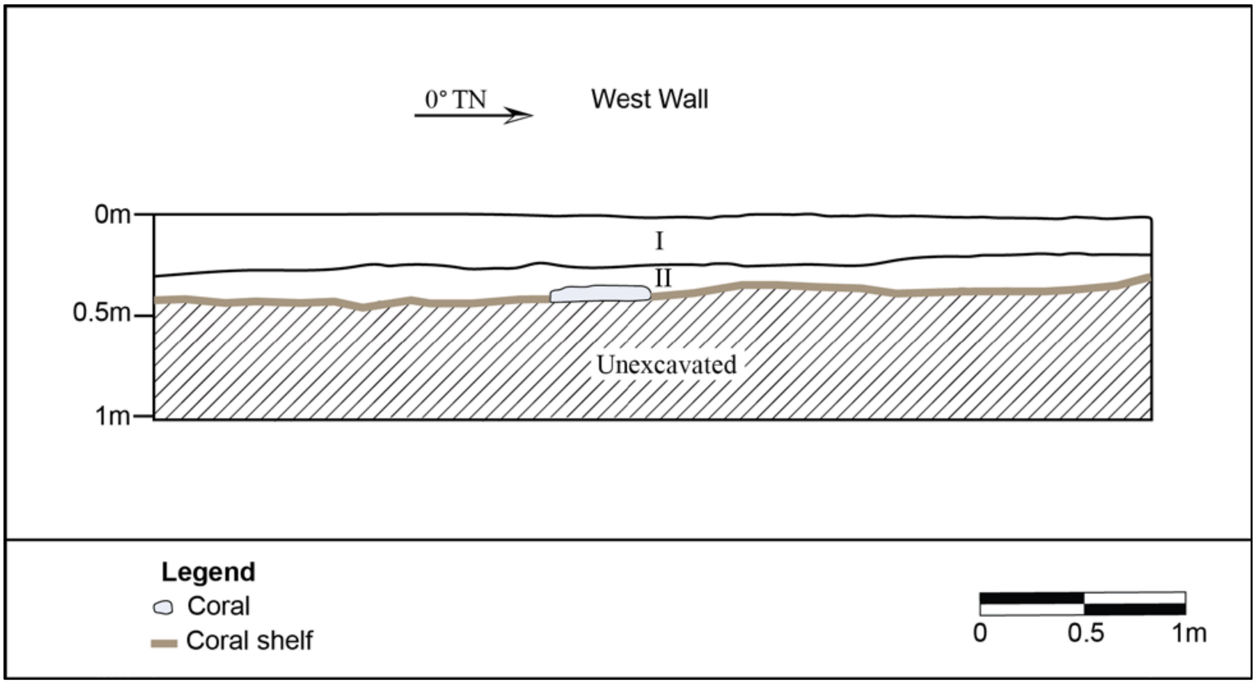

Figure 26. Profile of Trench 7 west wall.

Table 7. Soil Descriptions, Trench 7

Layer	Depth (cmbs)	Description
Layer I	0–30	Light brownish gray (10YR 6/2) gravelly sandy loam; structureless; loose; non-plastic; abrupt, smooth lower boundary. Topsoil containing many fine roots.
Layer II	19–45	Brown (10YR 5/3) extremely stony silt loam; structureless; loose; non-plastic; very abrupt, wavy lower boundary. Natural, very fine silt loam atop the coral shelf. Contained abundant platy and tabular coral blocks and many fine roots. No cultural material observed.
Layer III	35–45	Brown (7.5YR 3/3) loam; weak, fine, granular structure; very friable; non-plastic; very abrupt, broken lower boundary. Natural soil within depressions in the coral shelf. Contained dense mats of fine roots. No cultural material observed.

Figure 27. Trench 7 west wall profile, oblique view (view to southwest).

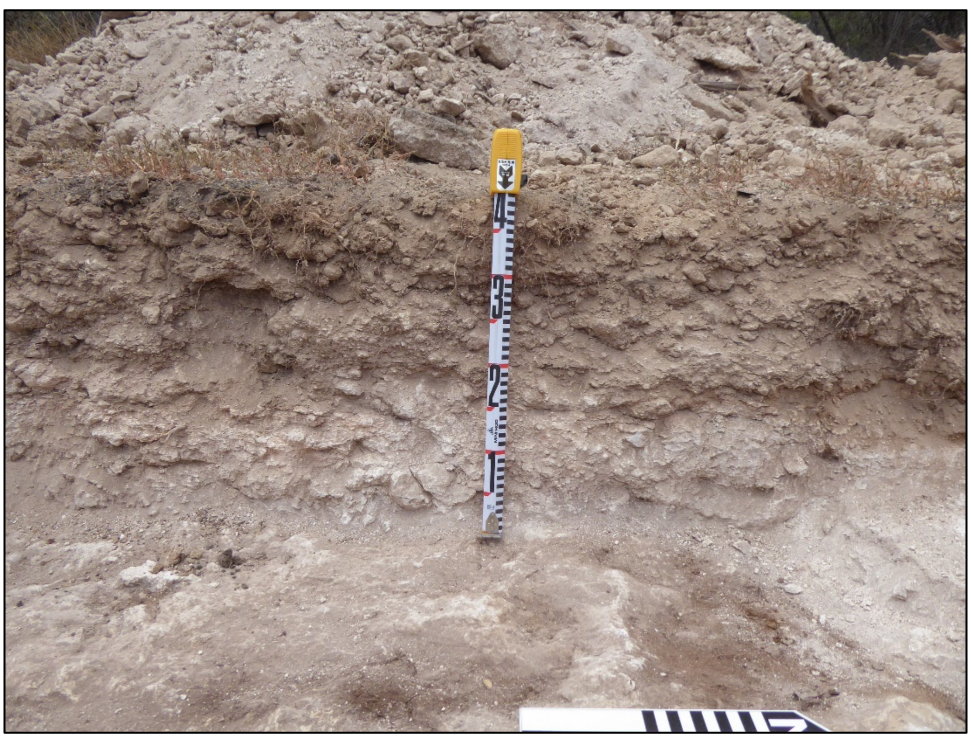

Figure 28. Trench 7, close-up of a portion of the west wall profile (view to west).

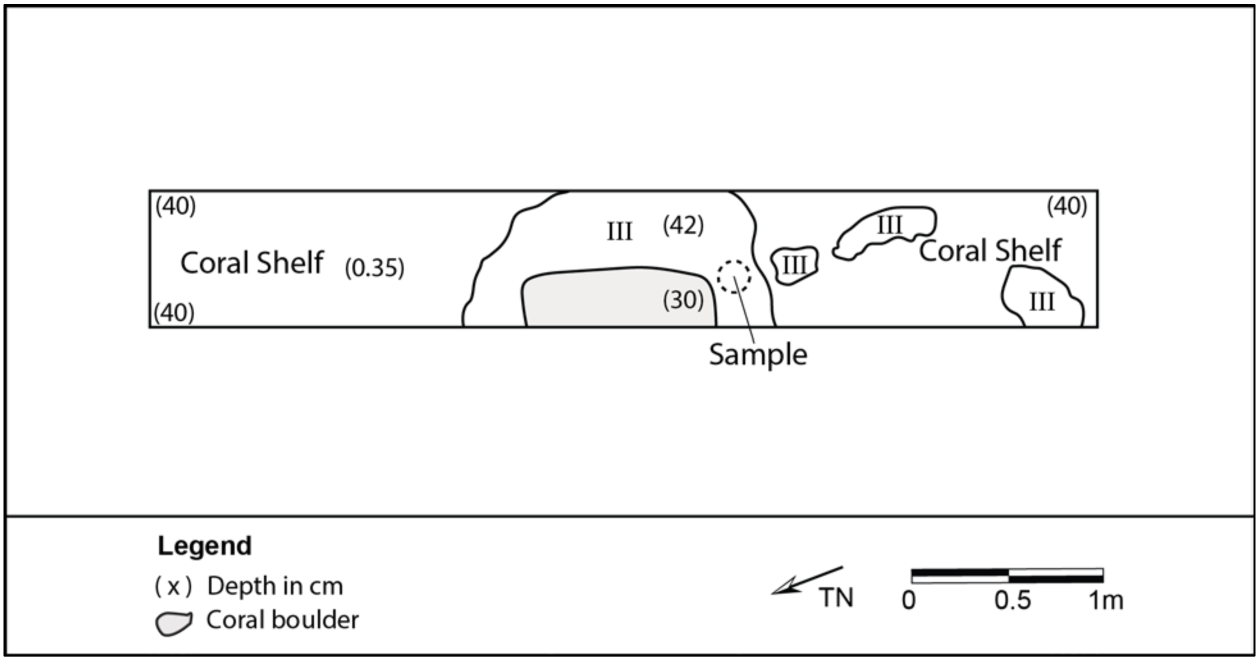

Figure 29. Plan view of Trench 7 at the level of the coral shelf.

Figure 30. Trench 7, close-up of Layer III loam with fine roots atop the coral shelf (view to north).

TRENCH 8

Trench 8 was located on the west side of Coral Sea Road within the open shoulder of the road and on the east edge of a thicket of young *koa haole* trees (Figure 31, Figure 32, and Figure 33). Two stratigraphic layers were observed (Table 8). Layer I was a gravelly sandy loam topsoil with many fine roots. Layer II consisted of a very fine silt loam atop the coral shelf. It contained several tabular coral blocks and many fine roots. Trench 8 terminated on top of the coral shelf at 48 cmbs. No cultural material was observed.

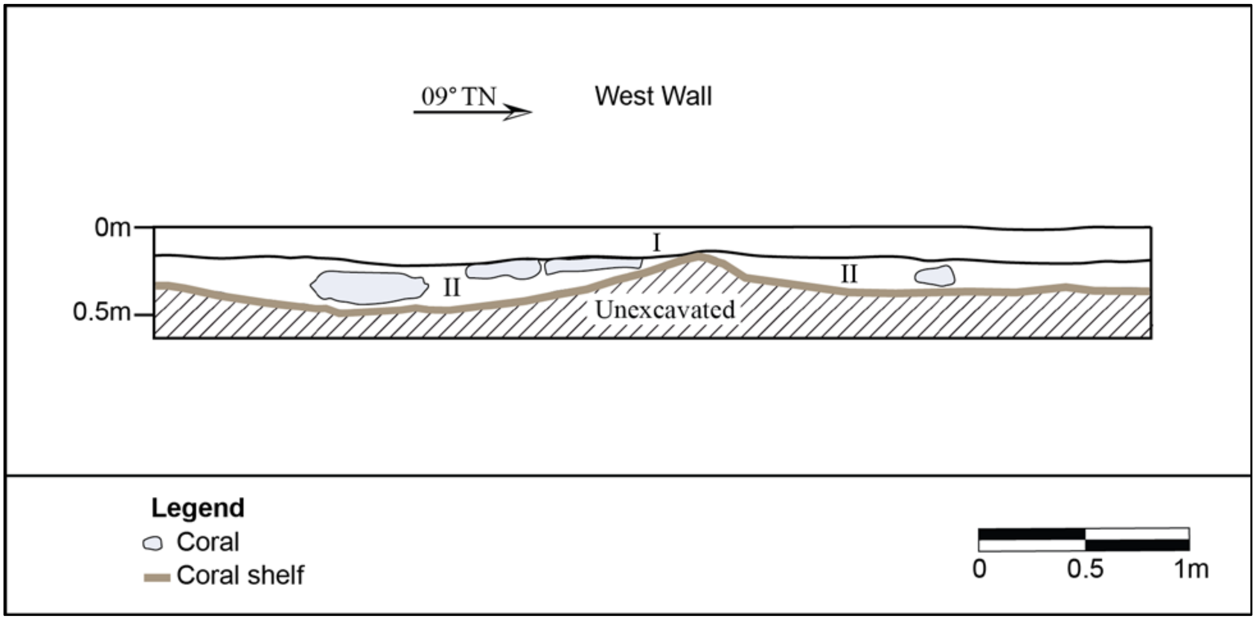

Figure 31. Profile of Trench 8 west wall.

Table 8. Soil Descriptions, Trench 8

Layer	Depth (cmbs)	Description
Layer I	0–20	Light brownish gray (10YR 6/2) gravelly sandy loam; structureless; loose; non-plastic; abrupt, smooth lower boundary. Topsoil containing many fine roots.
Layer II	15–48	Light gray (10YR 7/2) stony silt loam; weak, very fine, granular structure; loose; non-plastic; very abrupt, wavy lower boundary. Natural, very fine silt loam atop the coral shelf. Contained several tabular coral blocks and many fine roots. No cultural material observed.

Figure 32. Trench 8 south wall profile, oblique view (view to southwest).

Figure 33. Trench 8, close-up of a portion of the west wall profile (view to west).

TRENCH 9

Trench 9 was located on the west side of Coral Sea Road within the open shoulder of the road and on the east edge of a *kiawe* (mesquite; *Prosopis pallida*) thicket (Figure 34, Figure 35, and Figure 36). Three stratigraphic layers were observed (Table 9). Layer I was a gravelly sandy loam topsoil containing abundant fine to small roots. Layers II and III comprised natural deposits of silt loam, differing slightly in color (yellowish brown and light yellowish brown) and the inclusion of several tabular coral blocks within Layer III. Within the north end of the trench, a modern trench bisected Trench 9 at a northeast-southwest angle. The trench cut was straight-edged and extended from the upper boundary of Layer II to the base of excavation at 122 cmbs. The trench matrix appeared to incorporate Layers II and III backdirt. The coral shelf within Trench 9 sloped down to the north. Its depth below the modern trench was unable to be determined due to difficulty hand-excavating through the coral cobbles. No cultural material was observed.

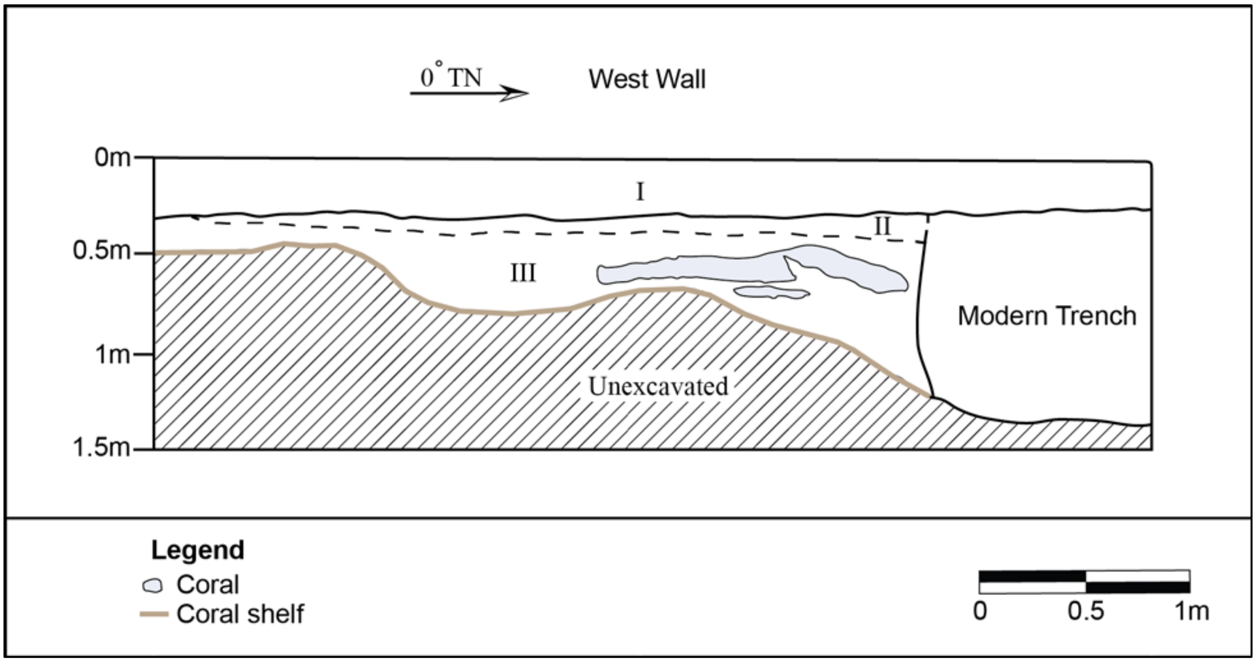

Figure 34. Profile of Trench 9 west wall.

Table 9. Soil Descriptions, Trench 9

Layer	Depth (cmbs)	Description
Layer I	0–31	Light brownish gray (10YR 6/2) extremely gravelly sandy loam; structureless; loose; non-plastic; abrupt, smooth lower boundary. Topsoil containing many fine to small roots.
Modern Trench	25–135	Brown (10YR 4/3) and light brownish gray (10YR 6/2) extremely gravelly loamy sand; structureless; loose; non-plastic; lower boundary not reached. Backfilled modern trench with abundant coral gravels and cobbles.
Layer II	29–41	Yellowish brown (10YR 5/4) stony silt loam; weak, very fine, granular structure; loose; non-plastic; clear, smooth lower boundary. Natural, very fine silt loam. No cultural material observed.
Layer III	33–122	Light yellowish brown (10YR 6/4) stony silt loam; weak, very fine, granular structure; loose; non-plastic; very abrupt, wavy lower boundary. Natural, very fine silt loam atop the coral shelf. Contained several tabular coral blocks and many fine to small roots. No cultural material observed.

Figure 35. Trench 9 west wall profile, oblique view (view to northwest).

Figure 36. Trench 9, close-up of north portion of the west wall profile, showing the modern trench truncating Layers II and III (view to west).

APPENDIX B. VEGETATION MANAGEMENT PLAN

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July 30, 2021

Acting Fire Chief Lionel Camara, Jr.
Honolulu Fire Department
1046 Young Street
Honolulu, HI 96814

Subject: Fire Code Compliance for Ground Mounted Solar Farms
Barbers Point Solar LLC, Kapolei, Oahu, Hawaii
TMK (1) 9-1-013:038,039,040

Dear Acting Fire Chief Camara,

We are kindly requesting a review and confirmation of the proposed approach to fire code compliance for the proposed ground-mounted solar project listed in this letter. This request intends to identify the specific code requirements and describe how the proposed project will comply with the code.

In 2015 and late 2020, G70 worked closely with HFD to set up a common understanding of the NFPA 1 requirements for several ground-mounted solar facilities on Oahu. Two (2) of those projects were subsequently permitted and constructed based on those initial meeting's contents. See ***Attachment A – 2015 HFD Memorandum*** and ***Attachment B – 2020 07 28_HFD Minutes***.

G70 is now working with Barbers Point Solar, LLC to design a ground-mounted solar farm in Barbers Point along Coral Sea Road. The project's design responds to a Power Purchase Agreement with Hawaiian Electric Company and intends to provide utility scale renewable power generation in support of the State's fossil fuel reduction effort. The current schedule has the project working through entitlements and conceptual site planning to 30% project design. The Project consists of construction and operation of a 15-megawatt (MW) solar photovoltaic system coupled with a 15 MW, 4-hour (60 MWh) PV-Coupled ESS as well as related interconnection and ancillary support infrastructure. The major infrastructures of the Project will include the following: single-axis tracking solar photovoltaic system; direct current electrical collector lines; power conversion systems including PV-coupled ESS units and step-up transformers; alternating current (AC) electrical collector lines; Project collector substation; a generation-tie line (combination overhead and underground); communication equipment; access roads and fencing; and temporary laydown areas.

Project Name	TMK	MW-AC	Acres	Permit Status
Barbers Point Solar	(1)9-1-013:038, 039,040	15 MW, 60 MWh (BESS)	163	Draft EA to be filed end of Q3 2021 and on track to file Final EA Q2 2022. HCDA CUP/DP on track to be obtained Q3 2022.

In a previous request, G70 asked for the use of the 2018 NFPA 1 Fire Code in lieu of the 2012 NFPA 1 version. The basis for the previous request rested on the use of a Vegetation Management Plan not outlined in prior versions of the Code. As of January 2021, it is G70's understanding Honolulu County has adopted the 2018 version of the NPFA 1 as such adopting the use of Vegetation Management Plan.

In an effort to design the project in alignment with HFD's understanding of the Code, we respectfully request HFD review the following excerpt of the 2018 NFPA 1 Fire Code and confirm HFD's enforcement position. Also, if HFD plans to amend the code in regards to Solar Farms, G70 is willing to review and discuss any additional comments or questions not currently quoted here.

The NFPA 2018 section 11.12.3 states, "ground-mounted photovoltaic systems shall be installed in accordance with 11.12.3.1 through 11.12.3.3." Shown below are specific code sections, along with the non-mandatory Annex A material from the NFPA 2018 Fire Code Handbook. The project's design intend to comply with all of these requirements, including submitting a *Vegetation Management Plan* for review (see Attachment C - VMP) and approval by the HFD Plan Review Division.

The following is an excerpt from the 2018 NFPA 1 Fire Code.

> 11.12.3.1* **Clearances**. A clear area of 10 ft (3048 mm) around ground-mounted photovoltaic installations shall be provided.
>
> > A.11.12.3.1 The zoning regulations of the jurisdiction setback requirements between buildings or property lines, and accessory structures may apply.
>
> 11.12.3.2* **Vegetation Management Plan**. A vegetation management plan or other non-combustible base acceptable to the AHJ shall be approved and maintained under and around the installation where required by the AHJ.
>
> > A.11.12.3.2 Though dirt with minor growth is not considered noncombustible, the AHJ might approve dirt bases as long as any growth is maintained under and around the installation to reduce the risk of ignition from the electrical system. This could be a serious consideration for large ground-mounted photovoltaic systems. Not only should the base be considered under the systems, but also around the systems to the point that the risk of fire from growth or other ignition sources will be reduced.
>
> 11.12.3.3* **Security Barriers**. Fencing, skirting, or other suitable security barriers shall be installed when required by the AHJ.
>
> > A.11.12.3.3 Security barriers are intended to protect individuals and animals from contact with energized conductors or other components.

In addition to confirming the use and understanding of the 2018 NFPA 1 Fire Code, a previous G70 meeting with HFD also discussed the topic of Code compliance with Chapter 18, Fire Department Access and Water Supply, which is documented in ***Attachment B – 2020 07 28_HFD Minutes.*** G70 and HFD agreed that fire department access and water supply is **not** a requirement for the following reasons.

- The solar farms are unmanned utility facilities and there will not be any use or occupancy that the fire code would apply to. Specifically, there will not be any occupied buildings in the proposed projects. Therefore, provision of fire access and water supply is not required by code.
- Locks will be utilized to secure the perimeter fencing/gates with access provided to HFD.
- The developer will prepare and coordinate an Emergency Response Plan with HFD that establishes appropriate HFD response at the proposed sites and implements regular training for HFD first responders for site-specific response.
- Notes will be provided on the proposed drawings that reference NFPA 1 Sections 18.2.2.1, 18.2.2.2, and 18.2.2.3 related to access boxes, access to developments, and access maintenance.

The Battery Energy Storage System (BESS) for the project consists of self-contained enclosures distributed across the site. Each system rests on open-air gravel pads. The battery enclosures design and manufacturing include safeguards to mitigate and monitor the systems to contain and suppress fires with no active fire response necessary from HFD.

Thank you for your attention to this matter; please feel free to call me directly at (808) 441-2127 if you have questions or need additional information.

Sincerely,

Group 70 International Inc., a Hawaii Corporation, dba G70

Paul T. Matsuda, PE, LEED AP
Principal

Attachments:
A. 2015 HFD Memorandum
B. 2020 07 28_HFD Minutes
C. Vegetation Management Plan

cc: Hawaii Wildlife Management Team
Julia Mancinelli, Innergex

ATTACHMENT A
2015 HFD MEMORANDUM

HONOLULU FIRE DEPARTMENT

CITY AND COUNTY OF HONOLULU

636 South Street
Honolulu, Hawaii 96813-5007
Phone: 808-723-7139 Fax: 808-723-7111 Internet: www.honolulu.gov/hfd

KIRK CALDWELL
MAYOR

MANUEL P. NEVES
FIRE CHIEF

LIONEL CAMARA JR.
DEPUTY FIRE CHIEF

September 28, 2015

Mr. Paul Matsuda, P.E.
Group 70 International
925 Bethel Street, 5th Floor
Honolulu, Hawaii 96813-4398

Dear Mr. Matsuda:

Subject: SunEdison Solar Farms
Fire Code Compliance for Ground-Mounted Solar Farms

In response to your memorandum dated September 2, 2015, regarding the above-mentioned subject, the Honolulu Fire Department approves the proposed approach to fire code compliance as outlined in your memorandum. Please note that this approval may be modified upon evaluating the proposed procedures or other factors that may impact fire safety.

Should you have questions, please contact Battalion Chief Terry Seelig of our Fire Prevention Bureau at 723-7151 or tseelig@honolulu.gov.

Sincerely,

Socrates D. Bratakos

SOCRATES D. BRATAKOS
Assistant Chief

SDB/SY:bh

RECEIVED

OCT - 1 2015

GROUP 70 INTL

MEMORANDUM

Group 70 International, Inc. • Architecture • Planning & Environment • Civil Engineering • Interior Design • Technolog
925 Bethel Street, Fifth Floor • Honolulu, Hawai'i 96813-4398 • PH: (808) 523-5866 • FAX: (808) 523-5874

GROUP 70 INTERNATIONAL

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Christine Mendes Ruotola, AICP LEED AP
James L. Stone, AIA, LEED AP
Katherine M. MacNeil, AIA, LEED AP
Tom Young, MBA, AIA
Paul T. Matsuda, PE, LEED AP
Ma Ry Kim, RIBA, ARB

OF COUNSEL
Ralph E. Portmore, FAICP

TO: Honolulu Fire Department
City and County of Honolulu
636 South Street
Honolulu, HI 96813

ATTENTION: Fire Chief Manuel P. Neves

DATE: September 2, 2015

PROJECT: SunEdison Solar Farms

PROJECT NO: See Table 1

EMAIL:

NO. OF PAGES: 4

SUBJECT: Fire Code Compliance for Ground-mount Solar Farms

PROJECT OVERVIEW:

SunEdison has been working closely with HECO, landowners, and City and State agencies for the past few years on entitlements and permitting for several large, utility scale projects on Oahu. These projects are being developed in conjunction with HECO and originated through a competitive bid which was solicited and awarded to several different companies. In total, SunEdison is working on four large solar farm projects at various locations on Oahu. Three of these projects were previously submitted for building permit approval and the fourth will be submitted by the end of 2015. The projects are listed below.

Table 1 – SunEdison Solar Farm Projects

Project Name	TMK	MW	Acres	Building Permit Application No.	DPP File No.
Mililani I and II	9-4-005: 090,091,092,096 &079	35	354.6	A2015-06-0495	2015/CP-028
Waipio*	9-5-003:004	47	309	A2015-06-1383	2015/CP-137
Waiawa	9-4-006: 034, 035,036,037 & 9-4-004: 024, 025,026	50	211	A2015-07-1063	2015/CP-090
Kawailoa	6-1-006:001 & 6-1-005:001	68	384.1	n/a	n/a

* Waipio Solar Farm was a First Wind project before First Wind was acquired by SunEdison.

The projects are all ground mounted, photovoltaic energy projects. Each project uses different types and models of solar rack systems and electrical equipment. However, in terms of layout and application of fire code, the solar farms are similar.

PURPOSE OF MEMORANDUM

We are requesting review and confirmation of the proposed approach to fire code compliance as outlined in this memorandum so that the design and response to comments for code compliance can be consistently applied to each project.

PERMIT REVIEW COMMENTS

HFD review comments were received for the three open building permits. It is our understanding that although NFPA 2006 is the adopted code, the projects are being reviewed using NFPA 2012, referenced below. The current NFPA 2012 contains specific requirements for ground mounted solar farms which are not part of the 2006 code.

Comments are generally consistent between the reviews and are summarized below with reference to the applicable NFPA 2012 section:

1. Fire Safety Notes – Notes related to code requirements for PV Solar Farms including Retention of Plans shall be included on plans
2. Access to PV Solar Farm required by NFPA 18.2.2
3. PV Solar Farms must comply with NFPA 11.12.3
    a. Clearance around PV Solar Farm required by NFPA 11.12.3.1
    b. Noncombustible Base around and under PV Solar Farm required by NFPA 11.12.3.2
    c. Security Barriers required by 11.12.3.3
4. Clarify and clearly state on plans whether the Control Building is classified as a structure or a building.
5. Indicate battery type and battery electrolyte amount on plans.

Item #1 – Fire Safety Notes

The following notes are consolidated from the three separate reviews and will be added to each permit set.

Fire Safety Notes

- 16.1.1 Structures undergoing construction, alteration, or demolition operations, including those in underground locations, shall comply with NFPA 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations, and this chapter. 2006 NFPA 1.
- 11.12.1 New photovoltaic systems shall be installed in accordance with NFPA 1 2012 Section 11.10, Section 11.12 and NFPA 70.
- 11.12.3 Ground-Mounted Photovoltaic System Installations. Ground-mounted photovoltaic systems shall be installed in accordance with 11.12.3.1 through 11.12.3.3.
- 11.12.3.1 Clearances. A clear area of 10ft around ground-mounted photovoltaic installations shall be provided.
- 11.12.3.2 Noncombustible Base. A gravel base or other non-combustible base acceptable to the AHJ shall be installed and maintained under and around the installation.
  Though dirt with minor growth is not considered noncombustible, the AHJ might approve dirt bases as long as any growth is maintained under and around the installation to reduce the risk of ignition from the electrical system. This could be a serious consideration for large ground-mounted photovoltaic systems. Not only should the base be considered under the systems, but also around the systems to the point that the risk of fire from growth or other ignition sources will be reduced.
- 11.12.3.3 Security Barriers. Fencing, skirting, or other suitable security barriers shall be installed when required by the AHJ.
- Sec. 18-5.2 Retention of Plans - One set of approved plans, specifications, and computations shall be retained by the building official for a period of not less than 90 days from date of completion of the

work covered therein, and one set of approved plans shall be returned to the applicant, and said set shall be kept on the site of the building or work at all times during which the work authorized thereby is in progress. (sec. 18-5.2 R.O. 1978 (1983 Ed.); Am. Ord. 93-59)

- 18.2.2.1 Access Boxes. The AHJ shall have the authority to require an access box(es) to be installed in an accessible location where access to or within a structure or area is difficult because of security.
- 18.2.2.2 Access to Gates Subdivisions or Developments. The AHJ shall have the authority to require fire department access be provided to gates subdivisions or developments through the use of an approved device system.
- 18.2.2.3 Access Maintenance. The owner or occupant of a structure or area, with required fire department access as specified in 18.2.2.1 or 18.2.2.2, shall notify the AHJ when access is modified in a manner that could prevent fire department access.

ITEM #2 – Access

Access notes will be added to the Building permit plans and access and security will be coordinated with HFD. The solar farm perimeter is secured, access is limited, and lock boxes will be in place to limit access to SunEdison personnel, security and HFD.

ITEM # 3 – NFPA 11.12.3 – Ground-mounted PV Solar Farms

NFPA 2012 code requires ground-mounted photovoltaic systems shall be installed in accordance with 11.12.3.1 through 11.12.3.3. Specific code sections with Annex A supplemental information are listed below with proposed compliance.

11.12.3.1 Clearances. A clear area of 10 ft (3048 mm) around ground-mounted photovoltaic installations shall be provided.*
A.11.12.3.1 The zoning regulations of the jurisdiction setback requirements between buildings or property lines, and accessory structures may apply.

- All sites will have a minimum 10′ clear space between the edge of the solar array and the perimeter fence and a 10′ area outside the fence that vegetation will be maintained to a height between 6″ and 18″ that will serve as a fire break.

11.12.3.2 Noncombustible Base. A gravel base or other non-combustible base acceptable to the AHJ shall be installed and maintained under and around the installation.*
A.11.12.3.2 Though dirt with minor growth is not considered noncombustible, the AHJ might approve dirt bases as long as any growth is maintained under and around the installation to reduce the risk of ignition from the electrical system. This could be a serious consideration for large ground-mounted photovoltaic systems. Not only should the base be considered under the systems, but also around the systems to the point that the risk of fire from growth or other ignition sources will be reduced.

- SunEdison will reduce fire risk under and around the installation by implementing the following:

A. All trees and shrubs will be removed from the site and a dirt base will be maintained around the installation with vegetation maintained to a height between 6″- 18″. This would be well below the lower edge of the equipment, which is approximately 36″. Section *A.11.12.3.2* acknowledges that “dirt with minor growth” could be approved as a “consideration for large ground-mounted systems.” Vegetation will be maintained by rotational mowing and/or grazing sheep or other livestock.

Continual vegetation management is required for normal operations to ensure the solar arrays are operating at maximum capacity.

B. The DC conductors from the combiner boxes to the inverters will be buried. All transitions to above ground equipment will be done inside PVC conduit. Inverters and other large electrical equipment including the substation will be mounted on concrete or gravel surfaces.

C. To assist in the vegetation abatement at all sites except Waiawa, SunEdison intends to also use the property for the pasturage of sheep. A condition of the Special Use Permits, issued by the State Land Use Commission (LUC) on March 25, 2015 for Waipio and June 29, 2015 for Kawailoa, requires that these projects make the site, including areas under PV panels, available for compatible agricultural use. Through studies and testimony submitted to the LUC, the SUP decision noted that sheep grazing around and under the panels limits vegetation growth and provides food in the form of lamb meat. The sheep will serve a dual purpose in that they will help to reduce vegetation growth as well as satisfy the requirements of the Special Use Permit. Sheep grazing is not a new idea to the solar industry and is a practice that has been used at a number of solar farms in Europe and the United States.

D. It is a standard O&M practice for SunEdison to consistently maintain all the vegetation surrounding equipment, solar or wind, to ensure the power facility functions in safe and efficient manner. In addition to the sheep grazing on the site, mechanical mowing will be accomplished by tow behind mowing equipment, and weed whackers. Mowing will bring the vegetation down to 4-6inches and will be cut typically once per month or as needed to keep growth below the maximum average height. Continual vegetation management is required for normal operations to ensure the solar arrays are operating at maximum capacity and to reduce the risk of any ignition by the electrical system.

11.12.3.3 Security Barriers. Fencing, skirting, or other suitable security barriers shall be installed when required by the AHJ.*
A.11.12.3.3 Security barriers are intended to protect individuals and animals from contact with energized conductors or other components.

- As required by section 11.12.3.3 of the NFPA 1, the project will have a fence along the perimeter of the site. Additionally, the high voltage substation and switchyards will be surrounded by a 8' security fence.

ITEM #4 – Control Enclosures

Control Enclosures – There are no buildings on any of the solar farm projects. There are enclosures and cabinets to protect inverters and other electrical equipment. These structures are not buildings and shall be labeled accordingly.

ITEM #5 – Battery
Battery type and battery electrolyte amount will be shown on applicable substation sheets.

VERY TRULY YOURS,

Paul T. Matsuda, P.E.

CC: **File**

ATTACHMENT B

FIRE CODE COMPLIANCE FOR GROUND MOUNT SOLAR FARMS

2020 07 28_MINUTES

CONFERENCE REPORT

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Honolulu, HI 96813
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TO:	Mr. Ricardo Zapata Honolulu Fire Department 1046 Young Street Honolulu, HI 96814		
FROM:	G70		
DATE:	July 28, 2020; 1:15-2:45pm	**LOCATION:**	HFD conference table
PROJECT:	Clearway Energy Group Solar Farms	**PROJECT NO:**	220020-01 MIL 220021-01 WAIA
SUBJECT:	Fire Code Compliance for Ground Mount Solar Farms	**NO. OF PAGES:**	2
THOSE PRESENT:	Ricardo Zapata (HFD) Michael Bungcayao (G70)		

DISCUSSION:

I. **Background –** G70 worked with HFD in 2015 to establish how NFPA 1 requirements for ground mount solar facilities would be applied on five solar farms on Oahu. A memorandum was submitted to HFD to document this process and HFD issued a letter that approved the approach outlined in the memorandum. A copy of the memorandum and letter were shared with HFD.

II. **Constructed Condition –** Mililani II was designed and constructed to conform with the approach outlined in the 2015 memorandum. The attached images were shared to present the constructed condition of Mililani II.
   a. **Overall Solar Farm –** Overall view of project from southern tip; looking north
   b. **Solar Block –** Zoomed in view of southern tip of project; looking north-northeast
      i. **G70 n**oted the gravel access, clear space around the perimeter of the facility and maintained vegetative growth.
   c. **Solar Block Zoom –** Zoomed in view of southern tip of project; looking west
   d. **Rack –** Backside of PV panels mounted on a rack.
      i. G70 noted the wiring is elevated above grade with minimum clear distance provided from vegetation.
   e. **Equipment Pad –** Typical, pad-mounted equipment enclosure
      i. G70 noted these are water-tight and elevated above surrounding grade. Gravel pads and additional clear width is provided around all equipment pads.
   f. **Substation and Switchyard –** looking southeast
      i. G70 noted the clear area around the substation/switchyard fencing, relatively small concrete foundations and gravel surface across the entire pad areas.
      ii. HFD noted the secondary containment visible in the project switchyard and G70 indicated that although dry transformers are proposed, secondary containment will be provided where required by code.
   g. **Proposed Mililani I Project Area** – Same as image #1 with the proposed Mililani I project area highlighted.

III. **NFPA 1 Section 11.12.3** – Ground-Mounted Photovoltaic System Installations
   a. G70 recognizes that although the 2012 edition of NFPA 1 is adopted, HFD is moving towards adoption of the 2018 edition.
      i. Changes in the 2018 edition in section 11.12.3 Ground-Mounted Photovoltaic System Installations is limited to a clarification that a vegetation management plan acceptable to the AHJ can be utilized if the project area is vegetated. This is in-line with the 2015

discussion with HFD that soil is the non-combustible base and vegetation is allowed on the soil if growth under and around the installation is maintained to reduce the risk of ignition from the electrical system.

b. Section 11.12.3.1 requires a 10’ clear area around ground-mounted photovoltaic installations. The proposed projects will provide a minimum 20’ clear space around the installation to meet/exceed the code requirement and to serve as a fire break.

c. Section 11.12.3.2 requires a vegetation management plan or noncombustible base acceptable to HFD be utilized. The proposed projects will have a vegetation management plan prepared that require maintenance of the vegetation beneath racks to maintain a height between 6”-18” tall to provide clear space from racks/panels and maintenance of the clear area around the installation to serve as a fire break.

d. Section 11.12.3.3 requires fencing or other suitable security barrier when required by HFD. The proposed projects will provide a perimeter fence around the facility and additional fencing around the substation, switchyard and battery storage areas.

IV. Mililani I and Waiawa Solar Farms – Site plans were shared and discussed for both proposed solar farms.

a. NFPA 1 Section 11.12.3 conformance – G70 noted conformance with the NFPA 1 requirements for Ground-mounted photovoltaic system installations.

b. Access

i. There are no occupied buildings proposed in the proposed projects and provision of fire water and access is not required by code.

ii. Although not designed specifically for HFD fire access, access routes into the site will be improved during construction to facilitate delivery of materials using large containers and low-boys (for substation equipment).

iii. The proposed equipment is specified/designed to contain a fire such that the fire will burn-out on its own and does not require active HFD response.

iv. The project owner (Clearway Energy Group; CEG) will prepare and coordinate an emergency response plan with HFD in the future. CEG also intends to implement regular training for HFD first responders for site-specific response at the proposed solar farms.

v. Lock boxes will be in place to limit access to CEG personnel, security and HFD.

vi. Notes will be provided on the proposed drawings that reference NFPA 1 Sections 18.2.2.1, 18.2.2.2 and 18.2.2.3 related to access boxes, access to developments and access maintenance.

c. **Batteries -** Battery storage areas will be provided in the proposed projects. Battery storage will be coordinated with HFD in a separate, follow-up meeting.


Image 1 - Overall Solar Farm (Mililani II)

Image 2 - Solar Block

Image 3 - Solar Block Zoom

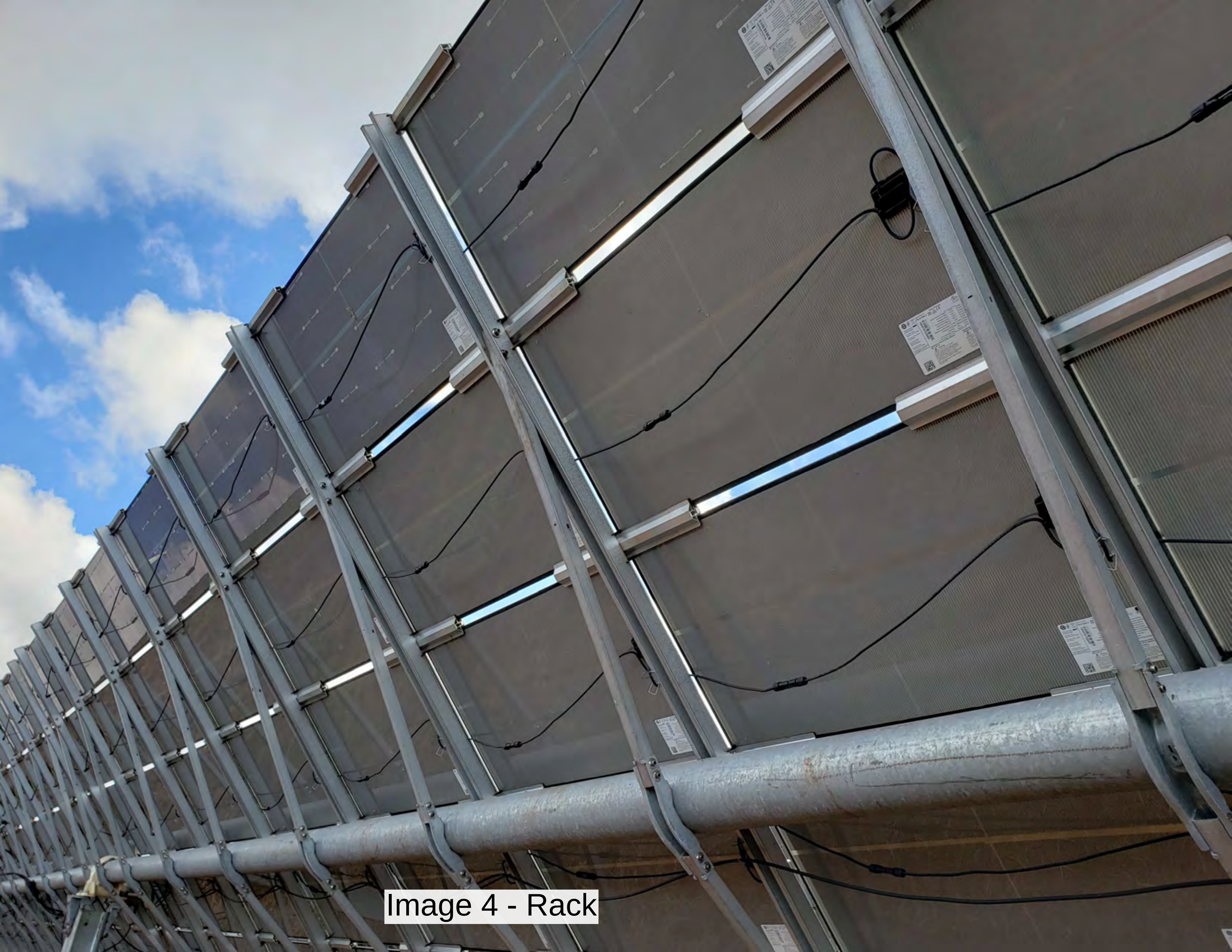


Image 4 - Rack

Image 5 - Equipment Pad

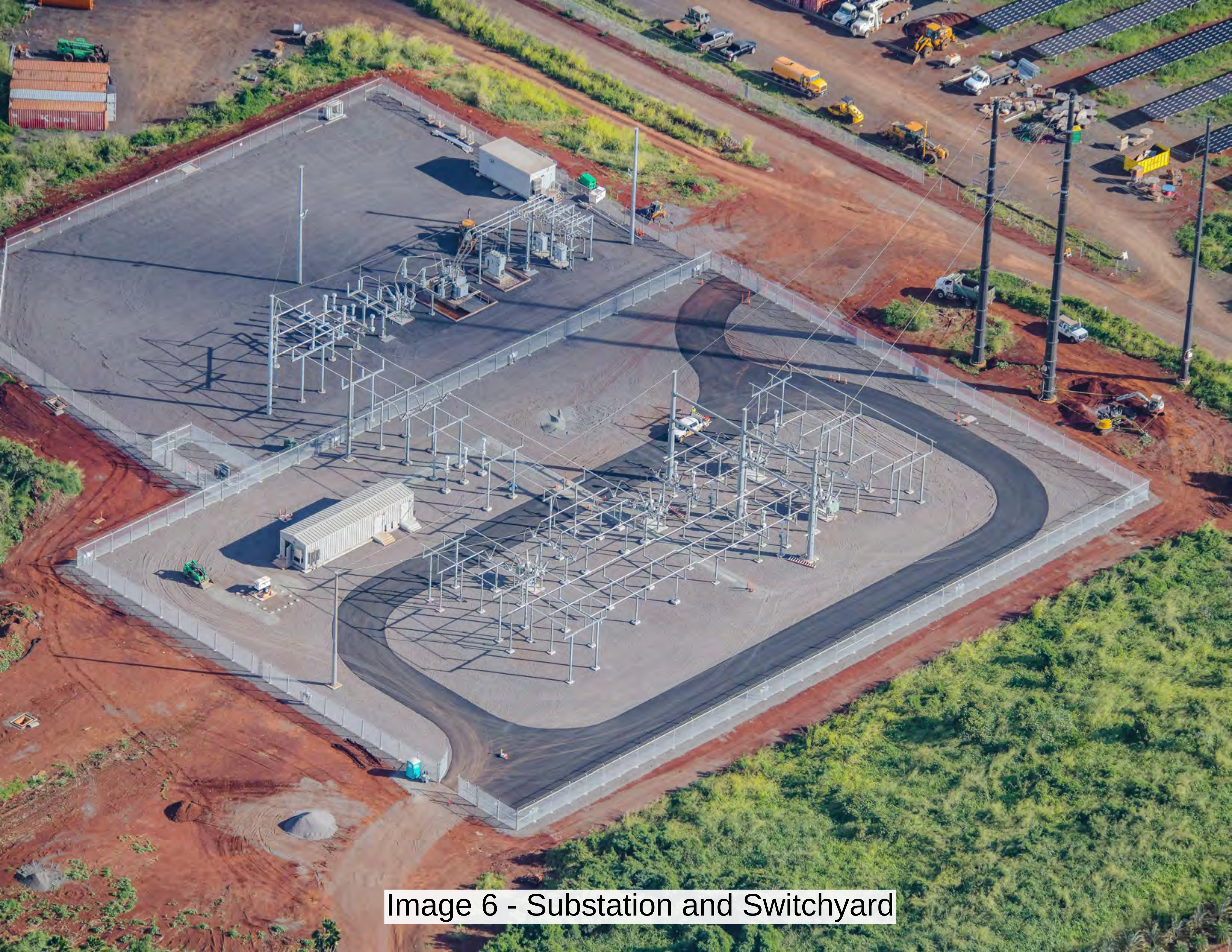


Image 6 - Substation and Switchyard

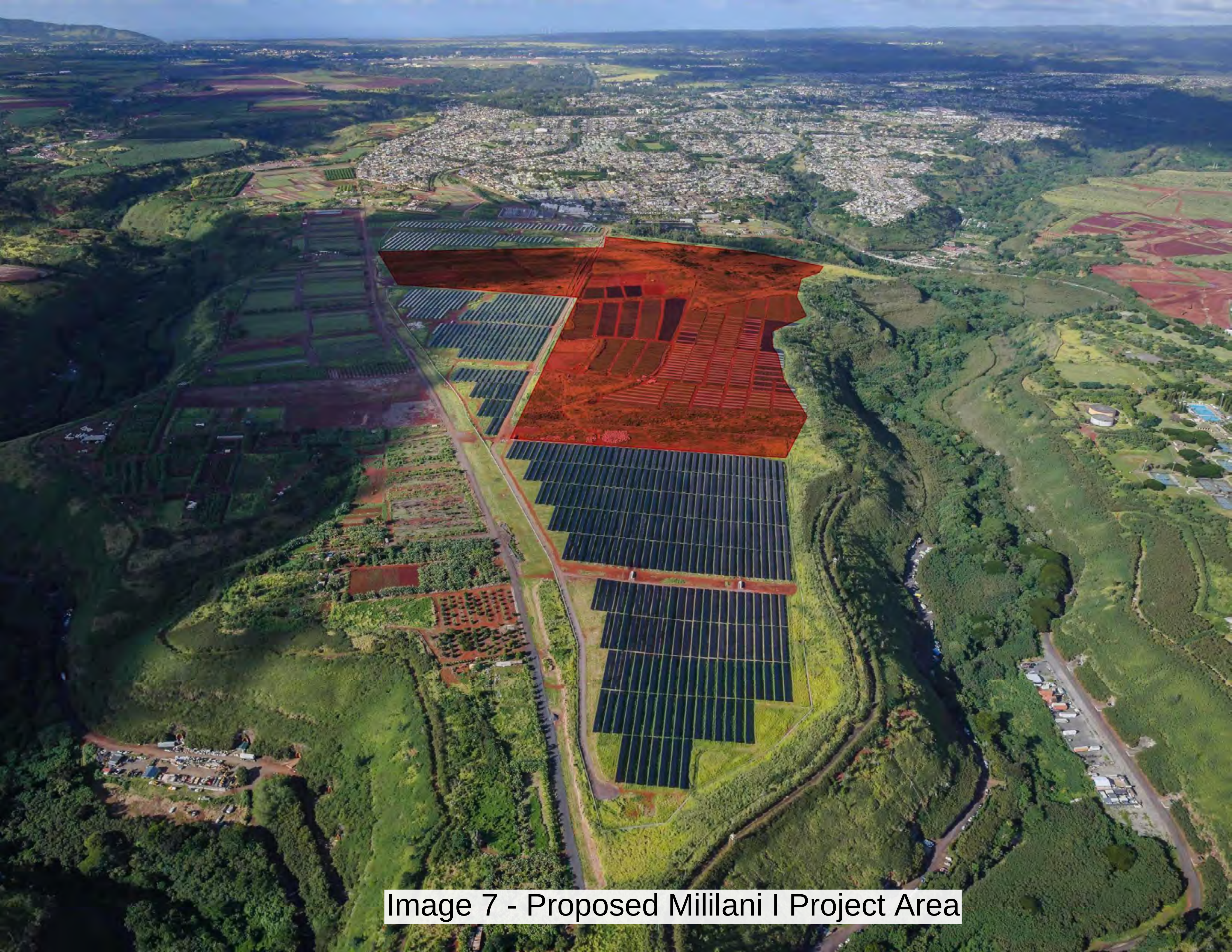


Image 7 - Proposed Mililani I Project Area

ATTACHMENT C

BARBERS POINT SOLAR PROJECT VEGETATION MANAGEMENT PLAN

BARBERS POINT SOLAR PROJECT

VEGETATION MANAGEMENT PLAN

Effective Date: November 2021
Expiry Date:

Original signed by:

APPROVED BY:

Environment Manager

APPROVED BY:

Operations Manager

Revision History

Revised by	Revision Date	Summary of Revision
O.Robson	12-July-2021	Draft version for review
L. McClain	23-Nov-2021	Edits based on Draft EA comments

Contents

1. OBJECTIVE

This operating Vegetation Management Plan describes the vegetation management program at the Barbers Point Solar Project.

The objective of the vegetation management program is to:

- Manage the site vegetation which can grow under and around the modules, fall on power lines and damage infrastructure.
- Establish and maintain fire and fuel breaks.
- Reduce the amount of vegetation to decrease wildfire hazards.
- Meet requirements established with the Oahu Fire Department and NFPA 1 (2018) requirements.

2. PROCEDURE

2.1 Vegetation Survey

A physical vegetation survey assessment of the Barbers Point Solar Project, including generation transmission (gen-tie) right-of-way, will be completed at least twice a year to monitor for vegetation clearances and monitor for wildfire hazards. The survey will be conducted by the Site Operations Manager (SOM) and will follow guidance standards as indicated in Section 2.3.

The survey will be used to assess the frequency of upcoming vegetation maintenance and identify areas that may need additional attention and will be used to create a Vegetation Maintenance Work Plan. The Vegetation Maintenance Work Plan will be a living document that will be updated in order to meet the objectives of this document.

Observations during the survey will include:

- Location
- Species
- Estimated growth rate
- Abundance
- Clearance / Setbacks
- Risk of fire hazard

In accordance with the Barbers Point Solar Project's environmental education and observation program, the vegetation survey will also document any observations of the endangered ʻakoko plant (*Euphorbia skottsbergii* var. *skottsbergii*), which is known to occur adjacent to the project area. If ʻakoko is found in the project area during operations, vegetation control activities would follow the recommended buffer distances by USFWS (https://www.fws.gov/pacificislands/articles.cfm?id=149489721) until further consultation with USFWS and Hawaiʻi DOFAW is coordinated (e.g., no mowing would occur within 20 feet of ʻakoko plants, and no hand application of herbicide would occur within 10 feet of ʻakoko plants).

2.2 Vegetation Maintenance Work Plan

Barbers Point Solar will create and implement the Vegetation Maintenance Work Plan based on the ground survey. The work plan shall include the method to be used for vegetation control and should be flexible to adjust to any changing site conditions as they arise. The work plan shall take into consideration the anticipated growth of vegetation, combustion risk, and all other environmental factors that may have an impact on the reliability of the Barbers Point Solar Project. Any adjustments to the work plan shall be documented as they occur. Barbers Point Solar will track the planned vegetation management work to ensure that it is completed according to the work specification.

Barbers Point Solar will also monitor the site vegetation on a monthly basis coinciding with each scheduled monthly maintenance cycle to ensure vegetation clearances and growth falls within the expected rates. Scheduled vegetation maintenance may be updated based on the observations.

Barbers Point Solar intends to generally subcontract the vegetation maintenance activities, however self-performance may be incorporated as required.

2.3 Vegetation Setbacks and Maintenance Requirements

Re-vegetation:

- Un-stabilized areas within the arrays and fire breaks will be revegetated with grass species that are currently found throughout the site or non-invasive grass species that already occur on Oʻahu. A weed-free seed mix will be designed to assist with quick establishment to reduce dust and sediment and erosion issues while adding native species that do well in dry environments.

Fire Breaks:

- All fire breaks, defined as a gap in combustible materials or maintained vegetation below 6 inches in height or cut to the appropriate height as recommended following the vegetation survey.
- All fire breaks will be 30 feet around any array block as shown in grey in Figure 2 below. This fire break can include a 10-foot buffer on the outside of the fence line.
- Removal of all wood debris, slashing, trees and shrubs.
- Branches and limbs overhanging the fire break will be trimmed to 8 feet above the ground.
- Danger trees and dying growth outside the perimeter fence will be assessed to minimize fuel loading falling within the fire break.
- Site access roads, with an approximate 20-foot width, will provide additional fire breaks.
- Vegetation will be cleared to a maximum of 10 feet on the outside of the fence line as required to maintain the fire break.

Solar Arrays:

- Vegetation will be maintained to a height of 18-inches and provide a minimum of 24-inch clear distance to any exposed electrical cables. Exposed electrical wires should be running under the solar panels at the midpoint or higher than the center of the panel.
- A 50-foot separation distance free of equipment will be provided between array blocks.

PV Coupled Battery Energy Storage System (PV-Coupled-ESS) Units:

- Vegetation will be removed within 10-foot perimeter of the PV-Coupled ESS Units (combines battery energy storage and step-up transformer) pads. Gravel or similar noncombustible base shall be present.

Project Collector Substation:

- Vegetation will be removed from inside the project collector substation fence line. Gravel or similar noncombustible base shall be used.
- The Main Power Transformer will be located within the project collector substation and will have its own concrete containment base.

Generation-Transmission (gen-tie) line:

- Vegetation may not exceed 8-feet in height under the gen-tie line right-of-way.
- Danger trees will be removed.

Retention Basins:

- Keep retention areas free of emergent vegetation to avoid attracting listed waterbirds.
- Maintain vegetation along the perimeter of the retention areas as low as possible to discourage listed waterbirds from nesting.

2.4 Vegetation Control

The Vegetation Maintenance Work Plan will be followed during operation of the Project to ensure that vegetation does not grow in a manner that blocks or reduces solar radiation reaching the solar panels and reduce the risk of starting a fire. Vegetation control will employ Best Management Practices (BMPs) and techniques that are most appropriate for the local environment based on factors such as compatibility with grazing and existing land operations and preventing runoff – thus reducing the need to use chemical herbicides. BMPs may include physical vegetation control such as mowing and shredding or introduction of a non-invasive plant species that are low growing.

In rare circumstances where it is necessary to use herbicides, an effort will be made to minimize use and only apply bio-degradable, EPA-registered, organic solutions that are non-toxic to wildlife. Sustainable, long-term management practices and the promotion of healthy biodiversity within local ecosystems is a priority. Any herbicides used for vegetation management the site will be selected and used in a manner that fully complies with all applicable laws and regulations and in accordance with label instructions.

Although non-native weedy species are common in the Project Area, implement invasive species minimization measures to avoid the unintentional introduction or transport of new invasive species to the area. This includes utilizing on-site gravel, rock, and/or soil when practicable, purchasing raw materials (e.g., gravel, rock, soil) from a local supplier when practicable; utilizing certified, weed-free seed mixes; and washing and/or visually inspecting (as appropriate) construction materials or equipment arriving from outside Maui for excessive debris, plant materials, and invasive or harmful non-native species. Consult with Oahu Invasive Species Committee (OISC) if needed.

Avoid trimming or removing woody vegetation (trees or shrubs) taller than 15 feet between June 1 and September 15, when juvenile bats are not yet capable of flying and may be roosting in the trees, resulting in the potential to be impacted. If some trimming or removing woody vegetation taller than 15 feet is necessary between June 1 and September 15, consultation with USFWS and DOFAW is required to ensure impacts to the Hawaiian hoary bat are avoided.

If the endangered ʻakoko is found in the Project area during operations, vegetation control activities would follow the recommended buffer distances by USFWS until further consultation with USFWS[1] and DOFAW is coordinated (e.g., no mowing would occur within 20 feet of ʻakoko plants, and no hand application of herbicide would occur within 10 feet of ʻakoko plants).

Mechanical means of vegetation control will include options as noted below.

- Mowing (preferred method, where terrain permits) using mower decks similar to the Van Wamel Series RF Rotary mower with swingarm capable of reaching under arrays and trimming around posts.
- Handheld brushing and line trimmers (limited access areas).
- Slashing (preferred method for low growing established plant community areas).
- Pruning (where a tree or higher growing vegetation is to be retained).
- Hazard tree removal.

Grazing livestock on solar farms is becoming a popular method of weed abatement and controlling grass. Sheep can be effective and are already being utilized on other utility-scale projects in Hawaiʻi and may be considered at the Barbers Point Solar Project, however it would not be considered the primary means of vegetation control.

2.5 Training

Each person will be provided a comprehensive Barbers Point Solar Project Orientation before commencing any work at site. The material at a minimum will cover topics such as a general overview of the project, hazard analysis, emergency response, environmental education and observation, archaeological and cultural, and vegetation management (as outlined in this document).

The environmental education and observation program will help to identify state or federally-listed threatened, endangered, or otherwise rare plants or animals that may be found on-site (including pueo, Hawaiian hoary bat, seabirds, waterbirds, and ʻakoko) and to take appropriate steps if listed wildlife (including downed listed wildlife) are found, especially during vegetation management activities.

2.6 Contacts

If any questions or concerns arise with regards to the Vegetation Management Plan, the following personal may be contacted:

[1] https://www.fws.gov/pacificislands/articles.cfm?id=149489721

POSITION	NAME	EMAIL	PHONE
Barbers Point Solar Operations Manager	TBD	TBD	TBD
Innergex Environmental Manager	TBD	TBD	TBD

3 SITE LOCATIONS- COORDINATES

The Barbers Point Solar Project is located in east Kalaeloa (east of the Kalaeloa Airport) in the ‘Ewa District, on the island of Oahu. The Project will be located within a 163-acre Study Area and is bordered by Tripoli Road to the south, Coral Sea Road to the west, the Barbers Point Golf Course to the east, and vacant land and Roosevelt Ave/Geiger Road on the north. The Project will be primarily located on tax map keys (TMK) 9-1-013:038 and 9-1-013:040, which are owned by Department of Hawaiian Home Lands (DHHL). Project electrical collector and transmission lines will also be located within rights-of-way owned by Hawai‘i Department of Transportation (HDOT) (Coral Sea Road and Roosevelt Avenue), as well as within a portion of TMK 9-1-016:027 (owned by Kapolei Infrastructure, LLC). See Figure 1.

The site’s main coordinates are as follows:

20°57'12.34"N **156°39'0.65"W**

The solar PV system would include a series of panels arranged into arrays consisting of evenly-spaced rows. The panels would be mounted on a racking system installed on posts. The Project’s solar arrays will include three areas: Area 1 in the northern portion of TMK 9-1-013:038 (north of intersection of Bismarck Sea Road and Tripoli Road), Area 2 in the southern portion of TMK 9-1-013:038 (north of San Juancinto Road), and Area 3 located on TMK 9-1-013:040 (borders the intersection of Coral Sea Road and Tripoli Road).

The photovoltaic coupled battery energy storage system (PV-Coupled ESS) and collector lines will be distributed across the Project area. The PV-Coupled ESS includes a self-contained standalone unit that incorporate several layers of protection to avoid failures, to contain potential hazardous substances, and to prevent fires. A Project collector substation will be constructed on TMK 9-1-013:038 where a 1.5 mile generation-tie line (combination of overhead and underground line) will extend north along Coral Sea Road and transition to the existing Hawaii Electric overhead transmission line.

Access to Areas 1 and 2 on TMK 9-1-013:038 will be provided by a new driveway off Coral Sea Road. This driveway will be located within an existing HDOT ROW associated with Roadway Lot 13083. Access to the DHHL parcel 9-1-013:40 is currently via an existing driveway on Coral Sea Road. Access within the Project’s two solar array parcels will be provided through a network of existing and new onsite access roads.

Figure 1: Location

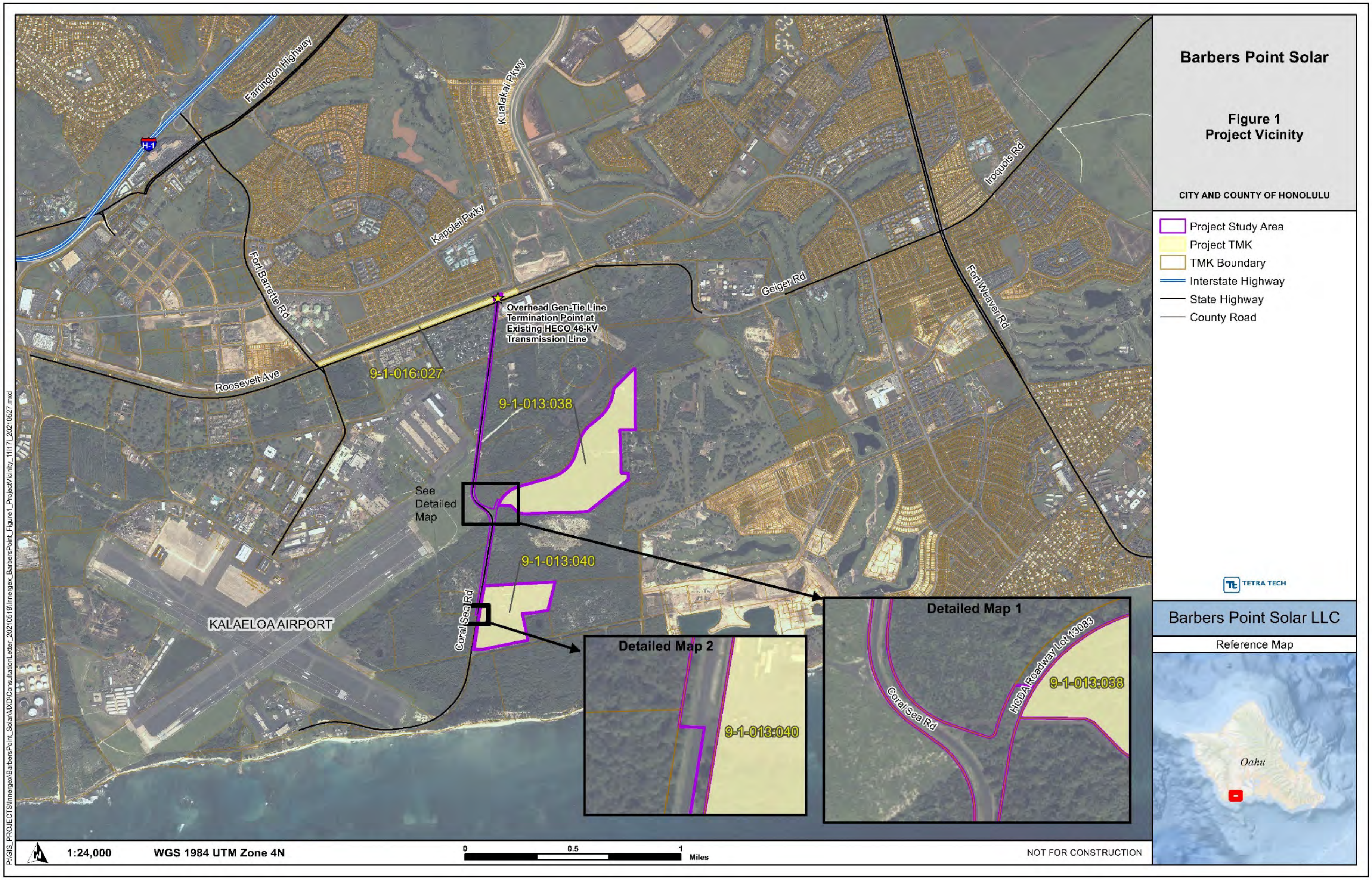
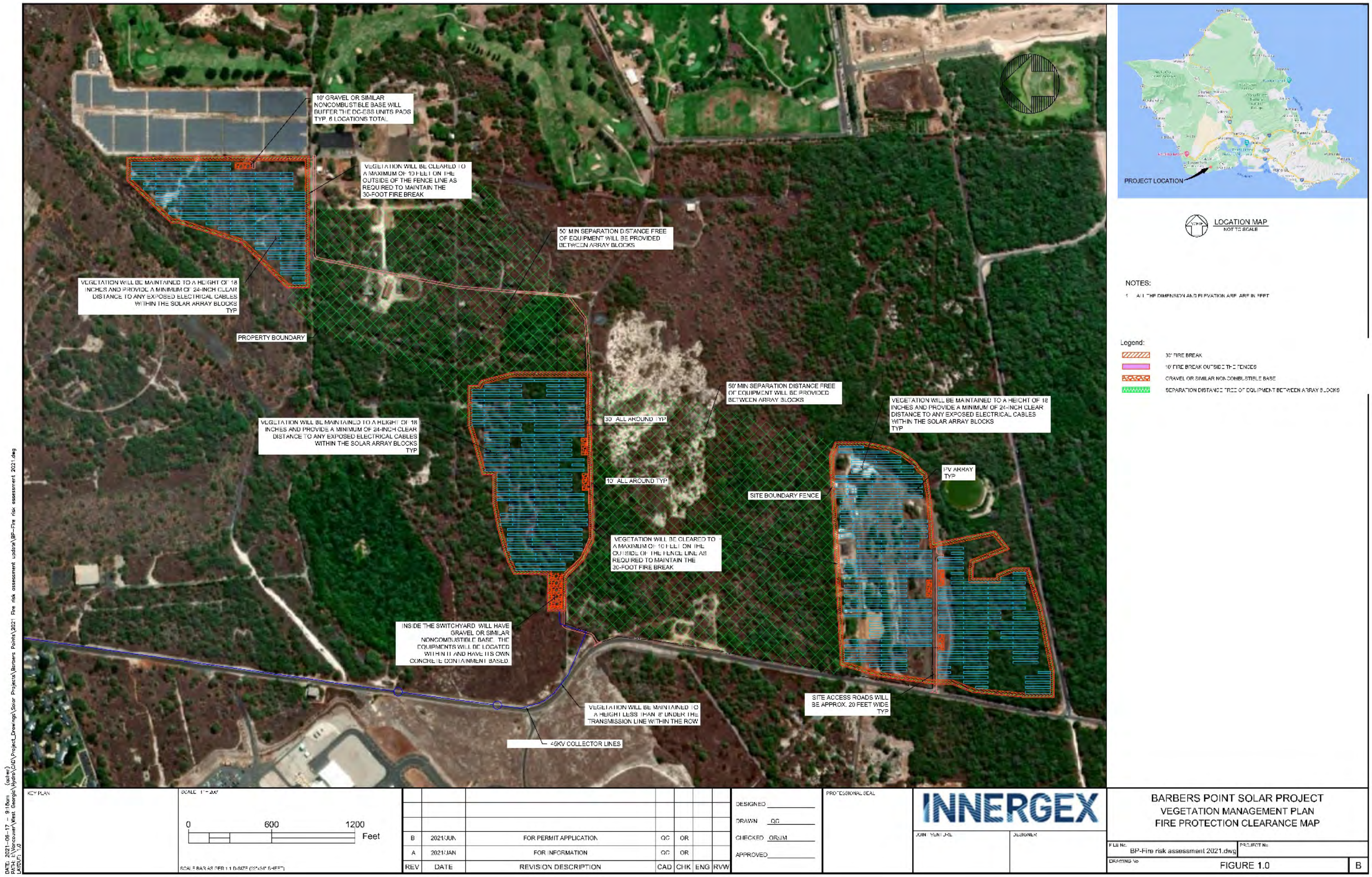


Figure 2: Fire Protection Clearance Map



APPENDIX C. BIOLOGICAL RESOURCES SURVEY REPORT AND SUPPLEMENTAL ‘AKOKO SURVEY

Barbers Point Solar Project

Revised Biological Resources Survey Report

Prepared for:

Barbers Point Solar, LLC

Revised November 2021

TETRA TECH

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1.0 Introduction

Barbers Point Solar, LLC is proposing to build and operate the Barbers Point Solar Project (Project) located in east Kalaeloa, ʻEwa District, on the Island of Oʻahu. The Project will consist of a 15-megawatt (MW) solar photovoltaic system coupled with a 15 MW, 4-hour (60MWh) photovoltaic-coupled battery energy storage system (PV-Coupled ESS) located within an approximately 163-acre (66-hectare) Study Area (Figure 1). The Project will be primarily located on tax map keys (TMK) 9-1-013:038 and 9-1-013:040, which are owned by Department of Hawaiian Home Lands (DHHL). Project electrical transmission lines will also be located within rights-of-way owned by Hawaiʻi Department of Transportation (HDOT) (Coral Sea Road and Roosevelt Avenue, and Roadway Lot 13083-B) as well as within a portion of TMK 9-1-016:027 (owned by Kapolei Infrastructure, LLC).

Tetra Tech, Inc. (Tetra Tech) was contracted by Barbers Point Solar, LLC to conduct biological surveys for the Project. The purpose of the surveys was to characterize the existing plant and animal habitat and determine whether state or federally-listed endangered or threatened species (pursuant to the federal Endangered Species Act or Hawaiʻi Revised Statutes [HRS] Chapter 195D), or otherwise rare plants or animals have the potential to occur and could be impacted by construction or operation of the Project. This report summarizes the results of the various biological surveys conducted by Tetra Tech in June 2020, August 2020, October 2020, November 2020, April 2021, and May 2021. The April 2021 survey consisted of a supplemental wet season survey for the endangered ʻakoko (*Euphorbia skottsbergii* var. *skottsbergii;* formerly *Chamaesyce skottsbergii* var. *skottsbergii*) within portions of the Study Area and areas adjacent to the Study Area; the complete results of the wet season ʻakoko survey are provided in a separate report (Tetra Tech 2021).

<u>Project Description</u>

The Project consists of construction and operation of a 15-megawatt (MW) solar photovoltaic system coupled with a 15 MW, 4-hour (60 MWh) PV-Coupled ESS as well as related interconnection and ancillary support infrastructure. The major infrastructures of the Project will include the following:

1. Solar photovoltaic system;
2. Direct current electrical collector lines;
3. Power conversion systems including PV-Coupled ESS units and step-up transformers;
4. Alternating current (AC) electrical collector lines;
5. Project collector substation;
6. A generation-tie line (combination overhead and underground);
7. Communication equipment;
8. Access roads and fencing; and
9. Temporary laydown areas.

The 46-kilovolt generation-tie line would extend approximately 1.1 miles (1.7 km) from the Project collector substation to connect into the Hawaiian Electric Company grid.

It is anticipated that Project construction and commissioning would require approximately 12-15 months. Based on the Projects Power Purchase Agreement (PPA) with Hawaiian Electric Company, Inc., the Project is expected to operate for approximately 25 years. At that point in time, the Project may be repowered under a renegotiated PPA or other contract (with subsequent permits/approvals) or decommissioned. Decommissioning will involve removal of all equipment associated with the Project and returning the area to substantially the same condition as existed prior to Project development. Decommissioning will include the recycling of materials demolished or removed from the site to the extent feasible.

2.0 Description of Study Area

As shown in Figure 1, the Study Area encompasses approximately 163 acres (66 hectares) on the ʻEwa Plain in east Kalaeloa (Barbers Point) on Oʻahu. It extends from Tripoli Road on the south to Roosevelt Avenue on the north. The Study Area includes four main sub-areas referred to as Area 1, Area 1x, Area 2 (all located on TMK 9-1-013:038), and Area 3 (located on TMK 9-1-013:040), as well as linear areas for access roads, collector lines, and a generation-tie line (Figure 1). The Project will primarily be located on two TMKs (9-1-013:038 and :040), which are owned by DHHL. Project electrical transmission lines (overhead and underground generation tie-line and AC electrical collector lines) will also be located within rights-of-way owned by HDOT (primarily Coral Sea Road from Casablanca Street to Roosevelt Avenue) and as well as within a portion of TMK 9-1-016:027 (owned by Kapolei Infrastructure, LLC).

The Study Area is located within the former Naval Air Station Barbers Point (NASBP), which was established in 1942 and closed in 1999, and was utilized for military purposes. Currently, the majority of the Study Areas is vacant, but portions of the Study Area are leased to tenants for commercial and agricultural purposes. There are large cleared areas, concrete and asphalt paved areas, as well as debris, bunkers, aircraft revetments and associated structures, and abandoned vehicles and equipment in the Study Area.

Notable land uses in the vicinity include: Honouliuli Wastewater Treatment Plant to the north, Kalaeloa Airport (or John Rodgers Field) to the west, Kalaeloa Heritage Park to the west, Kalaeloa Renewable Energy Park to the east, Barbers Point Golf Course to the east, Barbers Point Stables to the east, Ordy Pond to the east, and the Navy’s former Northern Trap and Skeet Range and Southern Trap and Skeet Range to the north and east of Area 3.

1:14,000 WGS 1984 UTM Zone 4N

0 0.25 0.5 Miles

NOT FOR CONSTRUCTION

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Barbers Point Solar

Figure 1
Study Area and Vicinity

CITY AND COUNTY OF HONOLULU

- Study Area
- TMK Boundary
- Road

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Barbers Point Solar LLC

Reference Map

2.1 Climate

The climate in the Study Area is characterized as arid and sunny. According to the Online Rainfall Atlas of Hawaiʻi (Giambelluca et al. 2013), the area receives a mean annual rainfall of approximately 21 inches (530 millimeters [mm]). Rainfall is typically highest in November-January and lowest in June-July (Giambelluca et al. 2013). Monthly rainfall totals for the two closest National Weather Service (NWS) rainfall gages during the survey periods are shown in Table 1. The Kalaeloa Airport (HJR) station is the closest station to the Study Area, roughly 0.8 miles (1.9 km) to the west. Because the HJR station was not functional for most of 2020, data from the ʻEwa Beach Pacific Tsunami Warning Center (PTWC) station (roughly 3.8 miles [6.1 km] to the southeast) is also provided. The year-to-date total for the PTWC station from January–June 2020 was above average (140 percent of normal), suggesting conditions were slightly wetter than normal during the June 2020 biological surveys. The year-to-date total for the HJR station from January–May 2021 was below average (73 percent of normal), suggesting conditions were slightly dry during the 2021 surveys (NWS 2021).

Table 1. Monthly Rainfall Totals Collected at the HJR and PTWC Stations between January 2020 and May 2021

Year/Month	Rainfall (Inches)	
	HJR Station	PTWC Station
January 2020	N/A	1.60
February 2020	N/A	1.09
March 2020	N/A	4.56
April 2020	N/A	3.45
May 2020	N/A	0.29
June 2020	N/A	0.11
July 2020	N/A	0.76
August 2020	N/A	0.00
September 2020	N/A	0.24
October 2020	3.10	2.42
November 2020	0.35	0.28
December 2020	0.10	0.63
January 2021	1.10	2.33
February 2021	1.22	1.99
March 2021	3.12	5.75
April 2021	0.43	0.80
May 2021	0.22	0.08

Source: NRCS 2021.

Note: Months when biological surveys were conducted are highlighted in in grey.

2.2 Topography, Geology, and Soils

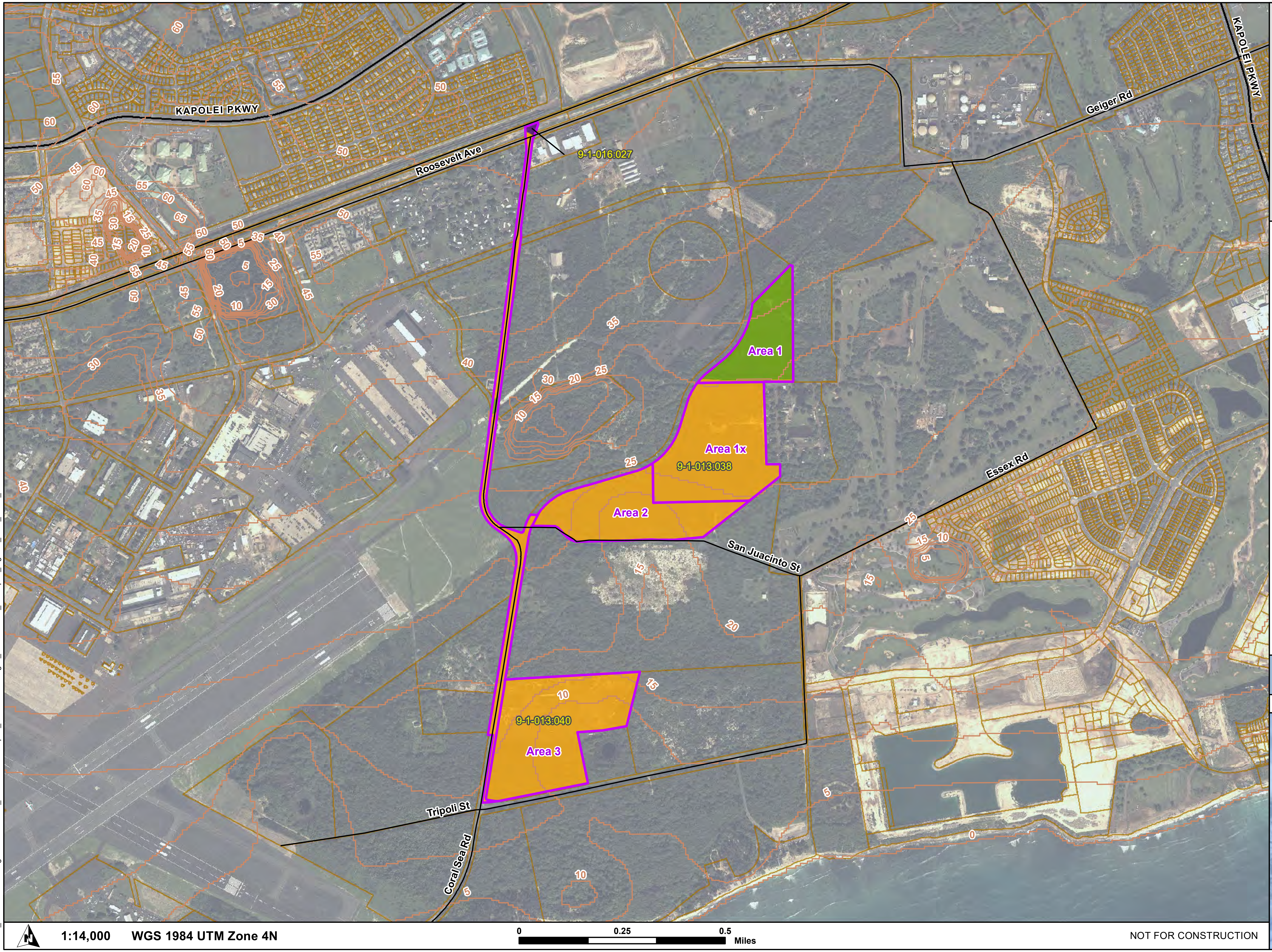
The topography of the Study Area is gently sloping in a south-westerly direction with elevations ranging between about 50 feet (15 m) above mean sea level (amsl) near Roosevelt Avenue on the north to about 10 feet (3 m) above amsl at the southwestern extent of the Study Area. Within the Study Area the topography is uneven due to numerous coral reef limestone outcroppings and sinkholes (also referred to as limestone pits) scattered throughout the area. Sinkholes are openings in the surface created by rainwater corroding the coral ground surface (Ziegler 2002).

Soil cover across the Kalaeloa area consists of a thin layer of friable, red material present in cracks and crevices on coral outcrop. The Natural Resources Conservation Service (NRCS) identifies three soil types in the Study Area (NRCS 2019). Approximately 87 percent of the Study Area is identified as coral outcrop (Figure 2). The northern portion of the Study Area (Area 1) is defined as fill land, mixed. A small portion of the Study Area near Roosevelt Avenue is classified as Mamala stony silty clay loam, 0 to 12 percent slopes (Figure 2).

2.3 Hydrology

The Study Area is within the Kaloʻi watershed (CWRM 2008). No perennial streams or wetlands are present in the Study Area according to the U.S. Fish and Wildlife Service (USFWS) National Wetlands Inventory (NWI) data (NWI 2019), the U.S. Geological Survey (USGS) topographic and National Hydrography Dataset (NHD) (2020), and the State of Hawaiʻi Division of Aquatic Resources (DAR) dataset (DAR 2008) (Figure 3). Although not located in the Study Area, Ordy Pond is located less than 130 feet (40 m) from Area 3 on TMK 9-1-013:041 (Figure 3). This pond is identified as a Freshwater Forested/Shrub Wetland (PFO3Cx) by NWI (2019) and a perennial land/pond by NHD (2020).

Anchialine pools have been recorded throughout the ʻEwa Plains. Anchialine pools are enclosed waterbodies that have no surface connection to the ocean but display tidal fluctuations and salinity ranges that indicate subsurface connections to the groundwater table and the ocean (Holthuis 1973). Anchialine pools occur in highly porous substrates and can occur at the bottom of sinkholes (Brock and Kam 1997).



Barbers Point Solar

Figure 2
Topography and Soils

CITY AND COUNTY OF HONOLULU

- Study Area
- TMK Boundary
- Road
- 5-ft Contour

Map Unit Name

- Coral outcrop
- Fill land, mixed
- Mamala stony silty clay loam, 0 to 12 percent slopes

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Barbers Point Solar LLC

Reference Map

Barbers Point Solar

Figure 3
Water Resources

CITY AND COUNTY OF HONOLULU

Study Area
TMK Boundary
Road

Water Resources

Stream (DAR)
Artificial Path (NHD)
Canal Ditch (NHD)
Coastline (NHD)
Perennial Stream (NHD)
Waterbody (NHD)
Estuarine and Marine Deepwater (NWI)
Estuarine and Marine Wetland (NWI)
Freshwater Emergent Wetland (NWI)
Freshwater Forested/Shrub Wetland (NWI)
Freshwater Pond (NWI)

TETRA TECH

Barbers Point Solar LLC

Reference Map

3.0 Methods

Prior to the field surveys, Tetra Tech conducted a review of relevant publicly available literature and data with respect to biological resources in and near the Study Area. This review included environmental assessments and environmental impact statements, NWI data, the USGS NHD, scientific journals and reports, and available, unpublished data that are relevant to the natural history and ecology of the area. In addition, Tetra Tech reviewed available geospatial data, aerial photographs, and topographic maps of the Study Area to identify occurrences of state or federally-listed species, rare species, or habitats that could harbor these species.

Field surveys of the Study Area included the following:

- General plant and wildlife survey conducted on June 3, 9, and 11, 2020;
- Pueo surveys conducted on June 11, August 17, October 8, and November 16, 2020;
- Wet season survey for the endangered ʻakoko (*Euphorbia skottsbergii* var. *skottsbergii*) conducted on April 10, 12, and 15, 2021;[1] and
- General plant and wildlife survey of the Coral Sea Road Right-of-Way conducted on May 5, 2021.

Details of the field survey methodologies are provided below.

Following the June 2020 biological survey, Tetra Tech had meetings with the USFWS and Hawaiʻi Division of Forestry and Wildlife (DOFAW) to discuss the survey results and measures to avoid and minimize impacts to state and federally-listed species.

3.1 Plants

Tetra Tech conducted pedestrian botanical surveys within the Study Area on the following dates: June 3, 9, and 11, 2020; April 10, 12, and 15, 2021; and May 5, 2021. All plant species, dominant vegetation types, as well as any listed or rare plant species were recorded. During the surveys, biologists examined areas more likely to support native plants (e.g., areas with exposed limestone substrate, rocky outcrops, and shady areas) more intensively. If found, Tetra Tech also mapped any state or federally-listed plants or planted listed in the International Union for Conservation of Nature's Red List (IUCN 2021). Plant identifications were made primarily in the field; plants that could not be positively identified were photo-documented for comparison with the recent taxonomic literature.

Plants recorded during the surveys are indicative of the season and environmental conditions at the time of the survey. The presence and location of plants can be influenced by seasonal and temporal

[1] This survey was conducted within a portion of the Study Area as well as adjacent areas. The complete results of the wet season ʻakoko survey are provided in a separate report (Tetra Tech 2021).

changes; therefore, it is possible additional species may occur within the Study Area but were not present during this survey.

The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999, 2012), Wagner and Herbst (2003), and Imada (2012, 2019) for native and naturalized flowering plants, Palmer (2003) and Smith et al. (2011) for ferns. and Staples and Herbst (2005) for ornamental plants. Common/Hawaiian names are provided first, followed by scientific names in parentheses. If no common or Hawaiian name is known, only the scientific name is provided.

3.2 Wildlife

Wildlife surveys consisted of observations and identification of birds, mammals, and large invertebrate species encountered while searching the Study Area. Tetra Tech recorded all wildlife seen or heard while walking and driving within the Study Area coupled with observation of scat, tracks, and other animal sign. Habitats or plants that could support listed species were also identified, if present (e.g., water features as potential habitat for listed Hawaiian waterbirds). Observations of invertebrates encountered were recorded incidentally to wildlife surveys. Invertebrates were identified through visual observations; no invertebrates were collected in the field.

Scientific nomenclature for birds follows Birds of the World (Billerman et al. 2020). Scientific names for mammals follows Tomich (1986). Scientific nomenclature follows Nishida (2002) for invertebrates.

3.2.1 Pueo

Surveys specifically to detect the pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*) were conducted on four dates: on the morning of June 11, 2020 (prior to the start of the plant and wildlife survey), and on the evenings of August 17, October 8, and November 16, 2020. Pueo are not federally-listed, but are listed as endangered by the State of Hawaiʻi for the Island of Oʻahu. The survey methods followed the Pueo Project Survey Protocol (Price and Cotin 2018), but were adjusted to stay within the boundaries of the Study Area. The morning survey was conducted from civil twilight to approximately 60 minutes after sunrise and the evening surveys were conducted approximately 60 minutes before sunset until civil twilight. According to researchers, most pueo detections have occurred in the evenings on Oʻahu (M. Price/ UH Mānoa, pers. comm., September 2019).

Two survey locations were chosen to provide the best vantage points of suitable habitat in the Study Area. A biologist was present at each survey point for the duration of each of the four surveys. The ground and sky within the viewshed of each survey point were scanned with binoculars and the naked eye throughout the survey period.

The following general information was collected during each pueo survey: date, observer, GPS coordinates, start time, and end time. Environmental information was recorded, including: cloud cover, wind speed, temperature, precipitation, extent of surveyed area (maximum length of viewshed surveyed in cardinal directions), and habitat classification. Any native or migrant birds recorded incidental to the pueo surveys were also noted. For any pueo observations, the following information was collected: detection start time, detection end time, detection type, owl behavior classification, owl vocalization description, distance from observer, direction from observer, habitat where owl observed, and courtship behavior description. All pueo surveys were conducted in good weather with light winds, few clouds, and no precipitation.

3.2.2 Hawaiian Hoary Bat

Specific surveys for the endangered Hawaiian hoary bat or ʻōpeʻapeʻa (*Lasiurus cinereus semotus*), through the use of acoustic bat detectors or nighttime observation, were not conducted. Rather, as the USFWS and DOFAW recognize all woody vegetation greater than 15 feet (4.5 m) tall as potential bat roosting habitat (DOFAW 2015, USFWS 2019a), Tetra Tech noted the presence or absence of such vegetation within the Study Area.

4.0 Results and Discussion

In general, the Study Area is heavily altered land that was previously used as a military base, and is now fallow or used for agricultural, transportation, or commercial purposes. There are large cleared or concrete and asphalt paved areas in the Study Area, as well as debris, and abandoned vehicles and equipment. Large concrete aircraft revetments, paved parking areas, and paved runways and former roads are present in Area 1x and Area 2 (see Photos 1 through 4 in Appendix A). Tenants currently operate agricultural or commercial activities in portions of the Study Area including a ranch (Area 3), an explosives and pyrotechnics company (Area 3), and a painting company (Area 1x).

Past and current disturbances, in addition to the introduction of invasive plants and animals, have modified and degraded the native biological resources in the Study Area. The area is dominated by non-native plant and wildlife species, and suitable habitat for native species is limited. Of the native species observed, most are common across Oʻahu and other Hawaiian Islands.

Two listed species were observed in the Study Area during the surveys: the state and federally-endangered aeʻo or Hawaiian stilt (*Himantopus mexicanus knudseni*)[2] and the state-listed pueo. In addition, endangered alae keʻokeʻo or Hawaiian coots (*Fulica alai*) were seen in the immediate vicinity of the Study Area at Ordy Pond and the endangered ʻakoko (*Euphorbia skottsbergii* var. *skottsbergii*) was observed outside of the Study Area in the critical habitat unit within TMK 9-1-013:039 (the Navy's former Northern Trap and Skeet Shooting Range). Several other state or federally-listed species not observed in the Study Area during the survey may occur in or traverse the Study Area. State and federally-listed species are discussed in further detail below. Representative photographs of the Study Area are presented in Appendix A.

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[2] USFWS (2021) recently proposed to reclassify the Hawaiian stilt from an endangered species to a threatened species.

4.1 Plants

No federal or state listed threatened, endangered, proposed listed, or candidate plant species were observed in the Study Area during the surveys. A total of 138 plant species were recorded within the Study Area during the biological surveys (Appendix B). Twelve of the observed plant species are native to the Hawaiian Islands (Table 2). Although none of the native plants are listed by USFWS or DOFAW, the endemic wiliwili (*Erythrina sandwicensis*) tree is listed as Vulnerable in the International Union for Conservation of Nature's Red List (IUCN 2021). None of the other native plants observed are considered rare throughout the Hawaiian Islands (Wagner et al. 1999). The remaining 126 plant species observed within the Study Area are non-native to the Hawaiian Islands. A list of plants observed during the survey is presented in Appendix B.

Table 2. Native Plant Species Recorded in the Study Area During the Surveys

Common/Hawaiian Name	Scientific Name	Status
ʻānunu	*Sicyos pachycarpus*	E
hoary abutilon	*Abutilon incanum*	I
ʻiliahiʻaloʻe	*Santalum ellipticum*	E
ʻilieʻe	*Plumbago zeylanica*	I
ʻilima	*Sida fallax*	I
kaunaʻoa pehu	*Cassytha filiformis*	I
kīpūkai, seaside heliotrope	*Heliotropium curassavicum*	I
pāʻū-o-Hiʻiaka	*Jacquemontia sandwicensis*	E
pololei	*Ophioglossum polyphyllum*	I
pōpolo	*Solanum americanum*	I
wiliwili	*Erythrina sandwicensis*	E
ʻuhaloa	*Waltheria indica*	I
Status: E = Endemic (native only to the Hawaiian Islands); I = Indigenous (native to the Hawaiian Islands and elsewhere). Species highlighted in grey were observed immediately outside of the Study Area.		

Five main vegetation types occur in the Study Area: Kiawe/Buffelgrass Forest, Koa Haole Scrub, Ruderal Vegetation, Non-Native Grassland, and Mixed Non-Native Forest. All of these vegetation types are dominated by non-native species.

The primary vegetation type within the Study Area is Kiawe (*Prosopis pallida*)/Buffelgrass (*Cenchrus ciliaris*) Forest. It is characterized by large kiawe trees, roughly 15 to 30 feet (5–9 m) tall (see Photo 5-7 in Appendix A). The kiawe canopy ranges from open to dense thickets. In general, dense mats of buffelgrass occur in the understory. In areas with denser canopy cover, Guinea grass (*Megathyrsus maximus*), Chinese violet (*Asystasia gangetica*), and Zulu giant (*Stapelia gigantea*) are common. The non-native koa haole (*Leucaena leucocephala*) and ʻopiuma (*Pithecellobium dulce*) trees are also widely scattered in this vegetation type. Sisal (*Agave sisalana*) also occurs in dense patches. Three native species—ʻilima (*Sida fallax*), hoary abutilon (*Abutilon incanum*), and ʻuhaloa (*Waltheria indica*)—are also common in understory areas with moderate shade. The native kaunaʻoa pehu (*Cassytha filiformis*) grows down from the canopy of kiawe trees in some areas, and the native ʻilieʻe (*Plumbago zeylanica*) is also present. Notably, the invasive vine rubber vine (*Cryptostegia grandifolia*) is present in the dense kiawe thicket within the southern portion of Area 3.

The Koa Haole Scrub vegetation type is scattered in Area 1x, Area 2, and along the outer edges of the Coral Sea Road right-of-way. It is characterized by open to dense stands of non-native koa haole trees, ranging from 4 to 10 feet (1–2.5 m) in height (see Photos 8-9 in Appendix A). Buffelgrass and Guinea grass are the most abundant plants in the understory, although the native ʻuhaloa and ʻilima, along with non-native *Sida acuta,* Chinese violet, and Zulu giant are also common in the understory. ʻOpiuma and kiawe trees are sparsely scattered throughout this vegetation type.

The Ruderal Vegetation type occurs on fallow land, along the edges of roads, in mowed or cleared areas, surrounding existing facilities, or in previously disturbed areas. It is dominated by a mix of non-native, low-growing plants (see Photos 10-11 in Appendix A). Abundant and common grasses found in the Ruderal Vegetation type include buffelgrass, sourgrass, lovegrass (*Eragrostis* spp.), fingergrass (*Chloris* spp.), Bermuda grass (*Cynodon dactylon*), and St. Augustine grass (*Stenotaphrum secundatum*). Common shrubs and herbaceous species include Australian saltbush (*Atriplex semibaccata*), *Sida ciliaris,* false mallow (*Malvastrum coromandelianum*), *Trianthema portulacastrum, Boerhavia coccinea*, creeping indigo (*Indigofera spicata*), graceful spurge (*Euphorbia hypericifolia*), hairy spurge (*Euphorbia hirta*), and prostrate spurge (*Euphorbia prostrata*). The native ʻuhaloa also occurs in this vegetation type.

A Non-Native Grassland is present in the central portion of Area 3 (see Photos 12-13 in Appendix A). It is dominated by buffelgrass, with patches of other non-native species including *Sida ciliaris*, Australian saltbush, and khaki weed (*Alternanthera pungens*).

Mixed Non-Native Forest occurs in limited area, notably Areas 1 and 2. In Area 1, which was previously paved, abundant vegetation has established from beneath or on top of the asphalt substrate. Rather than having one or two dominant species, it is characterized by a mix of non-native trees and shrubs, along with native ʻuhaloa and ʻilima, which all had similar levels of abundance. The canopy in this area ranged from 10 to 20 feet (3–6 m) high and was a mix of kiawe, ʻopiuma, and Indian sandalwood (*Santalum album*), along with sandalwood trees that appear to be hybrids (*Santalum album x Santalum ellipticum*). A single native ʻiliahiʻaloʻe (*Santalum ellipticum*) individual was also observed less than 10 feet (3 m) outside the Study Area (see Photo 16). Buffelgrass, koa haole, Zulu giant, and *Sida ciliaris* were common in the understory. Ficus (*Ficus* spp.) is a dominant component in Area 2.

Tetra Tech documented 11 native wiliwili (*Erythrina sandwicensis*) trees in the Study Area during the biological surveys (Figure 4). This includes one adult tree in Area 3, three adult trees in Area 2, and 7 trees in Area 1x (four adults and three juveniles). These trees were generally associated with areas of limestone substrate and sinkholes. Wiliwili tree height ranges from 8 to 25 feet (2.5–7 m) tall (see Photo 17 in Appendix A). No saplings were seen. Three dead wiliwili trees were also observed in the Study Area.

Barbers Point Solar

Figure 4
Wiliwili Trees Mapped in the Study Area

CITY AND COUNTY OF HONOLULU

Study Area
Road
Wiliwili Tree *(Erythrina sandwicencis)*

TETRA TECH

Barbers Point Solar LLC

Reference Map

1:14,000 WGS 1984 UTM Zone 4N

0 0.25 0.5 Miles

NOT FOR CONSTRUCTION

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Listed Species and Critical Habitat

As stated above, no state and federally-listed plant species were recorded in the Study Area during the biological surveys. In addition, no designated critical habitat occurs in the Study Area. However, the endangered ‘akoko (*Euphorbia skottsbergii* var. *skottsbergii*) and critical habitat for listed plants occurs adjacent to the Study Area.

In 2012, O‘ahu Lowland Dry – Unit 11 was designated as critical habitat by USFWS on TMKs 9-1-013:039 and 9-1-013:042, which are outside the Study Area north and east of Area 3 (Figure 5). This critical habitat unit is occupied by the endangered ‘akoko. It is also unoccupied critical habitat for the following 16 listed species: *Achyranthes splendens* var. *rotundata*, *Bidens amplectens*, *Bonamia menziesii*, *Euphorbia celastroides* var. *kaenana*, *Euphorbia haeleelenana*, *Gouania meyenii*, *Gouania vitifolia*, *Hibiscus brackenridgei*, *Isodendrion pyrifolium*, *Melanthera tenuifolia*, *Neraudia angulata*, *Nototrichium humile*, *Schiedea hookeri*, *Schiedea kealiae*, and *Spermolepis hawaiiensis*. None of these 16 listed plant species are known to occur in the area (USFWS 2012).

Although O‘ahu Lowland Dry – Unit 11 has been considered the largest population for ‘akoko (Department of Navy and Isla Botanica 2012; USFWS 2019b), various population numbers have been reported for this area in the last 20 years. Surveys in 2008 documented nearly 1,230 ‘akoko plants in TMK 9-1-013:039 (Whistler 2008, Department of Navy and Isla Botanica 2012). During 2012 surveys of TMK 9-1-013:039, fewer plants were documented, with a total of 823 ‘akoko plants recorded. The majority of these individuals were seen within the Navy’s ‘akoko restoration site located near the eastern boundary of TMK 9-1-013:039 (Department of Navy and Isla Botanica 2012).

Tetra Tech and LeGrande Biological Surveys Inc. recorded a total of 36 ‘akoko individuals within a portion of TMK 9-1-013:039 (outside of the Study Area) during surveys in April 2021 (Tetra Tech 2021). The ‘akoko plants occur at 3 locations in the northern central portion of the parcel within the former “2003 clean-up action area.” All of the ‘akoko individuals recorded during this survey are more than 328 feet (100 meters) from the Project’s limits of disturbance, which is USFWS’ recommended buffer for federally listed shrubs (USFWS 2018).[3] It is unknown how many additional ‘akoko plants occur within the remainder of TMK 9-1-013:039.

[3] This survey was conducted within a portion of the Study Area as well as adjacent areas. The complete results of the wet season ‘akoko survey are provided in a separate report (Tetra Tech 2021).

KAPOLEI PKWY
Roosevelt Ave
9-1-016:027
Geiger Rd
KAPOLEI PKWY
Area 1
Area 1x
9-1-013:038
Area 2
San Juacinto St
Essex Rd
Coral Sea Rd
9-1-013:039
9-1-013:040
9-1-013:042
Area 3
Tripoli St
Barbers Point Solar
Figure 5
Critical Habitat
CITY AND COUNTY OF HONOLULU
Study Area
TMK Boundary
Road
Critical Habitat
Oahu Lowland Dry
- Unit 11
TETRA TECH
Barbers Point Solar LLC
Reference Map
1:14,000
WGS 1984 UTM Zone 4N
0
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4.2 Wildlife

4.2.1 Birds

Thirty-three bird species were recorded within the Study Area during the surveys (Table 3). Warbling white-eye (*Zosterops japonicus*), common myna (*Acridotheres tristis*), and red-vented bulbul (*Pycnonotus cafer*) were the most common bird species recorded during the survey. Most of the bird species recorded are non-native to the Hawaiian Islands and are commonly found in rural or agricultural areas. One native migratory bird species—the Pacific golden-plover or kōlea (*Pluvialis fulva*)—was seen in the Study Area is protected by the Migratory Bird Treaty Act (MBTA).

As stated in Section 4.0, two listed bird species were recorded within the Study Area. The state and federally-listed Hawaiian stilt was observed flying over the Study Area and the state-listed pueo was also seen in the Study Area. Hawaiian coots and Hawaiian stilts were also seen and heard immediately adjacent to the Study Area at Ordy Pond. Federally and state-listed bird species are described in more detail below.

Table 3. Birds Detected in the Study Area and Immediate Vicinity

Common Name	Scientific Name	Status	MBTA	ESA	State Listed Endangered
African silverbill	*Euodice cantans*	NN			
Barn owl	*Tyto alba*	NN	X		
Cattle egret	*Bubulcus ibis*	NN	X		
Chestnut munia	*Lonchura atricapilla*	NN			
Common myna	*Acridotheres tristis*	NN			
Common waxbill	*Estrilda astrild*	NN			
Eurasian skylark	*Alauda arvensis*	NN	X		
Gray francolin	*Francolinus pondicerianus*	NN			
ʻAlae keʻokeʻo, Hawaiian coot[1]	*Fulica alai*	E		X	
Mallard – koloa-like duck, Hawaiian duck hybrid[1]	*Anas platyrhynchos x A. wyvilliana*	NN			
Pueo, Hawaiian short-eared owl	*Asio flammeus sandwichensis*	E			X
Aeʻo, Hawaiian stilt	*Himantopus mexicanus knudseni*	E		X	
House finch	*Haemorhous mexicanus*	NN	X		
House sparrow	*Passer domesticus*	NN			
Indian peafowl	*Pavo cristatus*	NN			
Mourning dove	*Zenaida macroura*	NN	X		
Northern cardinal	*Cardinalis cardinalis*	NN	X		
Northern mockingbird	*Mimus polyglottos*	NN	X		

Common Name	Scientific Name	Status	MBTA	ESA	State Listed Endangered
Pacific-golden plover	*Pluvialis fulva*	M	X		
Red avadavat	*Amandava amandava*	NN			
Red-crested cardinal	*Paroaria coronata*	NN			
Red junglefowl	*Gallus gallus*	NN			
Red-vented bulbul	*Pycnonotus cafer*	NN			
Red-whiskered bulbul	*Pycnonotus jocosus*	NN			
Rock pigeon	*Columba livia*	NN			
Rose-ringed parakeet	*Psittacula krameri*	NN			
Saffron finch	*Sicalis flaveola*	NN			
Scaly-breasted munia	*Lonchura punctulata*	NN			
Spotted dove	*Streptopelia chinensis*	NN			
Warbling white-eye	*Zosterops japonicus*	NN			
White-rumped shama	*Copsychus malabaricus*	NN			
Yellow-fronted canary	*Crithagra mozambica*	NN			
Zebra dove	*Geopelia striata*	NN			
Status: E = Endemic, M = Migrant, NN = non-native established species, MBTA = Migratory Bird Treaty Act, ESA = Endangered Species Act. 1. Indicates bird seen or heard outside the Study Area, but within the immediate vicinity.					

<u>Pueo</u>

The pueo or Hawaiian short-eared owl is a bird of prey listed as endangered by the State of Hawaiʻi on the island of Oʻahu, but is not a federally listed species. It is a culturally significant endemic subspecies of the widespread short-eared owl (*Asio flammeus*) and is believed to have colonized the Hawaiian Islands after the arrival of Polynesians (Price and Cotín 2018). Pueo are found on all of the main Hawaiian Islands, at elevations ranging from sea level to 8,000 feet (2,438 m). On Oʻahu, pueo occupy a variety of habitats, including agricultural lands, grasslands, wetlands, shrublands, and native forests. It is suggested their habitat use may be influenced by food availability (Price and Cotín 2018).

A single pueo was observed in the Study Area on the morning of June 11, 2020 (see Figure 6 and Photos 12 and 18 in Appendix A). The pueo was observed flying into the Non-native Grassland in Area 3. No pueo were detected on the subsequent three evening surveys. Pueo Survey Data Sheets are included in Appendix C. Given the pueo sighting and habitat present, pueo could forage, roost, or nest in and around the Study Area.

Listed Hawaiian Waterbirds

Listed waterbird species that occur on Oʻahu include the Hawaiian stilt, Hawaiian coot, and ʻalea ʻula or Hawaiian common gallinule (*Gallinula galeata sandvicensis*). Listed Hawaiian waterbirds are found primarily in and around fresh and brackish-water marshes and natural or man-made ponds. Hawaiian stilts may also be found in fields, and where ephemeral or persistent standing water may occur (Kawasaki et al. 2019). No suitable habitat for listed waterbirds occurs in the Study Area; however, Tetra Tech detected the Hawaiian stilt flying over the Study Area, and Hawaiian coots and Hawaiian stilts were seen immediately outside the Study Area at Ordy Pond, which is less than 130 feet (40 m) from Area 3. Stilts and coots have been reported to regularly occur at and nest at nearby Ordy Pond (C. Carnes/ NAVFAC Hawaii, pers. comm., March 2021). It is likely these two listed waterbird species could traverse the Study Area while moving to and from Ordy Pond.

At some solar facilities in the continental U.S., water dependent birds (e.g., grebes, loons, rails, coots, shorebirds, and waterfowl) have been documented as colliding with photovoltaic arrays (Kosciuch et al. 2020). It has been hypothesized that some waterbirds may perceive the panel arrays to be bodies of water and collide with the panels while attempting a water landing (Kagan et al. 2014, WEST 2014, Walston et al. 2016). This hypothesis has been termed the "lake effect." However, no studies have found a causal link for the source of waterbird mortalities observed in the continental U.S. More research is needed to investigate whether water-dependent birds are attracted to solar panel arrays, and if proximity to water sources or other factors relate to avian mortality at the facilities (Walston et al. 2016, Kosciuch et al. 2020).

Listed waterbird species that occur in Hawaiʻi have not been documented to collide with photovoltaic arrays. Hawaiʻi currently has over 1,000 MW of installed solar (HECO 2020, KIUC 2021) and utility-scale solar has existed in Hawaiʻi since 2008; yet there are no public records indicating endangered birds are colliding with solar panel arrays in Hawaiʻi. Waterbird activity and abundance varies regionally and may result in variation in avian mortality risk across different landscapes. There have been no reports to date of the "lake effect" from operating solar facilities in Hawaiʻi or information to indicate listed birds are colliding with solar panel arrays in Hawaiʻi.

Listed Seabirds

The endangered ʻuaʻu or Hawaiian petrel (*Pterodroma sandwichensis*), endangered ʻakeʻake or band-rumped storm petrel (*Oceanodroma castro*), and threatened aʻo Newell's shearwater (*Puffinus newelli*) (collectively referred to as seabirds) have not been documented in the Study Area, and suitable nesting habitat does not occur in the area. However, suitable nesting habitat may exist in upper elevations of the Waiʻanae Mountains and the Northern Koʻolau Mountains (Young et al. 2019), suggesting the potential for these birds to fly over the area at night while transiting between nest sites and the ocean. These listed seabirds may be attracted to construction lights at night. Disorientation and fallout as a result of light attraction could occur for individuals attracted to nighttime construction lighting and unshielded nighttime facility lighting. Juvenile birds are particularly vulnerable to light attraction, and grounded birds are vulnerable to mammalian predators or vehicle strike strikes.

White Terns

Although manu-o-Kū or white terns (*Gygis alba*) were not observed during this survey, the species was observed flying in the area by AECOS in June 2013 (AECOS 2017). The white tern is not federally listed, but is listed as threatened on the Island of Oʻahu by the State of Hawaiʻi.

4.2.2 Mammals

Several non-native terrestrial mammalian species were detected during the survey. Cats (*Felis catus*), small Indian mongoose (*Herpestes javanicus*), horses (*Equus ferus caballus*), goats (*Capra aegagrus hircus*), a single cow (*Bos taurus*), dogs (*Canis lupus familiaris*), and sheep (*Ovis aries*) were all observed within the Study Area. According to a resident in the area, feral pigs (*Sus scrofa*) have also been seen within the Study Area (J. Bond, pers. comm., January 2021). Although not observed, other introduced mammals, such as house mice (*Mus musculus*) and rats (*Rattus* spp.), are likely to occur within the Study Area.

The state and federally-endangered Hawaiian hoary bat may transit, forage, or roost in the Study Area. This species will forage in open and semi-cluttered landscapes in a wide range of habitats and vegetation types (Bonaccorso et al. 2015). Many of the trees within the Study Area (e.g., kiawe, ironwood, ficus) are over 15 feet (4.5 m) tall and have the potential to function as bat roost trees, per USFWS and DOFAW, and can provide edge habitat that bats could use for foraging. However, detections at nearby bat detector stations have documented low bat activity compared to other detector sites on Oʻahu (WEST 2020) (Table 4).

Table 4. Hawaiian Hoary Bat Activity Rates at Nearby Bat Detectors from WEST (2020)

Site Name and ID	Distance and Bearing from Study Area	Detections	Nights with Detections	Detector Nights	Mean Detections Per Detector Night	Proportion of Detector Nights with Detections
Kroc Center (Site-036)	1.4 mi NNWest	3	3	650	0.0046	0.0046
West Loch Golf (Site-098)	2.4 mi NNEast	8	8	632	0.0127	0.0127
Iroquois Pt (Site-070)	4.0 mi East	6	5	519	0.0166	0.0096
Barbers Point (Site-112)	3.1 mi West	0	0	520	0.0000	0.0000
Barbers Point (Site-034)	3.1 mi NWest	2	2	604	0.0033	0.0033

Barbers Point Solar

Figure 6
Listed Bird Species Recorded in the Study Area and Vicinity

CITY AND COUNTY OF HONOLULU

- Study Area
- Road
- TMK Boundary
- Pond
- Pueo Survey Point

Waterbird Observations (Tetra Tech)
- Hawaiian Coot
- Pueo
- Hawaiian Stilt

TETRA TECH

Barbers Point Solar LLC

Reference Map

4.2.3 Invertebrates

Twenty-four invertebrate species were observed during the surveys and are listed in Table 5. Of these, only the two dragonflies—globe skimmer (*Pantala flavescens*) and green darner (*Anax junis*)—are native to the Hawaiian Islands. These two dragonflies are common in Hawaiʻi.

Table 5. Invertebrates Recorded in the Study Area During the Surveys

Common Name	Scientific Name	Status
Ash-grey ladybeetle	*Olla v. nigrum*	NN
Cabbage white butterfly	*Pieris rapae*	NN
Clouded sulfur	*Colias philodice*	NN
Dog dung fly	*Musca sorbens*	NN
Fiery skipper	*Hylephila phyleus*	NN
Giant African land snail	*Achatina fulica*	NN
Globe skimmer	*Pantala flavescens*	I
Graceful twig ant	*Pseudomyrmex gracilis*	NN
Grasshopper	*Acrididae sp.*	NN
Gray bird grasshopper	*Schistocerca nitens*	NN
Green darner	*Anax junis*	I
Gulf fritillary	*Agraulis vanillae*	NN
Hawaiian garden spider	*Argiope appensa*	NN
Ladybird beetle	*Coccinellidae* sp.	NN
Large orange sulphur	*Phoebis agarithe*	NN
Narrow winged katydid	*Elimaea punctifera*	NN
Mantis	*Mantodea sp.*	NN
Paper wasp	*Polistes sp.*	NN
Rosy wolf snail	*Euglandina rosea*	NN
Tiger mosquito	*Aedes albopictus*	NN
Tropical fire ant	*Solenopsis geminata*	NN
Western honeybee	*Apis mellifera*	NN
Yellow garden spider	*Argiope aurantia*	NN
Status: E = Endemic, I = Indigenous, NN = non-native species.		

4.3 Sinkholes

Over 200 limestone sinkholes are present in the Study Area. Sinkholes occur in all sections of the Study Area, except Area 1. Tetra Tech did not observe any water in the sinkholes during the survey (see Photo 19 in Appendix A). Additionally, Pacific Legacy documented and conducted detailed investigations of the sinkholes in the Study Area for archaeological and cultural purposes and reported no observation of water or evidence of water. Therefore, no anchialine pools were observed in the Study Area.

5.0 Conclusions and Recommendations

As described in Section 4, the majority of the plants and animals observed in the Study Area are introduced species that are non-native to the Hawaiian Islands. However, the state and federally-listed Hawaiian stilt and the state-listed pueo were detected within the Study Area. Several other listed wildlife species have the potential to occur in or transit through the Study Area. Furthermore, the endangered ʻakoko occurs adjacent to the Study Area in TMK 9-1-013:039 (the Navy's former Northern Trap and Skeet Shooting Range). Recommended measures to avoid and minimize impacts to state and federally-listed species that could occur in the Study Area, as well as other native species, are outlined below.

5.1 Plants

Overall, the vegetation in the Study Area is disturbed from previous and current land-use activities. The majority of the plant species recorded in the Study Area (over 91 percent) are not native to the Hawaiian Islands. The vegetation types and species identified are not considered unique. However, the endangered ʻakoko has been recorded adjacent to the Study Area and critical habitat for listed species is designated in the immediate vicinity. All of the ʻakoko individuals recorded during the recent survey adjacent to the Study Area are more than 328 feet (100 meters) from the Project's limits of disturbance, which is USFWS' recommended buffer for federally listed shrubs (USFWS 2018).

Tetra Tech recommends the following measures to avoid and minimize potential impacts to native plants:

- Design the Project to maintain a 328-foot (100-m) buffer from the remaining ʻakoko individuals in TMK 9-1-013:039 in accordance with USFWS recommendations (USFWS 2018).
- Establish an environmental education and observation program to educate all construction and operational personnel about the nearby endangered ʻakoko and critical habitat. Staff should be trained to identify the species and to take appropriate steps if ʻakoko are found.
- Vegetation clearing and temporary watering following hydroseeding in the portions of the Project area adjacent to the ʻakoko critical habitat has the potential to create more suitable habitat for ʻakoko. In addition to the environmental education and observation program (described above), a post-construction ʻakoko survey will be conducted during the first wet season following end of construction. The post-construction ʻakoko survey would be limited to the portion of the Project area located within 200 feet (60 meters) north of San Juacinto Road (which is north of the critical habitat) in areas with suitable ʻakoko habitat. This distance is based

on historical locations of ʻakoko on TMK 9-1-013:039, the likely dispersal ability of the species, and buffer recommendations from USFWS.

- If ʻakoko were to establish in the Project area, re-initiation of consultation with DOFAW and USFWS would be necessary. If ʻakoko is found in the Project area during construction, all ground disturbing activities would cease within 328 feet (100 meters) of the plant(s) until further consultation with USFWS and DOFAW is coordinated. Further specifics would be determined in consultation with the relevant agencies depending on the location. If ʻakoko is found in the Project area during operations, vegetation control activities would follow the recommended buffer distances by USFWS (2018) until further consultation with USFWS and DOFAW occurs (e.g., no mowing would occur within 20 feet [6 m] of ʻakoko plants, and no hand application of herbicide would occur within 10 feet [3 m] of ʻakoko plants).
- If the Project's limits of disturbance change, a comprehensive ʻakoko survey may be needed in areas with suitable ʻakoko habitat (if present) during the wet season following sufficient rains.
- If landscaping is installed along the perimeter of the Project for visual screening or due to Hawaii Community Development Authority requirements, use non-invasive plants, and consider incorporating native plant species to the maximum extent practicable. Potential native species that may be appropriate for landscaping at the site include ʻilieʻe, ʻilima, ʻiliahiʻaloʻe, wiliwili, Oʻahu sedge (*Carex wahuensis*), pili grass (*Heteropogon contortus*), ʻaweoweo (*Chenopodium oahuense*), ʻakia (*Wikstroemia uva-ursi*), pōhinahina (*Vitex rotundifolia*), and ʻulei (*Osteomeles anthylidifolia*).
- Although non-native weedy species are common in the Study Area, implement invasive species minimization measures to avoid the unintentional introduction or transport of new invasive species to the area. This includes utilizing on-site gravel, rock, soil when practicable, purchasing raw materials (e.g., gravel, rock, soil) from a local supplier when practicable; utilizing certified, weed-free seed mixes; and washing and/or visually inspecting (as appropriate) construction materials or equipment arriving from outside Oʻahu for excessive debris, plant materials, and invasive or harmful non-native species. Consult with Oʻahu Invasive Species Committee if needed.
- Coordinate with the Hawaiʻi Department of Transportation on their efforts to control the invasive rubbervine (*Cryptostegia grandiflora*) along Coral Sea Road and Tripoli Road.
- Develop an Emergency Response Plan and Vegetation Management Plan to reduce potential fire risk to/from the Project.

5.2 Wildlife

The majority of the animal species recorded in the Study Area are not native to the Hawaiian Islands, with the exception of the state-listed pueo, state and federally-listed Hawaiian stilt, migrant Pacific golden-plover, and the two native dragonflies. Tetra Tech recommends the following general measures to avoid and minimize potential impacts to native wildlife:

- Establish an environmental education and observation program for all construction and operational personnel. Staff should be trained to identify listed wildlife that may be found on-site (including pueo, Hawaiian waterbirds, seabirds, and Hawaiian hoary bats) and to take appropriate steps if listed wildlife species (including downed listed wildlife) are found.
- If downed listed species are observed at the Project, notify USFWS and DOFAW using the standard protocol for responding to dead or injured birds and bats (USFWS 2020).

5.2.1 Pueo

As described in Section 4.2.1, a single pueo was observed in the Study Area during Tetra Tech's surveys. Pueo have been reported to use the surrounding areas (Price and Cotín 2018, Pueo Project 2019). Given the pueo sighting and habitat present, it is possible that pueo could fly through, hunt, roost, or nest within the Study Area. Should this species occur within the Study Area, it could be impacted by construction activities. In addition to the general measures listed above, Tetra Tech recommends the following avoidance and minimization measures for pueo:

- Prior to clearing vegetation or ground-disturbing activities with heavy machinery within areas of suitable nesting habitat within the Project Area, pre-construction ground nesting surveys should be conducted by a qualified biologist(s) to confirm pueo are not nesting in the area.
- If a pueo is observed in the Project area at any time (prior to construction, during construction, or during operation), all activities in the immediate vicinity should stop immediately. The location of the bird should be reported to a designated representative, and a qualified biologist(s) should check the area for the presence of a pueo nest.
- If a ground nest or a pueo nesting on the ground is observed at any time (prior to construction, during construction, or during operation), an approximately 100-foot (30 m) buffer should be established around the nest and marked in the field by a qualified biologist. DOFAW should be notified immediately. If the nest is confirmed as a pueo nest, no work should occur in the buffer until pueo nesting is complete.

5.2.2 Listed Hawaiian Waterbirds

The Study Area does not provide suitable nesting or foraging habitat for the three listed Hawaiian waterbirds on Oʻahu; however, suitable habitat is available at the nearby Ordy Pond. Listed waterbirds may fly through the Study Area in transit to and from other areas or forage in the Study Area in the event of temporary flooding. If these species land within the Study Area, they could be impacted by construction and operation activities. Tetra Tech recommends the following avoidance measures:

- Avoiding creating areas with standing water. Design stormwater retention areas to drain within 48 hours of end of a storm event and keep retention areas free of emergent vegetation, to avoid attracting listed waterbirds.

- If listed waterbirds are found in the Study Area during active construction, cease all activities within 100 feet (30 m) of the bird(s), and do not approach the bird(s). Have a biological monitor that is familiar with the species' biology conduct Hawaiian waterbird nest surveys where appropriate habitat occurs. Repeat surveys again within 3 days of project initiation and after any subsequent delay of work of 3 or more days (during which birds may attempt nesting). If a nest of a listed waterbird is not discovered, work may continue after the listed waterbird leaves the area of its own accord. If a nest of a listed waterbird is discovered, contact USFWS and DOFAW, and establish a 100- foot (30 m) buffer around all active nests and/or broods until the chicks/ducklings have fledged. Do not conduct potentially disruptive activities or habitat alteration within this buffer.

5.2.3 Listed Seabirds

The Study Area does not provide suitable nesting or foraging habitat for the listed Hawaiian seabirds. However, seabirds may fly over the Study Area at night in transit between the ocean and upland breeding sites during the breeding, nesting and fledging seasons and may be attracted to construction lights at night. Tetra Tech recommends the following measures to avoid and minimize potential impacts to listed seabirds:

- Restrict construction activity to daylight hours during the seabird peak fallout period (September 15–December 15) and avoid the use of nighttime lighting that could attract seabirds.
- If nighttime construction cannot be avoided, construction lighting should be shielded and directed downward and fit with non-white lights if construction safety is not compromised, to minimize the attractiveness of construction lights to seabirds.
- If nighttime construction is required during the seabird peak fallout period, a biological monitor should be present in the construction area from approximately 0.5-hour before sunset to 0.5-hour after sunrise to watch for the presence of seabirds. If the biological monitor observes a seabird, and the seabird appears affected by the lighting, the monitor should notify the construction manager to reduce or turn off construction lighting until the individual(s) move out of the area.
- If a grounded seabird is found, contact DOFAW and USFWS.
- For operational on-site lighting, use fixtures that will be shielded and directed downward to prevent upward radiation, and fitted with non-white light bulbs to the extent possible. The lighting should also be triggered by a motion detector, unless otherwise directed by Hawaiian Electric Company or code compliance. Lighting should be situated so that light does not shine on and reflect off the solar panels.

5.2.4 Hawaiian Hoary Bat

The USFWS (2019a) provides the following avoidance and minimization measures for the Hawaiian hoary bat:

- Avoid trimming or removing woody vegetation (trees or shrubs) taller than 15 feet (4.5 m) between June 1 and September 15, when juvenile bats are not yet capable of flying and may be roosting in the trees, resulting in the potential to be impacted.
- To prevent entanglement, do not use barbed wire for fencing.

Tetra Tech recommends that if some trimming or removing woody vegetation taller than 15 feet (4.5m) is necessary between June 1 and September 15, consult with USFWS and DOFAW to ensure impacts to the Hawaiian hoary bat are avoided.

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APPENDIX A

REPRESENTATIVE PHOTOGRAPHS OF THE BARBERS POINT SOLAR STUDY AREA

Barbers Point Solar

Figure A-1
Photo Location Map

CITY AND COUNTY OF HONOLULU

- Study Area
- Photo Point
- TMK Boundary
- Road

TETRA TECH

Barbers Point Solar LLC

Reference Map

1:14,000 WGS 1984 UTM Zone 4N

0 0.25 0.5 Miles

NOT FOR CONSTRUCTION

P:\GIS_PROJECTS\Innergex\BarbersPoint_Solar\MXD\BioReport_20200910\Innergex_BarbersPoint_BioReport_Figure1a_PhotoLocations_11i17i_20210625.mxd

Photo 1. Cleared area within the Study Area along Coral Sea Road. Location: 21.314828, -158.055356. June 3, 2020.

Photo 2. Aircraft revetments are common within Area 1x. Location: 21.320097, -158.04865. June 9, 2020.

Photo 3. Ranch within Area 3 of the Study Area. Location: 21.309835, -158.055595. June 11, 2020.

Photo 4. Numerous paved roads are present in Areas 1x and 2. Location: 21.316434, -158.050331. April 12, 2021.

Photo 5. Kiawe (*Prosopis pallida*)/Buffelgrass (*Cenchrus ciliaris*) Forest common in the Study Area. Location: 21.323763, -158.045227. June 9, 2020.

Photo 6. Typical area with Chinese violet (*Asystasia gangetica*) within the Study Area. Location: 21.315487, -158.051798. April 10, 2021.

Photo 7. Kiawe (*Prosopis pallida*) thicket common in Area 3. Location: 21.306915, -158.055272. June 11, 2020.

Photo 8. Koa Haole Scrub vegetation type within Area 1x. Location: 21.317236, -158.048224. June 3, 2020.

Photo 9. Koa Haole Scrub between Area 2 and the Coral Sea Road right-of-way. Location: 21.315649, -158.054927. May 5, 2021.

Photo 10. Typical vegetation along Coral Sea Road right-of-way showing low-growing mowed grasses and herbaceous species. Location: 21.316619, -158.056685. May 5, 2021.

Photo 11. Mowed grasses along the western portion of the Coral Sea right-of-way. Location: 21.328694, -158.055069. May 5, 2021.

Photo 12. Non-native Grassland in Area 3. Location: 21.308449, -158.054901. June 11, 2020.

Photo 13. Looking north to the Non-native native Grassland in Area 3. Location: 21.307763, -158.053362. June 11, 2020.

Photo 14. Area 1 showing asphalt substrate with vegetation. Location: 21.322543, -158.04559. June 9, 2020.

Photo 15. Representative habitat within Area 1 showing *Santalum album x Santalum ellipticum* hybrid in right foreground. Location: 21.321707, -158.045449. June 9, 2020.

Photo 16. A single native iliahiʻaloʻe (*Santalum ellipticum*) plant found less than 10 feet (3 m) outside the Study Area. Location: 21.321303, -158.047563. June 9, 2020.

Photo 17. Native wiliwili (*Erythrina sandwicensis*) trees observed within Area 2 of the Study Area. Location: 21.316021, -158.054202. June 3, 2020.

Photo 18. Survey point where a single pueo (*Asio flammeus sandwichensis*) was detected within Area 3 of the Study Area at 5:27am. Location: 21.307716, -158.054952. June 11, 2020.

Photo 19. Sinkhole observed within Area 1x of the Study Area. Numerous sinkholes of various sizes occur throughout the entire Study Area. Location: 21.316323, -158.049555. June 3, 2020.

APPENDIX B

LIST OF PLANT SPECIES OBSERVED DURING SURVEYS OF THE BARBERS POINT SOLAR STUDY AREA

Table B-1 provides a list of plant species observed in the Study Area by Tetra Tech on June 3, 9, 11, 2020; April 10, 12, and 15, 2021; and May 5, 2021. The plant names are arranged alphabetically by family and then by species into three groups: Ferns/Lycophytes, Monocots, and Dicots. The taxonomy and nomenclature of the ferns and lycophytes follow Palmer (2003), with recent name changes in accordance with Smith et al. (2011). Flowering plants are in accordance with Wagner et al. (1999, 2012), Wagner and Herbst (2003), Imada (2012, 2019), and Staples and Herbst (2005). If no common or Hawaiian name is known, only the scientific name is provided.

Status

- E = endemic = native only to the Hawaiian Islands
- I = indigenous = native to the Hawaiian Islands and elsewhere
- P = Polynesian = introduced by Polynesians
- X = introduced/ non-native = all those plants brought to the Hawaiian Islands by humans, intentionally or accidentally, after Western contact (Cook's arrival in the islands in 1778)

Table B-1. List of Plant Species Observed During Surveys for the Barbers Point Solar Project

Scientific Name and Authorship	Hawaiian/Common Name	Status
FERNS/LYCOPHYTES		
Ophioglossaceae		
Ophioglossum polyphyllum A. Braun	pololei	I
MONOCOTS		
Agavaceae		
Agave sisalana Perrine	sisal	X
Cordyline fruticosa (L.) A.Chev.	ti, kī	P
Sansevieria trifasciata Prain	mother-in-law's tongue	X
Aloeaceae		
Aloe vera (L.) Burm.f.	aloe vera	X
Arecaceae		
Phoenix sp.	date palm	X
Veitchia merrillii (Beccari) H.E. Moore	manila palm	X
Commelinaceae		
Commelina diffusa Burm.f.	honohono	X
Poaceae		
Axonopus compressus (Sw.) P.Beauv.	carpetgrass	X
Axonopus fissifolius (Raddi) Kuhlm.	narrow-leaved carpetgrass	X
Bothriochloa pertusa (L.) A. Camus	pitted beardgrass	X
Cenchrus ciliaris L.	buffelgrass	X

Scientific Name and Authorship	Hawaiian/Common Name	Status
Cenchrus echinatus L.	common sandbur	X
Chloris barbata Sw.	swollen fingergrass	X
Chloris radiata (L.) Sw.	radiate fingergrass	X
Cynodon dactylon (L.) Pers.	Bermuda grass	X
Digitaria insularis (L.) Mez ex Ekman	sourgrass	X
Eleusine indica (L.) Gaertn.	wire grass	X
Eragrostis amabilis (L.) Wight & Arn.	lovegrass	X
Eragrostis pectinacea (Michx.) Nees var. *pectinacea*	Carolina lovegrass	X
Megathyrsus maximus (Jacq.) B.K.Simon & S.W.L. Jacobs	Guinea grass	X
Melinis repens (Willd.) Zizka	Natal redtop	X
Setaria parviflora (Poir.) Kerguélen	yellow foxtail	X
Setaria verticillata (L.) P.Beauv.	bristly foxtail	X
Sporobolus indicus (L.) R.Br.	West Indian dropseed, smutgrass	X
Sporobolus sp.	–	X
Stenotaphrum secundatum (Walter) Kuntze	St. Augustine grass	X
DICOTS		
Acanthaceae		
Asystasia gangetica (L.) T.Anderson	Chinese violet	X
Aizoaceae		
Trianthema portulacastrum L.	–	X
Amaranthaceae		
Achyranthes aspera L. var. *aspera*	–	X
Alternanthera pungens Kunth	khaki weed	X
Amaranthus spinosus L.	spiny amaranth	X
Amaranthus viridus L.	slender amaranth	X
Atriplex semibaccata R.Br.	Australian saltbush	X
Atriplex suberecta I.Verd.	saltbush	X
Dysphania carinata (R.Br.) Mosyakin & Clemants	goosefoot	X
Salsola tragus L.	tumbleweed	X
Anacardiaceae		
Schinus terebinthifolius	Christmas berry	X
Annonaceae		
Annona muricata L.	soursop	X
Apocynaceae		
Thevetia peruviana (Pers.) K.Schum.	be-still tree, yellow oleander	X

Scientific Name and Authorship	Hawaiian/Common Name	Status
Asclepiadaceae		
Cryptostegia grandiflora Roxb. ex R.Br.	rubber vine	X
Stapelia gigantea (N.E. Brown)	Zulu giant	X
Asteraceae		
Bidens alba (L.) DC. var. *radiata* (Sch.Bip.) Ballard ex Melchert	Spanish needle	X
Bidens pilosa L.	Spanish needle	X
Calyptocarpus vialis Less.	–	X
Flaveria trinervia (Spreng.) C.Mohr	–	X
Parthenium hysterophorus L.	false ragweed	X
Pluchea carolinensis (Jacq.) G. Don	sourbush	X
Pluchea Xfosbergii Cooperr. & Galang	marsh fleabane	X
Sonchus oleraceus L.	sow thistle	X
Synedrella nodiflora (L.) Gaertn.	nodeweed	X
Taraxacum officinale W.W.Weber ex F.H.Wigg.	common dandelion	X
Thymophylla tenuiloba (DC.) Small	Dahlberg daisy, lemon drop	X
Tridax procumbens L.	coat buttons	X
Verbesina encelioides (Cav.) Benth. & Hook.	golden crown-beard	X
Bignoniaceae		
Spathodea campanulata P.Beauv.	African tulip tree	X
Boraginaceae		
Cordia sebestena L.	geiger tree	X
Heliotropium curassavicum L.	kīpūkai, seaside heliotrope	I
Heliotropium procumbens Mill. var. *depressum* (Cham.) Fosberg	–	X
Brassicaceae		
Lepidium sp.	–	X
Cactaceae		
Acanthocereus tetragonus (L.) Hummelinck	barbed wire cereus	X
Hylocereus undatus (Haw.) Britton & Rose	night-blooming cereus, dragon fruit	X
Opuntia ficus-indica (L.) Mill.	prickly-pear, panini	X
Caricaceae		
Carica papaya L.	papaya	X
Casuarinaceae		
Casuarina equisetifolia L.	ironwood	X

Scientific Name and Authorship	Hawaiian/Common Name	Status
Convolvulaceae		
Ipomoea cairica (L.) Sweet	ivy-leaved morning glory	X?
Ipomoea obscura (L.) Ker Gawl.	morning glory	X
Jacquemontia sandwicensis A. Gray	pāʻū-o-Hiʻiaka	E
Merremia aegyptia (L.) Urb.	hairy merremia	X
Cucurbitaceae		
Cucumis dipsaceus Ehrenb. ex Spach	wild cucumber	X
Momordica charantia L.	balsam pear, bitter melon	X
Sicyos pachycarpus Hook. & Arn.	kūpala	E
Euphorbiaceae		
Euphorbia graminea Jacq.	spurge	X
Euphorbia hirta L.	hairy spurge	X
Euphorbia hypericifolia L.	graceful spurge	X
Euphorbia hyssopifolia L.	spurge	X
Euphorbia tirucalli L.	pencil tree	X
Euphorbia prostrata Aiton	prostrate spurge	X
Jatropha gossypiifolia L.	cotton-leaved jatropha	X
Ricinus communis L.	castor bean	X
Synadenium grantii Hook.f.	African milkbush	X
Fabaceae		
Acacia farnesiana (L.) Wild.	klu	X
Albizia lebbeck (L.) Benth.	siris tree	X
Crotalaria pallida Aiton	smooth rattlepod	X
Desmanthus pernambucanus (L.) Thell.	slender mimosa	X
Erythrina sandwicensis O.Deg.	wiliwili	E
Indigofera spicata Jacq.	creeping indigo	X
Indigofera suffruticosa Mill.	indigo	X
Leucaena leucocephala (Lam.) de Wit	koa haole	X
Macroptilium atropurpureum (DC.) Urb.	–	X
Macroptilium lathyroides (L.) Urb.	wild bean	X
Mimosa pudica L. var. *unijuga* (Duchass. & Walp.) Griseb.	sensitive plant	X
Neonotonia wightii (Wight & Arn.) Lackey	perennial soybean	X
Pithecellobium dulce (Roxb.) Benth	ʻopiuma	X
Prosopis pallida Kunth	kiawe	X
Samanea saman (Jacq.) Merr.	monkeypod	X

Scientific Name and Authorship	Hawaiian/Common Name	Status
Senna surattensis (Burm.f.) H.S.Irwin & Barneby	scrambled eggs	X
Tamarindus indica L.	tamarind	X
Gentianaceae		
Centaurium erythraea Raf. subsp. *erythraea*	bitter herb	X
Lamiaceae		
Leonotis nepetifolia (L.) R.Br.	lion's ear	X
Vitex trifolia L.	blue vitex	X
Lauraceae		
Cassytha filiformis L.	kaunaʻoa pehu	I
Malvaceae		
Abutilon grandifolium (Willd.) Sweet	hairy abutilon	X
Abutilon incanum (Link.) Sweet	hoary abutilon	I
Hibiscus rosa-sinensis L.	red hibiscus	X
Malva parviflora L.	cheese weed	X
Malvastrum coromandelianum (L.) Garcke	false mallow	X
Sida acuta Burm.f.	–	X
Sida ciliaris L.	–	X
Sida fallax L.	ʻilima	I
Sida rhombifolia L.	–	X
Sida spinosa L.	prickly sida	X
Moraceae		
Ficus microcarpa L.f.	Chinese banyan	X
Ficus platypoda (A.Cunn. ex Miq.) A.Cunn. ex Miq.	Australian rock fig	X
Ficus sp.		X
Moringaceae		
Moringa oleifera Lamarck	drumstick tree	X
Nyctaginaceae		
Boerhavia coccinea Mill.	–	X
Bougainvillea sp.	bougainvillea	X
Oxalidaceae		
Oxalis corniculata L.	wood sorrel	P?
Passifloraceae		
Passiflora foetida L.	love in a mist	X
Passiflora suberosa L.	huehue haole	X

Scientific Name and Authorship	Hawaiian/Common Name	Status
Phytolaccaceae		
Rivina humilis L.	coral berry	X
Plumbaginaceae		
Plumbago zeylanica L.	ʻilieʻe	I
Polygonaceae		
Antigonon leptopus Hook. & Arn.	Mexican creeper	X
Portulacaceae		
Portulaca oleracea L.	pigweed	X
Portulaca pilosa L.	hairy pigweed	X
Rubiaceae		
Morinda citrifolia L.	noni	P
Rutaceae		
Murraya paniculata (L.) Jack	mock orange	X
Santalaceae		
Nicotiana glauca Graham	tree tobacco	X
Santalum album L.	Indian sandalwood	X
Santalum ellipticum Gaudich.*	ʻiliahiʻaloʻe	E
Santalum album x Santalum ellipticum hybrids	sandalwood hybrids	X
Solanaceae		
Solanum americanum Mill.	pōpolo	I
Solanum seaforthianum Andrews	vining solanum	X
Sterculiaceae		
Waltheria indica L.	ʻuhaloa	I
Verbenaceae		
Citharexylum sp.	–	X
Stachytarpheta jamaicensis (L.) Vahl	Jamaican vervain	X
* = Species observed immediately outside of the Study Area.		

APPENDIX C

PUEO SURVEY DATA SHEETS

Pueo Project Survey Datasheet 2017

Site : Barber's Park GPS point: #1 GPS coordinates: (D.dddddd, -D.dddddd) 21.315291 N 158.055767 W

Date: 11/16/20 Visit # (1, 2 or 3): 4 Survey Start Time: 4:36 Survey Stop Time: 6:19 Observers: J Dutton

Temperature: 78 Cloud cover (Clear, PC, MC, Cloudy): PC Rain: None Wind (0-7): 1-2 from NE

Detection start time	Detection end time	Number	Initial distance	Initial direction	Sounds	Behavior	Habitat
—	—	—	—	—	—	—	—

% Habitat w/in 400 m or surveyed area (must be 100%):

Developed	Wetland	Agricultural Crops	Agricultural Dirt	Grasslshort Grazed	Grasslshort Golf	Grasslshort Mowed
						50%
Grassland Fallow	**Grasslands Tall >75cm**	**Shrublands**	**Non Native Forest**	**Native Forest**	**Other**	**Total**
	10%	40%				100%

Surveyed area (max visible meters):

N: 600	S: 300
NE: 300	SW: 1000
E: 250	W: 1000
SE: 350	NW 1000+

→ To Kiawe canopy

N W E S

Observations: No owls detected

Pueo Project Survey Datasheet 2017

Site: Barber's Point GPS point: #2 GPS coordinates: (D.dddddd, -D.dddddd) 21.309716N 158.054952W

Date: 11-16-20 Visit # (1, 2 or 3): 4 Survey Start Time: 4:25p Survey Stop Time: 6:30p Observers: Phil Taylor

Temperature: 80°F Cloud cover (Clear, PC, MC, Cloudy): PC Rain: Ø Wind (0-7): 3

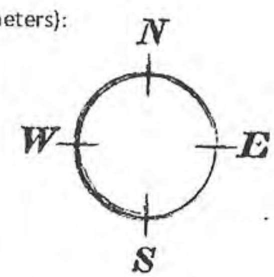
Detection start time	Detection end time	Number	Initial distance	Initial direction	Sounds	Behavior	Habitat
—	—	—	—	—	—	—	—

% Habitat w/in 400 m or surveyed area (must be 100%):

Developed	Wetland	Agricultural Crops	Agricultural Dirt	Grasslshort Grazed	Grasslshort Golf	Grasslshort Mowed
—	—	—	—	—	—	—
Grassland Fallow	**Grasslands Tall >75cm**	**Shrublands**	**Non Native Forest**	**Native Forest**	**Other** Short grass/gravel	**Total**
—	—	20	20	—	60	100

Surveyed area (max visible meters):

N: 100	S: 10
NE: 400	SW: 20
E: 20	W: 100
SE: 10	NW 100



Observations: Bird species list - zebra dove, house finch, spotted dove, Japanese white-eye, northern cardinal, red-vented bulbul, Pacific golden-plover, chestnut munia, gray francolin, red-crested cardinal, Hawaiian stilts (flyover-2), common waxbill, Barbers Point Solar Project

‘Akoko (*Euphorbia skottsbergii* var. *skottsbergii*) Survey Report

Prepared for:

Barbers Point Solar, LLC

July 2021

TETRA TECH

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1.0 Introduction

Barbers Point Solar, LLC is proposing to build and operate the Barbers Point Solar Project (Project) located in ‘Ewa District, on the Island of O‘ahu. The Project will consist of a 15-megawatt (MW) solar photovoltaic system coupled with a 15 MW, 4-hour (60MWh) photovoltaic-coupled battery energy storage system located within approximately 66-hectares (163-acres) in east Kalaeloa (Barbers Point). The Project will be primarily located on tax map keys (TMK) 9-1-013:038 and 9-1-013:040, which are owned by Department of Hawaiian Home Lands (DHHL). Project electrical transmission lines will also be located within rights-of-way owned by Hawai‘i Department of Transportation (HDOT) (Coral Sea Road, Roosevelt Avenue, and Roadway Lot 13083-B) as well as within a portion of TMK 9-1-016:027 (owned by Kapolei Infrastructure, LLC).

Tetra Tech conducted a biological survey within an approximately 68-hectares (168-acres) Project Study Area (i.e. “2020 Project Study Area”) on June 3, 9, and 11, 2020. The purpose of the 2020 biological survey was to characterize the habitat and verify whether state or federally-listed threatened, endangered, or otherwise rare plants or animals have the potential to occur in the Project Study Area and could be impacted by construction or operation of the Project. Although no listed plant species were observed in the 2020 Project Study Area during the June 2020 survey, review of previous surveys in the Project’s vicinity indicated that the endangered ‘akoko (*Euphorbia skottsbergii* var. *skottsbergii;* formerly *Chamaesyce skottsbergii* var. *skottsbergii*) was documented adjacent to the Project Study Area in 2012. Because the 2020 biological survey was conducted during the dry season, and this species of ‘akoko can be difficult to identify during dry periods due to seasonal leaf loss and dormancy, a supplemental wet season ‘akoko survey was recommended by the U.S. Fish and Wildlife Service (USFWS) and Hawai‘i Division of Forestry and Wildlife (DOFAW) for portions of the Project Study Area.

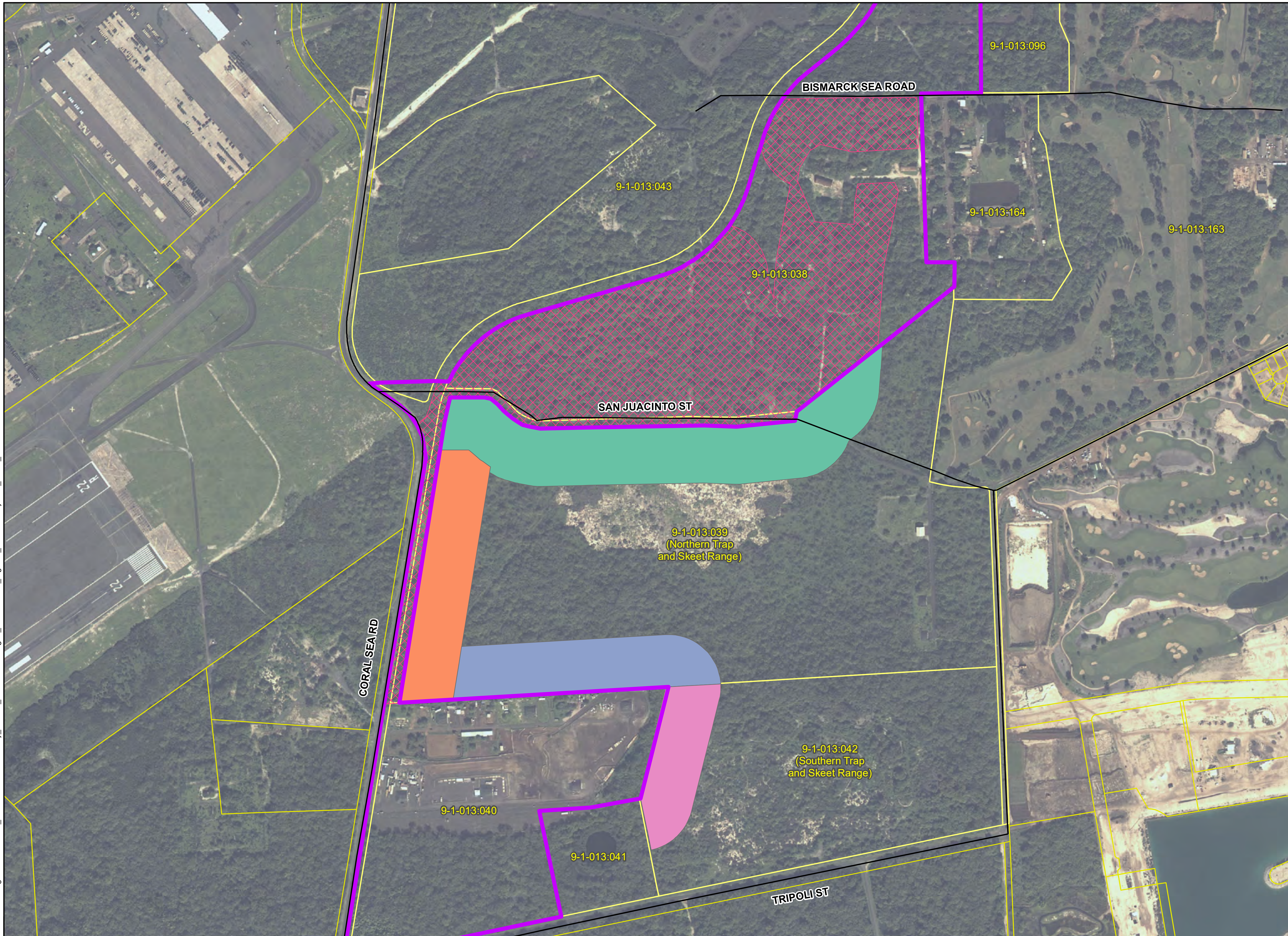
Furthermore, the USFWS recommended a supplemental ‘akoko survey for adjacent areas outside of and adjacent to the Project Study Area to assess potential indirect impacts to the species as a result of the Project. USFWS recommended surveying portions of the Northern Trap and Skeet Range (NTSR) and Southern Trap and Skeet Range (STSR) that are within 100 meters (328 feet) of any proposed Project activity (Lindsy Asman/USFWS, pers. comm., March 2021). The 100-meter distance is based on USFWS’ recommended 100-meter buffer for federally listed shrubs (USFWS 2018).

This report summarizes the results of the wet season ‘akoko survey conducted in the ‘Akoko Survey Area (Figure 1) by Tetra Tech and LeGrande Biological Surveys Inc. between April 8 - 15, 2021. The ‘Akoko Survey Area includes portions of the 2020 Project Study Area, as well as portions of the NTSR and STSR adjacent to the Project components (see Figure 1 and Section 2).

Barbers Point Solar

Figure 1
‘Akoko Survey Area

CITY AND COUNTY OF HONOLULU



- 2020 Project Study Area
- Akoko Survey Area 1
- Akoko Survey Area 2
- Akoko Survey Area 3
- Akoko Survey Area 4
- Project Resurvey Area
- TMK Boundary
- Roads

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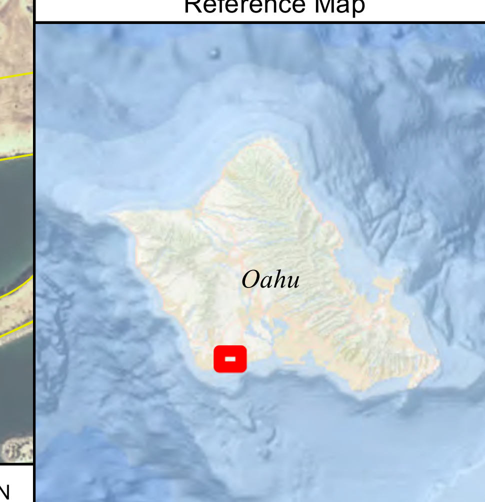
Reference Map



1:7,000 WGS 1984 UTM Zone 4N

0 0.25 0.5 Miles

NOT FOR CONSTRUCTION

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Project Description

The major infrastructures of the Project will include the following: a solar photovoltaic system, a network of electrical collector lines, battery energy storage system and step-up transformers, a collector substation and transformer, a generation-tie line (combination of overhead and underground), internal access roads, and temporary laydown (i.e., staging) areas for construction. Details of the Project design are provided in the biological survey report (Tetra Tech 2021).

2.0 Description of ʻAkoko Survey Area

As shown in Figure 1, the ʻAkoko Survey Area encompasses approximately 49.8 hectares (123.1 acres) on the ʻEwa Plain in east Kalaeloa (Barbers Point). It includes five areas which are listed in Table 1 and described in detail below. The ʻAkoko Survey Area is located within the former Naval Air Station Barbers Point, which closed in 1999, and was utilized for military purposes. It includes portions of the NTSR and STSR which were utilized as trap and skeet ranges prior to base closure. The NTSR ʻakoko population is considered to be the largest and last known existing wild population of the species (Department of Navy and Isle Botanica 2012). USFWS designated portions of the ʻAkoko Survey Area as critical habitat for ʻakoko (Oʻahu Lowland Dry – Unit 11) in 2012 (see Figure 2). Notable land uses in the vicinity of the ʻAkoko Survey Area include: Barbers Point Stables, Barbers Point Golf Course, Ordy Pond, Kalaeloa Airport, Honouliuli Wastewater Treatment Plant, Kalaeloa Heritage Park, and the Kalaeloa Renewable Energy Park.

Table 1. Tax Map Key Parcels and Ownership Within ʻAkoko Survey Area

Survey Area	Size	TMK Parcel #	Parcel Owner
Project Resurvey Area	27.6 hectare (68.3 acres)	9-1-013:038	DHHL
		9-1-013:043	U.S. Navy
Survey Area 1	9.7-hectare (24.0 acre)	9-1-013:039	U.S. Navy
Survey Area 2	4.8-hectare (11.8 acre)	9-1-013:039	U.S. Navy
Survey Area 3	4.8-hectare (11.8 acre)	9-1-013:039	U.S. Navy
Survey Area 4	2.9-hectare (7.2 acre)	9-1-013:042	U.S. Navy

Project Resurvey Area (27.6 hectares, 68.3 acres):

The Project Resurvey Area includes a portion of the 68-hectare (168-acre) 2020 Project Study Area that was surveyed by Tetra Tech in June 2020. The Resurvey Area is based on the distance from the known ʻakoko population in Tax Map Key (TMK) 9-1-013:039 (NTSR), the presence of suitable ʻakoko habitat identified during the previous site visits, and the location of proposed Project components. The Project Resurvey Area includes the Right-of-Way east of Coral Sea Road from San Juacinto Street (also known as South Hanson Road) to TMK 9-1-013:040. It is bordered by Bismarck Sea Road (or Elrod Road) on the north.

<u>Survey Area 1 (9.7 hectares, 24.0 acres):</u>

Survey Area 1 extends 110 meters (360 feet) from the southern boundary of the Project Study Area on TMK 9-1-013:038 near San Juacinto Street south into the NTSR (TMK 9-1-013:039). Survey Area 1 includes a portion of the "2003 clean-up action area," which is an area that was scraped and cleared of vegetation in 2003 to remove arsenic-containing soils. This is the only portion of the 'Akoko Survey Area where 'akoko has been recorded in the last 20 years.

<u>Survey Area 2 (4.8 hectares, 11.8 acres):</u>

Survey Area 2 is in the western portion of the NTSR, and extends 100 meters (328 feet) east from the Right-of-Way off Coral Sea Road into TMK 9-1-013:039. This area is bounded by Survey Area 1 on the north and TMK 9-1-013:040 on the south.

<u>Survey Area 3 (4.8 hectares, 11.8 acres):</u>

Survey Area 3 is in the southern portion of the NTSR, and extends 100 meters (328 feet) north from TMK 9-1-013:040 into the NTSR (TMK 9-1-013:039). This area is bounded by Survey Area 2 on the west.

<u>Survey Area 4 (2.9 hectares, 7.2 acres):</u>

Survey Area 4 is within the STSR, and extends 100 meters (328 feet) east from TMK 9-1-013:040 into TMK 9-1-013:042. This area is bounded by Survey Area 3 on the north, the Project Study Area on the west, and TMK 9-1-013:041 (which includes Ordy Pond) on the southwest.

2.1 Climate

The climate in the 'Akoko Survey Area is characterized as arid and sunny. According to the Online Rainfall Atlas of Hawai'i (Giambelluca et al. 2013), the area receives a mean annual rainfall of approximately 21 inches (530 millimeters [mm]). Rainfall is typically highest in January and lowest in June-July (Giambelluca et al. 2013). The closest National Weather Service (NWS) rainfall gage to the 'Akoko Survey Area, Kalaeloa Airport (HJR), is roughly 1.6 kilometers (1 mile) to the southwest. This station recorded 1.10 inches in January 2021 (47% of normal), 1.22 inches in February 2021 (60% of normal), 3.12 inches in March 2021 (170% of normal), and 0.43 inches in April 2021 (38% of normal) (NWS 2021). The NWS rainfall data suggest this survey was conducted during the preferred survey period for this species (see Section 4).

2.2 Topography and Soils

Coral reef limestone outcroppings and sinkholes (also referred to as limestone pits) are scattered throughout the 'Akoko Survey Area resulting in uneven topography. In general, soil cover across the Kalaeloa area consists of a thin layer of friable, red material present in cracks and crevices on coral outcrop. The Natural Resources Conservation Service (NRCS) identifies a single soil type, Coral Outcrop, in the 'Akoko Survey Area (NRCS 2019).

Barbers Point Solar

Figure 2
Designated Critical Habitat within the Akoko Survey Area

CITY AND COUNTY OF HONOLULU

- 2020 Project Study Area
- Akoko Survey Area 1
- Akoko Survey Area 2
- Akoko Survey Area 3
- Akoko Survey Area 4
- Project Resurvey Area
- TMK Boundary
- Roads
- Critical Habitat (Oahu Lowland Dry - Unit 11)

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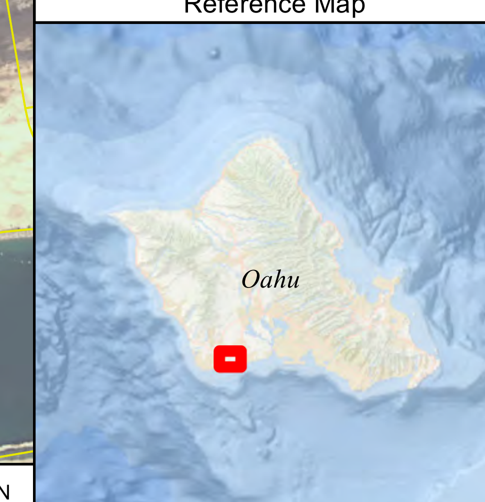
Reference Map



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0 0.25 0.5 Miles

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3.0 Previous ‘Akoko Surveys

Recent ‘akoko surveys conducted in the ‘Akoko Survey Area are briefly summarized below. Based on these survey reports, ‘akoko has only been recorded at the NTSR within the last 20 years (within Survey Area 1) (Department of Navy 2011). The population within the NTSR has declined since 2003.

Chamaesyce skottsbergii botanical survey of the NAS Barbers Point, O’ahu, Hawai‘i (Whistler 1998)

This survey included portions of the 2020 Project Study Area, Project Resurvey Area, and the STSR (including Survey Area 4). During the 1998 survey, a single ‘akoko plant was found near the historic aircraft revetments between Mofet Street and Lamalle Road; however, this historic plant location was outside of the Project footprint and the 100 m buffer (east of the Project Resurvey Area). This report also states that ‘akoko were previously found along Bismark Sea Road in 1997, but were not relocated during the 1998 survey. The specific location of the 1997 survey results were not provided.

‘Akoko Survey of the NTSR at the former NAS Barbers Point (Whistler 2003)

This survey included a portion of the NTSR in the “2003 clean-up action area” prior to the soil removal. A total of 858 ‘akoko individuals were documented in the area during the survey.

Botanical Survey for ‘Akoko on Seven Parcels at Kalaeloa, O‘ahu, Hawai‘i (Whistler 2008)

This survey included seven parcels at Kalaeloa including the Project Resurvey Area and portions of the NTSR. This survey did not include the “2003 clean-up action area” or ‘akoko restoration site adjacent to Building 1527 within the NTSR. No ‘akoko were documented in TMK 9-1-013:038 (including the Project Resurvey Area) during this survey. A total of 176 ‘akoko plants were recorded in the NTSR.

‘Akoko restoration project, Kalaeloa, ‘Ewa District, O‘ahu, Final Report (AECOS 2008)

This survey was part of the conservation actions required due to the 2003 clean-up. Following the 5-year restoration period, a total of 941 ‘akoko plants were documented in nine clusters at the ‘akoko restoration site near Building 1527. A total of 288 ‘akoko plants were found within the “2003 clean-up action area.”

Botanical Survey for the ‘Ewa Plains ‘Akoko (Chamaesyce skottsbergii var. kalaeloana), Northern and Southern Trap and Skeet Range, Former Naval Air Station Barbers Point, O‘ahu, Hawai‘i (Department of the Navy and Isle Botanica 2012)

This survey included the entire NTSR and STSR. A total of 823 ‘akoko individuals were documented in the NTSR during this survey. Of these, 102 plants were within the “2003 clean-up action area.” No ‘akoko or suitable ‘akoko habitat was observed in the STSR.

4.0 Methods

This survey methodology was approved by the DOFAW and USFWS on March 24, 2021 and March 29, 2021, respectively. Prior to the field surveys, linear parallel transects were created at regular intervals on a map-overlay with ARC GIS software. The transects were spaced 5 meters (16.4 feet) apart[1] and loaded on iPad Minis with Collector/Field Maps for ArcGIS. Previous known ʻakoko locations from the 2012 survey in the area were also loaded on the iPad minis to facilitate re-discovery.

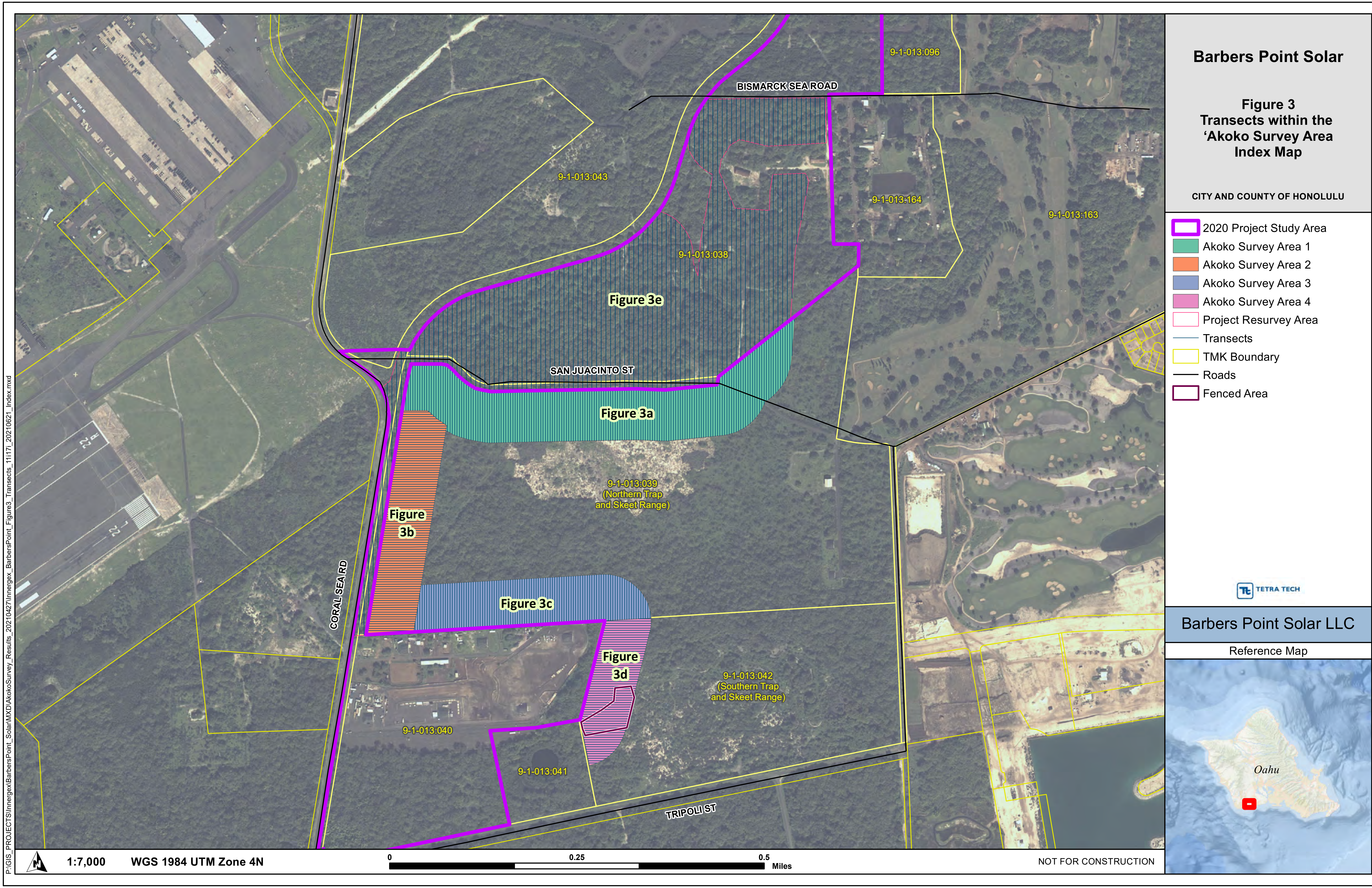
The field surveys were conducted over 5 days: April 8, 10, 12, 14 and 15, 2021. This time of year is preferred because the species is easier to identify after sufficient winter rain events due to the seasonal flush of new growth of leaves, and new seedlings may have germinated (Susan Ching/DOFAW Oʻahu Botanist, pers. comm., February 2021). The weather during the survey was typical for the area, consisting of light winds, clear to partly cloudy skies, and warm to hot temperatures. Details on the rainfall prior to and during the survey is described in Section 2.1.

In the field, 3 botanists walked concurrently along adjacent transects looking for ʻakoko. Areas where ʻakoko was previously recorded, or areas with exposed limestone substrate with minimal groundcover and thin soils were more intensively examined. Transects were spaced 5 meters (16.4 feet) apart in ʻAkoko Survey Area 1, Survey Area 2, Survey Area 3, and Survey Area 4. Transects were spaced 10 meters (32.8 feet) apart in the Project Resurvey Area. This modification to transect spacing in the Project Resurvey Area was made following approval from USFWS and DOFAW (Lindsy Asman/USFWS, pers. comm., April 2021; Susan Ching/DOFAW Botanist, pers. comm., April 2021), and was based on the notable substrate and vegetation differences in the Project Resurvey Area compared to known suitable ʻakoko habitat. To document transect coverage, points were taken at the beginning, middle, and end of each transect. Transects were oriented north to south in the Project Resurvey Area, Survey Area 1, and Survey Area 3; transects were oriented east to west in Survey Areas 2 and 4 (Figure 3).

When found, the location of individual ʻakoko plants or groups of ʻakoko plants were recorded with an iPad Mini connected to a Geode or R1 receiver, which collect data to sub-meter accuracy. When a group of ʻakoko plants was found, the point was taken in the center of the group. For each ʻakoko point, botanists recorded number of individuals, height category, reproductive state, and notes about condition. DOFAW's Oʻahu botanist joined the survey team on April 8, 2021; USFWS did not participate in the survey.

The taxonomy and nomenclature of the flowering plants are in accordance with Wagner et al. (1999, 2012), Wagner and Herbst (2003), and Imada (2012, 2019). Common/Hawaiian names are provided first, followed by scientific names in parentheses. If no common or Hawaiian name is known, only the scientific name is provided.

[1] 5-meter transects were used in this survey upon request from DOFAW and USFWS. Previous surveys in this area used 10-meter transects.



Barbers Point Solar
Figure 3
Transects within the
'Akoko Survey Area
Index Map
CITY AND COUNTY OF HONOLULU
2020 Project Study Area
Akoko Survey Area 1
Akoko Survey Area 2
Akoko Survey Area 3
Akoko Survey Area 4
Project Resurvey Area
Transects
TMK Boundary
Roads
Fenced Area
TETRA TECH
Barbers Point Solar LLC
Reference Map
Oahu
BISMARCK SEA ROAD
SAN JUACINTO ST
CORAL SEA RD
TRIPOLI ST
9-1-013:096
9-1-013:043
9-1-013:164
9-1-013:163
9-1-013:038
9-1-013:039
(Northern Trap
and Skeet Range)
9-1-013:042
(Southern Trap
and Skeet Range)
9-1-013:040
9-1-013:041
Figure 3e
Figure 3a
Figure 3b
Figure 3c
Figure 3d
1:7,000
WGS 1984 UTM Zone 4N
0
0.25
0.5
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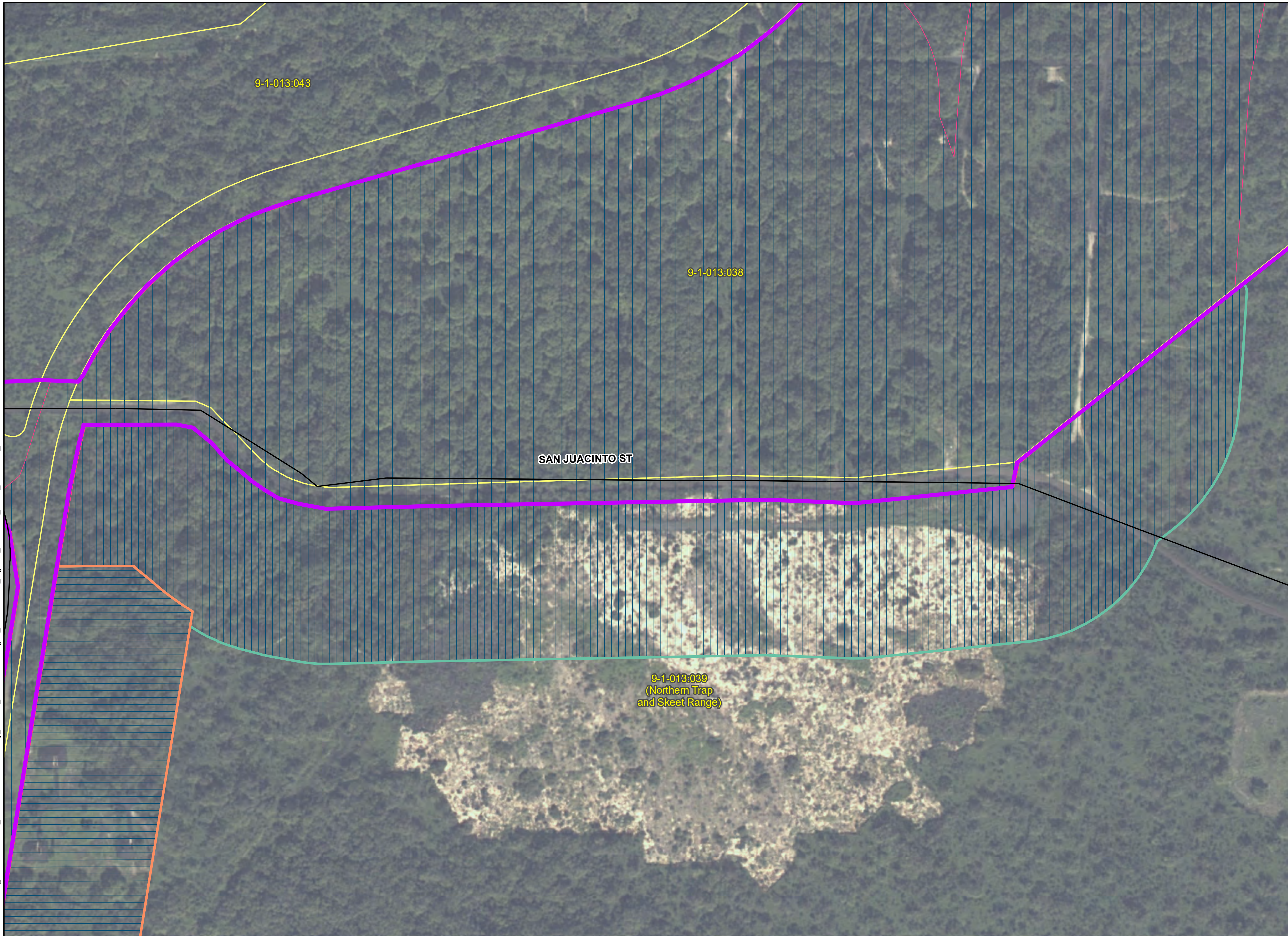

1:2,600 WGS 1984 UTM Zone 4N

0 50 100
Feet

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Barbers Point Solar

Figure 3a
Transects within the ‘Akoko Survey Area
Akoko Survey Area 1

CITY AND COUNTY OF HONOLULU

- 2020 Project Study Area
- Akoko Survey Area 1
- Akoko Survey Area 2
- Project Resurvey Area
- Transects
- TMK Boundary
- Roads

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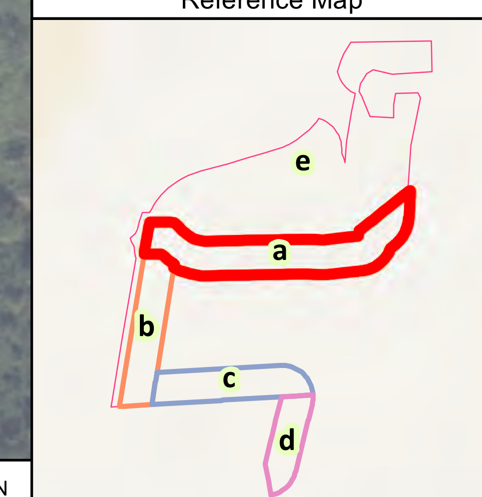
Barbers Point Solar LLC

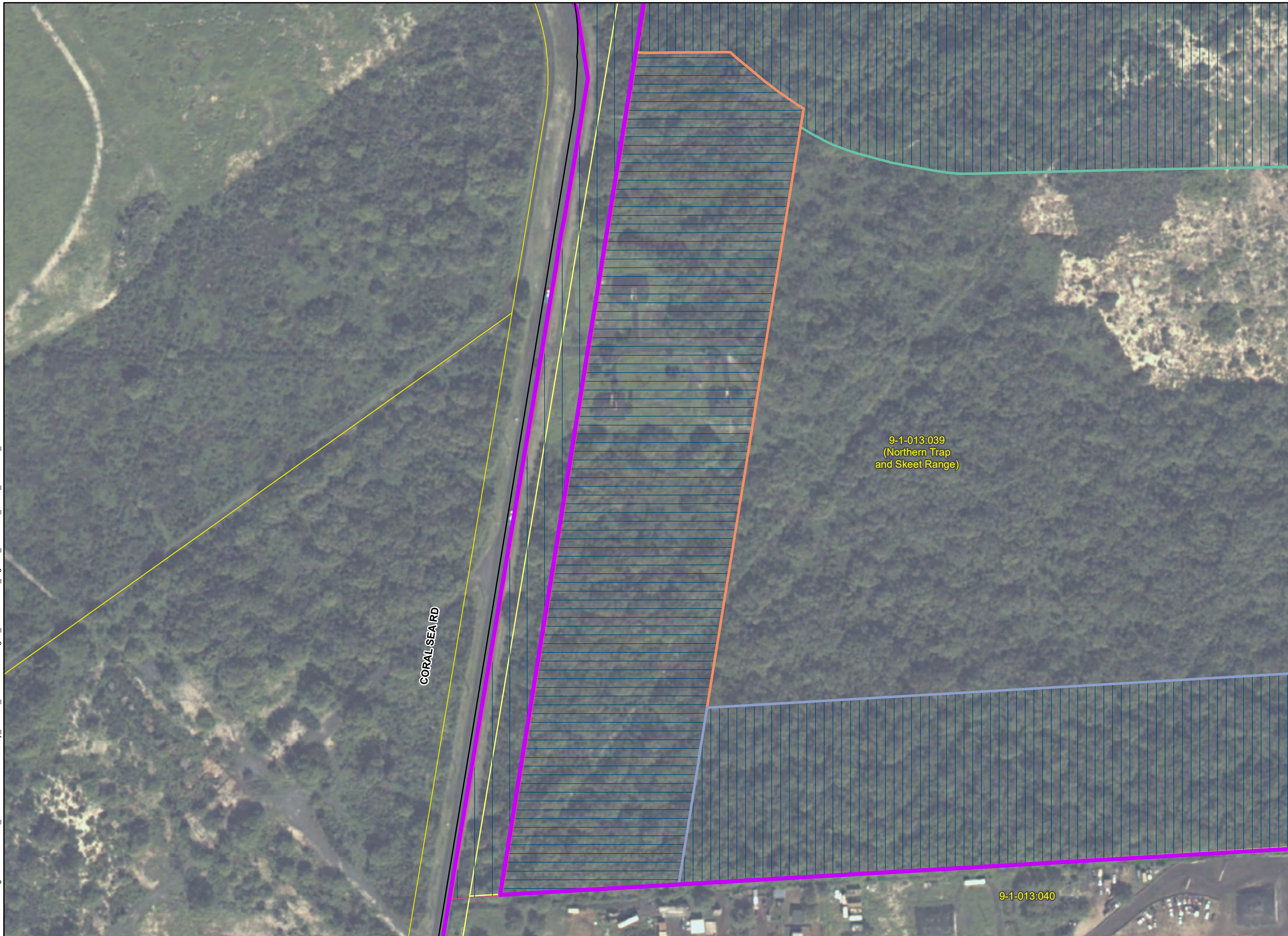
Reference Map



Barbers Point Solar

Figure 3b
Transects within the
'Akoko Survey Area
Akoko Survey Area 2

CITY AND COUNTY OF HONOLULU

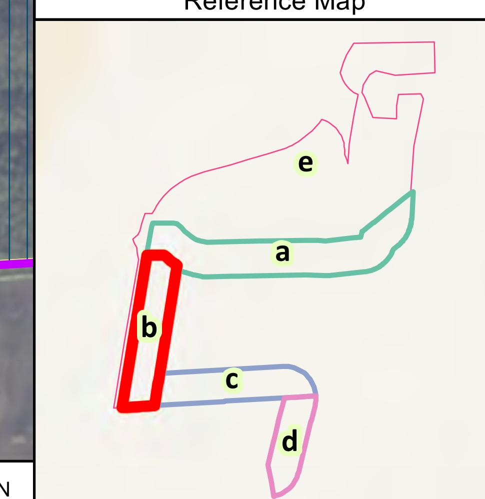


- 2020 Project Study Area
- Akoko Survey Area 1
- Akoko Survey Area 2
- Akoko Survey Area 3
- Project Resurvey Area
- Transects
- TMK Boundary
- Roads

TETRA TECH

Barbers Point Solar LLC

Reference Map



1:2,100 WGS 1984 UTM Zone 4N

0 50 100 Feet

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1:1,600 WGS 1984 UTM Zone 4N

0 50 100
Feet

NOT FOR CONSTRUCTION

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Barbers Point Solar

Figure 3c
Transects within the 'Akoko Survey Area
Akoko Survey Area 3

CITY AND COUNTY OF HONOLULU

- 2020 Project Study Area
- Akoko Survey Area 2
- Akoko Survey Area 3
- Akoko Survey Area 4
- TMK Boundary
- Fenced Area

TETRA TECH

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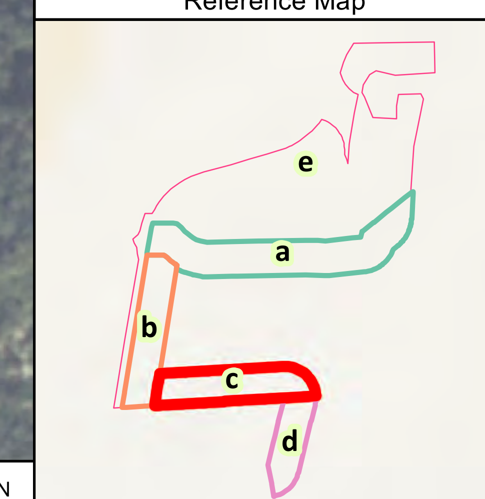
Reference Map



Barbers Point Solar

Figure 3d
Transects within the ‘Akoko Survey Area Akoko Survey Area 4

CITY AND COUNTY OF HONOLULU

- 2020 Project Study Area
- Akoko Survey Area 3
- Akoko Survey Area 4
- TMK Boundary
- Fenced Area

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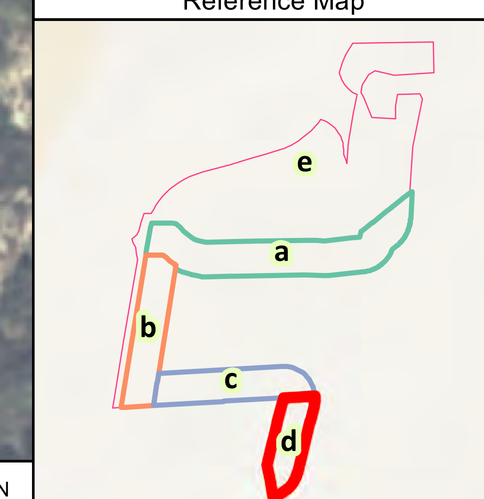
Barbers Point Solar LLC

Reference Map



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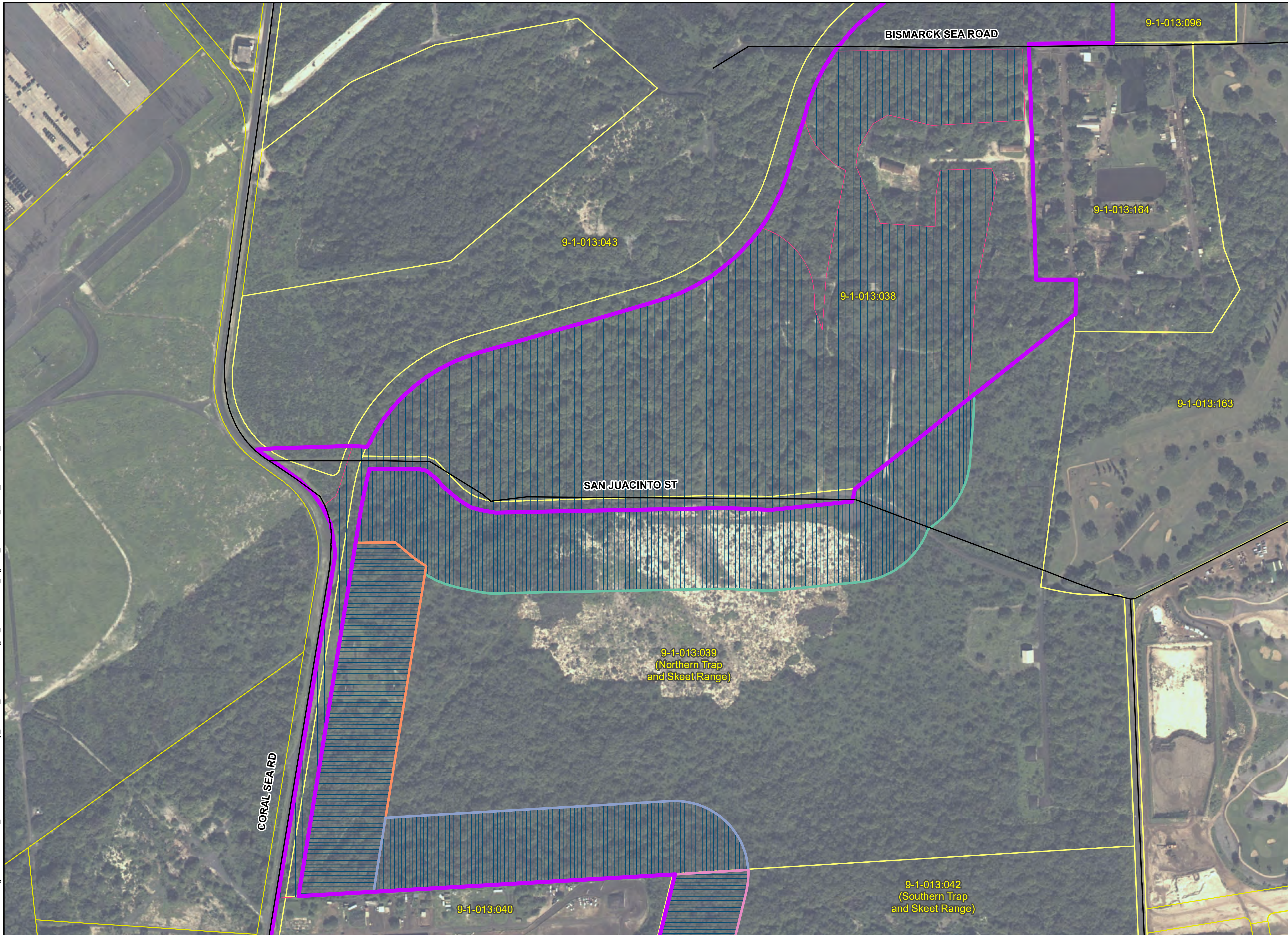


Barbers Point Solar

Figure 3e
Transects within the
'Akoko Survey Area
Project Resurvey Area

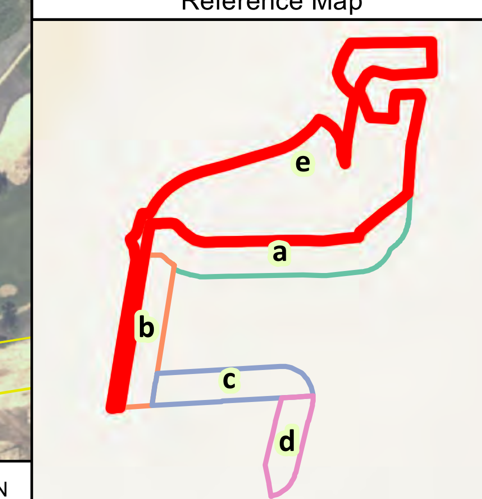
CITY AND COUNTY OF HONOLULU

- 2020 Project Study Area
- Akoko Survey Area 1
- Akoko Survey Area 2
- Akoko Survey Area 3
- Akoko Survey Area 4
- Project Resurvey Area
- Transects
- TMK Boundary
- Roads

TETRA TECH

Barbers Point Solar LLC

Reference Map



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5.0 Results and Discussion

A total of 36 ʻakoko individuals were recorded within the ʻAkoko Survey Area. All ʻakoko plants were within Survey Area 1 in a portion of the NTSR "2003 clean-up action area." Twelve additional plant species native to the Hawaiian Islands were recorded during the survey (Table 2). Impacts from a March 2021 brush fire were evident in some of the survey areas. Details on each survey area are provided below. Representative photographs from the survey are included in Appendix A.

Table 2. Native Plant Species Recorded in the Survey Area

Common/Hawaiian Name	Scientific Name	Status	Location
ʻakoko	*Euphorbia skottsbergii* var. *skottsbergii*	E, End	Area 1
ʻānunu	*Sicyos pachycarpus*	E	Resurvey Area, Area 1, Area 2, Area 3
hoary abutilon	*Abutilon incanum*	I	Resurvey Area, Area 1, Area 2, Area 3
ʻiliahiʻaloʻe	*Santalum ellipticum*	E	Area 1
ʻilieʻe	*Plumbago zeylanica*	I	All survey areas
ʻilima	*Sida fallax*	I	All survey areas
kaunaʻoa pehu	*Cassytha filiformis*	I	Resurvey Area
kīpūkai, seaside heliotrope	*Heliotropium curassavicum*	I	Resurvey Area
pāʻū-o-Hiʻiaka	*Jacquemontia sandwicensis*	E	Resurvey Area
pololei	*Ophioglossum polyphyllum*	I	Resurvey Area, Area 1, Area 2
pōpolo	*Solanum americanum*	I	Resurvey Area, Area 1
wiliwili	*Erythrina sandwicensis*	E	Resurvey Area, Area 1, Area 3
ʻuhaloa	*Waltheria indica*	I	Resurvey Area, Area 1, Area 2
Status: E = Endemic (native only to the Hawaiian Islands); I = Indigenous (native to the Hawaiian Islands and elsewhere); End = Federally and State endangered. Note: Wiliwili observed in Survey Area 2 and Area 4 were all dead.			

5.1 Project Resurvey Area

No ʻakoko individuals were recorded within the Project Resurvey Area. In general, the vegetation in this area is dominated by large kiawe trees (*Prosopis pallida*), roughly 15 to 30 feet (5–9 m) tall, with dense mats of buffelgrass (*Cenchrus ciliaris*) in the understory (see Photo 1 in Appendix A). The kiawe canopy ranges from open to dense thickets. In areas with denser canopy cover, Guinea grass (*Megathyrsus maximus*), Chinese violet (*Asystasia gangetica*), and Zulu giant (*Stapelia gigantea*) are common (Photos 2 and 3). Koa haole (*Leucaena leucocephala*) and ʻopiuma (*Pithecellobium dulce*) trees are also widely scattered in the area. Sisal (*Agave sisalana*) also occurs in dense patches throughout the area. Common native plants in this area include hoary abutilon (*Abutilon incanum*), ʻilima (*Sida fallax*), and ʻuhaloa

(*Waltheria indica*). Three native plant species were found that were not recorded during the June 2020 surveys in the area – ʻānunu (*Sicyos pachycarpus*), pāʻū-o-Hiʻiaka (*Jacquemontia sandwicensis*), and pololei (*Ophioglossum polyphyllum*).

Vegetation in the Project Resurvey Area is disturbed by previous military activities. Large concrete aircraft revetments, paved parking areas, and paved runways and roads are present in this area (Photo 4). An old quarry pit from which limestone was extracted is present in the southeastern portion of the Project Resurvey Area; this heavily vegetated pit was not re-surveyed during April 2021 because of the previous disturbance, and suitable ʻakoko habitat is not present in the area. Sinkholes are scattered throughout the area, and are more abundant in the southwestern corner where several wiliwili (*Erythrina sandwicensis*) trees occur. No notable areas of suitable ʻakoko habitat are present in the Project Resurvey Area.

5.2 Survey Area 1

A total of 36 ʻakoko individuals were recorded within Survey Area 1. The plants occur at 3 locations in the northern central portion of the NTSR within the former "2003 clean-up action area" (see Figure 4). All of the ʻakoko individuals recorded during this survey are more than 100 meters from the Project's limits of disturbance.

Site 1 has the most ʻakoko individuals, with 4 mature plants and 29 seedlings (Table 3). Minimal ground cover and tree canopy is present at Site 1, whereas buffelgrass is abundant around the ʻakoko plants at Sites 2 and 3 (Photos 5-8). The vegetation and substrate in the former "2003 clean-up action area" is notably different than the surrounding; it is characterized by bare limestone substrate with thin soils and minimal vegetation cover (see Photos 9). In comparison, the western portion of Survey Area 1 has denser vegetation and canopy cover. Evidence of the March 2021 fire was observed near the eastern end of Survey Area 1 (Photo 10). A fire break was recently cleared on the western side of Survey Area 1 (Photo 11).

Table 3. ʻAkoko Sites and Individuals Recorded Within Survey Area 1

Site #	No. of individuals	Age/Height*	Reproductive	Notes
1	33	4 mature, 29 seedlings	4 mature plants flowering	South of large kiawe tree. Closest to Cluster 89 from 2012 survey.
2	2	2 mature	Both flowering	On the southern boundary of Survey Area 1.
3	1	mature	Flowering	Next to R6 tag.
*Mature plants are those with flowers or fruits, or plants ≥ 18 inches in height. Seedlings are plants ≤ 7 inches in height.				

Barbers Point Solar

Figure 4
'Akoko
recorded in the
'Akoko Survey Area.

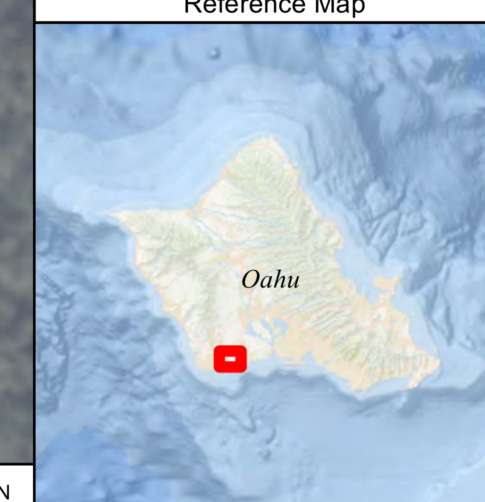
CITY AND COUNTY OF HONOLULU

Akoko Observations
2020 Project Study Area
Akoko Survey Area 1
Project Resurvey Area
TMK Boundary
Road

TETRA TECH

Barbers Point Solar LLC

Reference Map



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5.3 Survey Area 2

No ʻakoko individuals were recorded within Survey Area 2. The vegetation is dominated by kiawe and koa haole trees with buffelgrass and Guinea grass in the understory (Photo 12). The March 2021 fire burned portions of the understory in this area (Photo 13). The vegetation along the western edge of Survey Area 2 is disturbed by road clearance, debris, and gravel piles. The northern and southern portions of the area are less disturbed. A small area of relatively suitable ʻakoko habitat remains at the northern edge of Survey Area 2 (Photo 14).

5.4 Survey Area 3

No ʻakoko individuals were recorded within Survey Area 3. The vegetation is dominated by kiawe trees, with buffelgrass, Guinea grass, and Chinese violet in the understory (Photo 15). A portion of this area was impacted by the recent fire (Photo 16). Kiawe stands become increasingly denser toward the eastern side of Survey Area 3 (Photo 17).

5.5 Survey Area 4

No ʻakoko individuals were recorded within Survey Area 4. Survey Area 4 is dominated by dense kiawe thickets where minimal light penetrates the canopy (Photo 18). A 0.63-hectare (1.6 acre) area within Survey Area 4 is fenced and could not be surveyed (see Figure 3 and Photo 19). A large area of downed kiawe logs is also present in the vicinity of the fence that excludes vegetation growth (Photo 20). Dense pluchea (*Pluchea* spp.) thickets occur at the southern tip of Survey Area 4. Observations during this survey confirm conclusions from the 2012 survey that suitable ʻakoko habitat is not present in this area (Department of Navy and Isle Botanica 2012).

6.0 Conclusions and Recommendations

This survey was conducted to confirm that the federally and state listed ʻakoko does not currently occur within the Project Study Area, and to determine the distance from the Project boundary to the closest ʻakoko plant. As stated above, ʻakoko was only recorded in Survey Area 1 in the former "2003 clean-up action area" in the NTSR. The number of ʻakoko within this area has decreased since surveys in 2012 and 2008. Although evidence of the March 2021 fire was observed in Survey Areas 1-4, fire evidence was not seen in the immediate vicinity of the ʻakoko plants.

With regards to the Project, Tetra Tech recommends the following measures to avoid and minimize potential impacts to the endangered ʻakoko:

- Design the Project to maintain a 100-meter buffer from the remaining ʻakoko individuals in the NTSR in accordance with USFWS recommendations (USFWS 2018).
- As part of the Project's environmental education and observation program, educate all construction and operational personnel about the nearby ʻakoko and critical habitat. Staff should be trained to identify the species and to take appropriate steps if ʻakoko are found.

- Although non-native weedy species are common in the area, implement invasive species minimization measures to avoid the unintentional introduction or transport of new invasive species to the area. This includes utilizing non-invasive species for landscaping; on-site gravel, rock, soil when practicable; purchasing raw materials (e.g., gravel, rock, soil) from a local supplier when practicable; utilizing certified, weed-free seed mixes; and washing and/or visually inspecting (as appropriate) construction materials or equipment arriving from outside Oʻahu for excessive debris, plant materials, and invasive or harmful non-native species. Consult with Oʻahu Invasive Species Committee if needed.
- Develop an Emergency Response Plan and Vegetation Management Plan to reduce potential fire risk to/from the Project.
- If the location of the Project's limits of disturbance changes, a comprehensive ʻakoko survey may be needed in areas with suitable ʻakoko habitat (if present) during the wet season following sufficient rains.

7.0 Literature Cited

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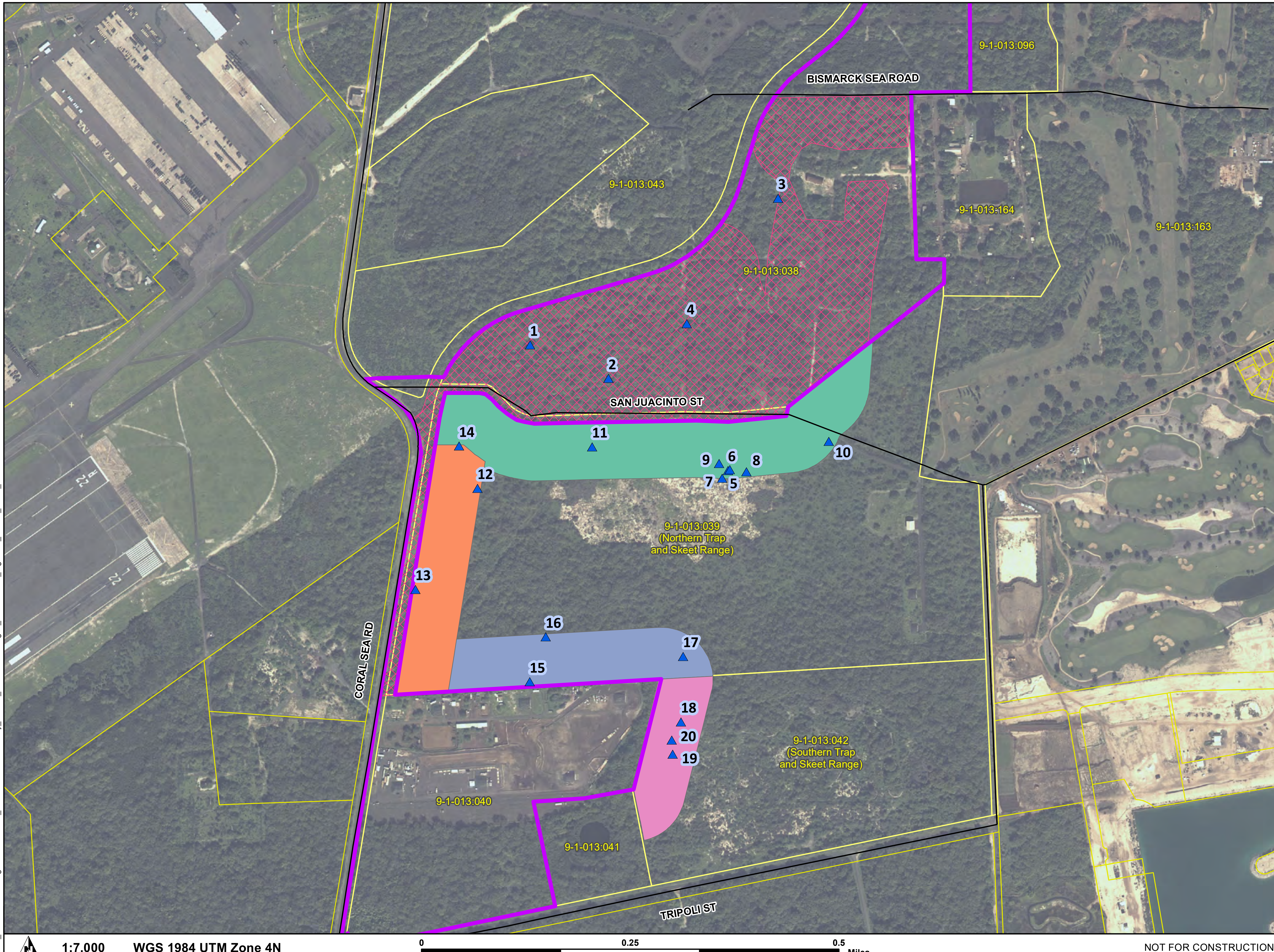
APPENDIX A

REPRESENTATIVE PHOTOGRAPHS OF THE 'AKOKO SURVEY AREA

Barbers Point Solar

Figure A-1
Photo Location Map

CITY AND COUNTY OF HONOLULU



- Photo Points
- 2020 Project Study Area
- Akoko Survey Area 1
- Akoko Survey Area 2
- Akoko Survey Area 3
- Akoko Survey Area 4
- Project Resurvey Area
- TMK Boundary
- Roads

TETRA TECH

Barbers Point Solar LLC

Reference Map

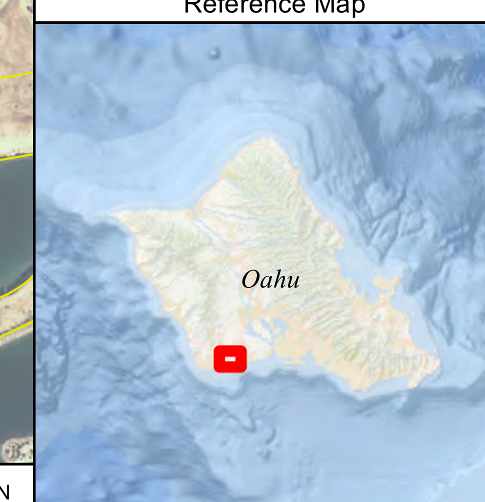


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Photo 1. Kiawe (*Prosopis pallida*) and buffelgrass (*Cenchrus ciliaris*) are abundant in the Project Resurvey Area. Location: 21.316077, -158.053246. April 10, 2021.

Photo 2. Typical area with Chinese violet (*Asystasia gangetica*) within the Project Resurvey Area. Location: 21.315487, -158.051798. April 10, 2021.

Photo 3. Kiawe with Guinea grass (*Megathyrsus maximus*) in the Project Resurvey Area. Location: 21.318609, -158.048619. April 12, 2021.

Photo 4. Numerous paved roads are present in the Project Resurvey Area. Location: 21.316434,-158.050331. April 12, 2021.

Photo 5. Survey team counting ‘akoko plants at Site 1 within Survey Area 1, showing minimal ground and canopy cover. Location: 21.313882, -158.049547. April 8, 2021.

Photo 6. Mature 'akoko plant at Site 1 within Survey Area 1. Location: 21.313869, -158.049582. April 8, 2021.

Photo 7. Site 2 within Survey Area 1 which consisted of 2 mature plants. Location: 21.313733,-158.049694. April 8, 2021.

Photo 8. Site 3 within Survey Area 1, showing 1 mature plant and nearby R6 tag. Location: 21.313846, -158.049242. April 8, 2021.

Photo 9. Typical substrate within the 2003 clean up action area where ‘akoko has been recorded. Location: 21.313993, -158.049747. April 8, 2021.

Photo 10. Evidence of recent fire in Survey Area 1. Location: 21.3143672, -158.047707. April 10, 2021.

Photo 11. Fire break cleared in Survey Area 1. Location: 21.31429671, -158.0521043. April 10, 2021.

Photo 12. Kiawe and buffel grass within Survey Area 2. Location: 21.313586, -158.054239. April 14, 2021.

Photo 13. Showing recent fire that burned understory in Survey Area 2. Location: 21.311831, -158.055408. April 14, 2021.

Photo 14. Small area of suitable akoko habitat in Survey Area 2. Location: 21.31432457,-158.0545788. April 14, 2021.

Photo 15. Typical vegetation in Survey Area 3. Location: 21.310209, -158.053289. April 14, 2021.

Photo 16. Previously burned area in Survey Area 3. Location: 21.31099, -158.052991. April 14, 2021.

Photo 17. Kiawe becomes thicker toward the eastern side of Survey Area 3. Location: 21.310635,-158.050439. April 15, 2021.

Photo 18. Kiawe thicket in Survey Area 4. Location: 21.309494, -158.050482. April 15, 2021.

Photo 19. Fenced area within Survey Area 4. Location: 21.308934, -158.05064. April 15, 2021.

Photo 20. Downed kiawe logs within Survey Area 4. Location: 21.309179, -158.05066. April 15, 2021.

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APPENDIX D. CORRESPONDENCE FROM U.S. FISH AND WILDLIFE SERVICE AND STATE OF HAWAIʻI DEPARTMENT OF LAND AND NATURAL RESOURCES DIVISION OF FORESTRY

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INNERGEX
Renewable Energy.
Sustainable Development.

July 6, 2021

David Smith, Administrator
Division of Forestry and Wildlife
State of Hawaiʻi, Department of Land and Natural Resources
Kalanimoku Building
1151 Punchbowl Street, Room 325
Honolulu, Hawaiʻi 96813
david.g.smith@hawaii.gov

RE: Barbers Point Solar Project
ʻEwa District, Oʻahu; Revised Request for Species List and Impact Avoidance Measures

---

Dear Mr. Smith,

Thank you for DOFAW's previous coordination and input on the Barbers Point Solar Project (Project) located east of Kalaeloa Airport on the Island of O'ahu, Hawaiʻi. Since our meeting in 2020, Barbers Point Solar LLC (Barbers Point Solar) has modified the Project Study Area. The Project will be located within a 163-acre Study Area and is bordered by Tripoli Road to the south, Coral Sea Road to the west, the Barbers Point Golf Course to the east, and vacant land and Roosevelt Ave/Geiger Road on the north. The Project will be primarily located on tax map keys (TMK) 9-1-013:038 and 9-1-013:040, which are owned by Department of Hawaiian Home Lands (DHHL). Project electrical collector and transmission lines will also be located on portions of TMK 9-1-016:027 (owned by Kapolei Infrastructure, LLC) and within rights-of-way owned by Hawaiʻi Department of Transportation and Hawaiʻi Community Development Authority. A preliminary Project layout is provided in Attachment 1.

As the Project will involve the use of lands owned by the state, compliance with Hawaiʻi Revised Statutes (HRS) Chapter 343 is required, and the Project is currently preparing an Environmental Assessment (EA). DHHL has agreed to be the Accepting Authority for the EA. A pre-consultation letter was sent to your office in May 2021 requesting input on the scope of issues to be considered in the Draft EA. No federally owned lands will be utilized for the Project and no federal action is required. Therefore, the Project has no trigger for review under the National Environmental Policy Act and no requirement for consultation under Section 7 of the Endangered Species Act (ESA).

Tetra Tech, Inc. (Tetra Tech) has conducted several biological surveys for the Project. The purpose of the surveys was to characterize the existing plant and animal habitat and determine whether state or federally-listed endangered or threatened species (pursuant to the federal ESA or HRS Chapter 195D), or otherwise rare plants or animals have the potential to occur and could be impacted by construction or operation of the Project. Biological surveys were conducted in June

2020, August 2020, October 2020, November 2020, April 2021, and May 2021. Surveys specific to detect the state-listed pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*) specific surveys) were conducted on the morning of June 11, 2020 and the evenings of August 17, October 8, and November 16, 2020. As previously discussed with DOFAW, the April 2021 survey consisted of a supplemental wet season survey for the endangered ʻakoko (*Euphorbia skottsbergii* var. *skottsbergii*) within portions of the Study Area and areas adjacent to the Study Area. Finally, Tetra Tech conducted a general plant and wildlife survey of the Coral Sea Road rights-of-way on May 5, 2021.

The enclosed reports (Attachments 2 and 3) summarize the results of the biological surveys, and offers recommendations to avoid and minimize potential impacts to listed species. As the Project intends to avoid impacts to federally and state listed species, we are also requesting Project-specific avoidance measures from DOFAW. A similar request for information has also been sent to the U.S. Fish and Wildlife Service.

We look forward to your response. Should you have any questions or require additional information, please feel free to contact me at (604) 345-4009 or via email at JMancinelli@innergex.com or Tiffany Agostini at (808) 271-7274 or via email at Tiffany.Agostini@tetratech.com.

Sincerely,

Barbers Point Solar LLC

Julia Mancinelli

Julia Mancinelli
Director - Environment

Attachments:

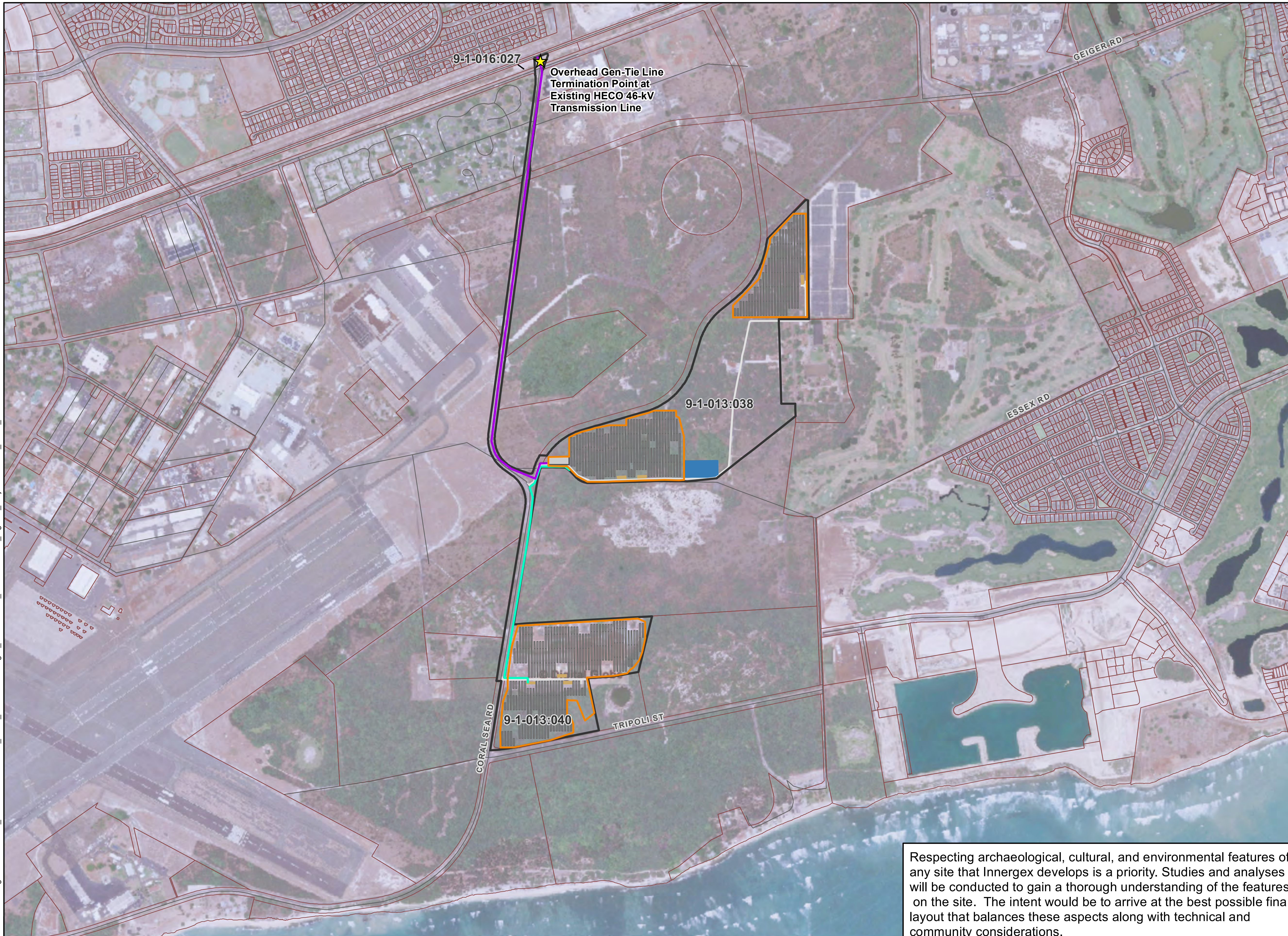
1. Preliminary Project Layout
2. Barbers Point Solar Project Revised Draft Biological Resources Survey Report (Tetra Tech 2021)
3. Barbers Point Solar Project Draft ʻAkoko (*Euphorbia skottsbergii* var. *skottsbergii*) Survey Report (Tetra Tech 2021)

cc: Koa Matsuoka, DOFAW
Susan Ching, DOFAW
Tiffany Agostini, Tetra Tech
Leslie McClain, Tetra Tech

Barbers Point Solar Project

Figure 1
Conceptual Project Overview

HONOLULU COUNTY, HI

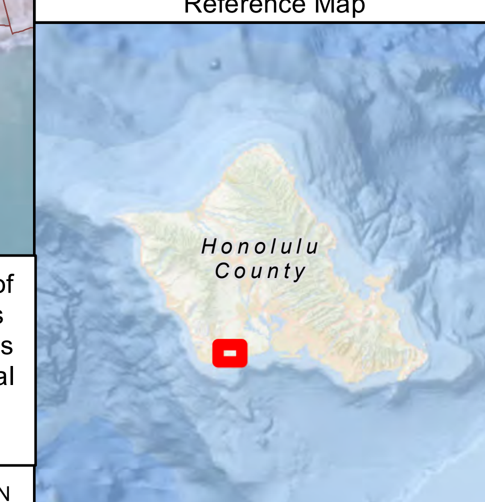


- Project Study Area
- Security Fence
- Solar Array
- Collector Line
- Project Substation
- Power Conversion System
- Temporary Laydown (Staging) Area
- Site Access Road & Collector Line
- 46-kV Transmission Line (Overhead and Underground)
- Existing Seconday Road
- TMK Boundary

Respecting archaeological, cultural, and environmental features of any site that Innergex develops is a priority. Studies and analyses will be conducted to gain a thorough understanding of the features on the site. The intent would be to arrive at the best possible final layout that balances these aspects along with technical and community considerations.

Innergex Renewable Development USA LLC

Reference Map



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DAVID Y. IGE
GOVERNOR OF HAWAII

STATE OF HAWAII
DEPARTMENT OF LAND AND NATURAL RESOURCES
DIVISION OF FORESTRY AND WILDLIFE
1151 PUNCHBOWL STREET, ROOM 325
HONOLULU, HAWAII 96813

July 15, 2021

Julia Mancinelli
Innergex Renewables USA, LLC
4660 La Jolla Village Drive, Suite 680
San Diego, CA 92122

Dear Ms. Mancinelli:

The Department of Land and Natural Resources, Division of Forestry and Wildlife (DOFAW) has received your revised request for a species list and impact avoidance measures for the Barbers Point Solar Project in ʻEwa on Oʻahu, Hawaiʻi, TMKs: (1) 9-1-013:038, 9-1-013-040, and 9-1-016:027. The proposed project consists of constructing a 15-megawatt (MW) solar photovoltaic system coupled with a 15 MW, 4-hour (60 MW-hour) photovoltaic coupled battery energy storage system (PV-Coupled ESS) as well as ancillary support infrastructure on 163-acres of undeveloped land.

We appreciate your proactive planning efforts with DOFAW on avoidance and minimization measures for listed species to inform the development of the proposed solar project. Based on the information from the updated June 2021 Draft Biological Resources Survey Report, DOFAW provides the following comments.

The wet season survey data from June 2021 report indicates that no *Euphorbia skottsbergii* var. *skottsbergii* were found within 100-meters of the proposed project area. If any *Euphorbia skottsbergii* var. *Skottsbergii* are observed during the construction and operation of the proposed solar project, DOFAW supports the U.S. Fish and Wildlife guidelines and does not support any digging within 100 meters of any endangered plants regardless of their location to the project boundaries.

Due to the arid climate and risks of wildfire to listed species, we recommend coordinating with the Hawaiʻi Wildfire Management Organization (808-850-900, admin@hawaiiwildfire.org) on how wildfire prevention can be addressed in the project area.

DOFAW recommends that any Wiliwili (*Erythrina sanwichensis*) trees present at the project site should not be damaged and avoided by project infrastructure when possible. While not State listed species, these Wiliwili have been species of concern in the past and are still a valuable resource for Hawaii's imperiled lowland dry forests. Additionally, we recommend reaching out to the Kalaeloa Heritage and Legacy Foundation near the project site about the best practices for caring for the Wiliwili trees in this area. Please visit: https://www.khlfoundation.org/ for more information.

The State endangered Pueo has been observed in the project site vicinity. Pueo are a crepuscular species, most active during dawn and dusk twilights. DOFAW recommends twilight pre-construction surveys by a qualified biologist prior to clearing vegetation for construction. If Pueo nests are present, a buffer zone of 46 m (150 feet) should be established in which no clearing occurs until nesting ceases, and DOFAW staff should be notified. Work should not resume until directed by DOFAW.

State listed waterbirds such as the Hawaiian Stilt (*Himantopus mexicanus knudseni*), Hawaiian Coot (*Fulica alai*), and Hawaiian Moorhen (*Gallinula galeata sandvicensis*) have the potential to occur in the vicinity of the proposed project site. It is against State law to harm or harass these species. If any of these species are present during construction activities, then all activities within 100 feet (30 meters) should cease, and the bird should not be approached. Work may continue after the bird leaves the area of its own accord. If a nest is discovered at any point, please contact the O‘ahu DOFAW Office at (808) 973-9778.

We appreciate your efforts to work with our office for the conservation of Hawai‘i’s native species. Should the scope of the project change significantly, or should it become apparent that threatened or endangered species may be impacted, please contact our staff as soon as possible. If you have any questions, please contact Paul Radley, Protected Species Habitat Conservation Planning Coordinator at (808) 587-0010 or paul.m.radley@hawaii.gov.

Sincerely,

DAVID G. SMITH
Administrator

cc: Tiffany Agostini, Tetra Tech
Leslie McClain, Tetra Tech

INNERGEX

Renewable Energy.
Sustainable Development.

July 6, 2021

Lindsy Asman
Pacific Islands Fish and Wildlife Office
U.S. Fish and Wildlife Services
300 Ala Moana Blvd. Room 30122
Honolulu, Hawaiʻi 96850
Lindsy_Asman@fws.gov

RE: **Barbers Point Solar Project**
ʻEwa District, O'ahu; Revised Request for Species List and Impact Avoidance Measures

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Dear Ms. Asman,

Thank you for your previous coordination and input on the Barbers Point Solar Project (Project) located east of Kalaeloa Airport on the Island of O'ahu, Hawaiʻi. Since our meeting in 2020, Barbers Point Solar LLC (Barbers Point Solar) has modified the Project Study Area. The Project will be located within a 163-acre Study Area and is bordered by Tripoli Road to the south, Coral Sea Road to the west, the Barbers Point Golf Course to the east, and vacant land and Roosevelt Ave/Geiger Road on the north. The Project will be primarily located on tax map keys (TMK) 9-1-013:038 and 9-1-013:040, which are owned by Department of Hawaiian Home Lands (DHHL). Project electrical collector and transmission lines will also be located on portions of TMK 9-1-016:027 (owned by Kapolei Infrastructure, LLC) and within rights-of-way owned by Hawaiʻi Department of Transportation and Hawaiʻi Community Development Authority. A preliminary Project layout is provided in Attachment 1.

No federally owned lands will be utilized for the Project and no federal action is required. Therefore, the Project has no trigger for review under the National Environmental Policy Act and no requirement for consultation under Section 7 of the Endangered Species Act (ESA). As the Project will involve the use of lands owned by the state, compliance with Hawaiʻi Revised Statutes (HRS) Chapter 343 is required, and the Project is currently preparing an Environmental Assessment (EA). DHHL has agreed to be the Accepting Authority for the EA. Pre-consultation letters were sent to the Pacific Islands Fish and Wildlife Office in May 2021 requesting input on the scope of issues to be considered for the Draft EA.

Tetra Tech, Inc. (Tetra Tech) has conducted several biological surveys for the Project. The purpose of the surveys was to characterize the existing plant and animal habitat and determine whether state or federally-listed endangered or threatened species (pursuant to the federal ESA or HRS Chapter 195D), or otherwise rare plants or animals have the potential to occur and could be impacted by construction or operation of the Project. Biological surveys were conducted in June

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2020, August 2020, October 2020, November 2020, April 2021, and May 2021. Surveys specific to detect the state-listed pueo or Hawaiian short-eared owl (*Asio flammeus sandwichensis*) specific surveys) were conducted on the morning of June 11, 2020 and the evenings of August 17, October 8, and November 16, 2020. As previously discussed with USFWS, the April 2021 survey consisted of a supplemental wet season survey for the endangered ‘akoko (*Euphorbia skottsbergii* var. *skottsbergii*) within portions of the Study Area and areas adjacent to the Study Area. Finally, Tetra Tech conducted a general plant and wildlife survey of the Coral Sea Road rights-of-way on May 5, 2021.

The enclosed reports (Attachments 2 and 3) summarize the results of the biological surveys, and offers recommendations to avoid and minimize potential impacts to listed species. As the Project intends to avoid impacts to federally and state listed species, we are also requesting Project-specific avoidance measures from USFWS. A similar request for information has also been sent to the State of Hawai‘i Division of Forestry and Wildlife (DOFAW).

We look forward to your response. Should you have any questions or require additional information, please feel free to contact me at (604) 345-4009 or via email at JMancinelli@innergex.com or Tiffany Agostini at (808) 271-7274 or via email at Tiffany.Agostini@tetratech.com.

Sincerely,

Barbers Point Solar LLC

Julia Mancinelli

Julia Mancinelli
Director - Environment

Attachments:

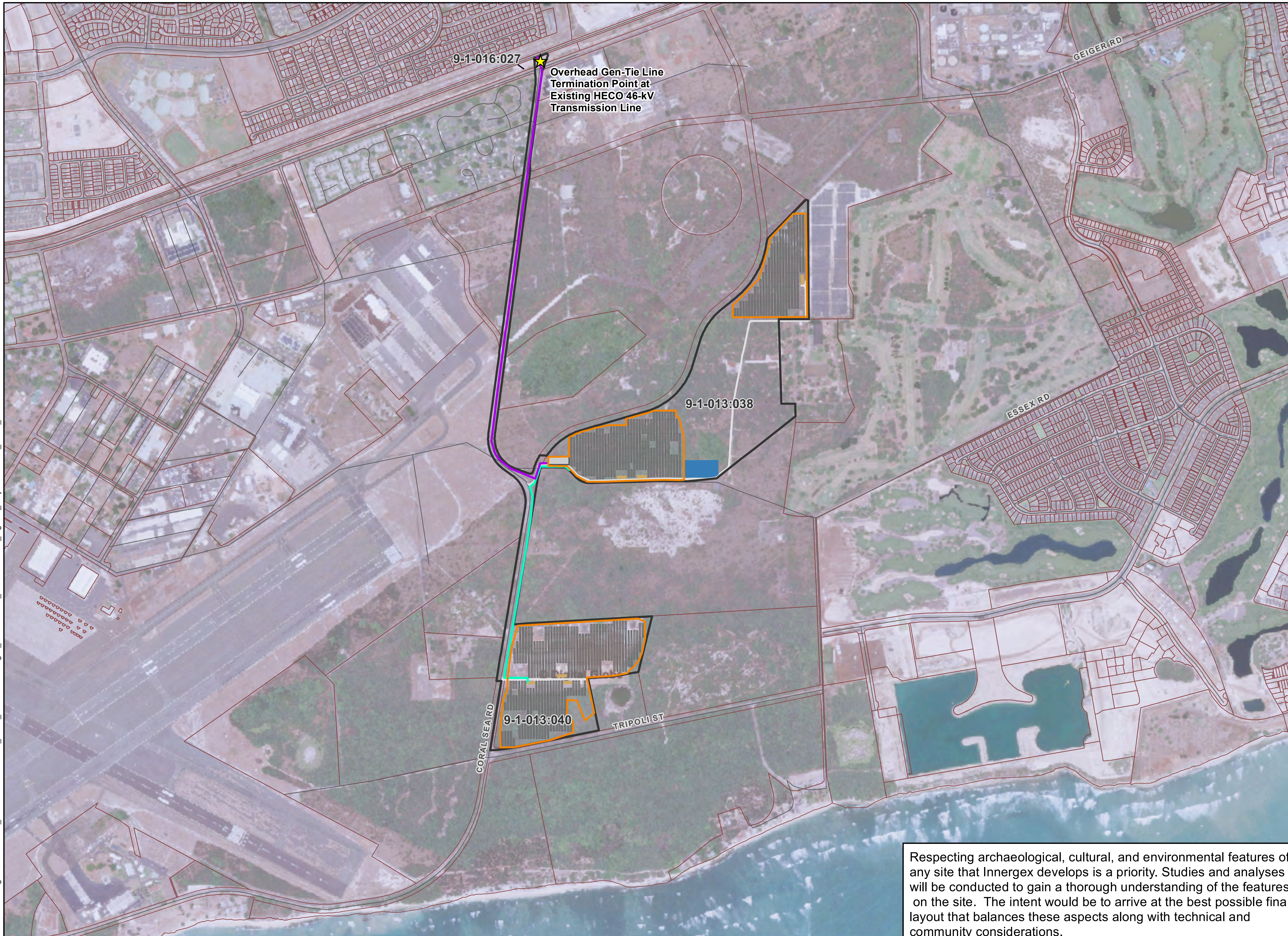
1. Preliminary Project Layout
2. Barbers Point Solar Project Revised Draft Biological Resources Survey Report (Tetra Tech 2021)
3. Barbers Point Solar Project Draft ‘Akoko (*Euphorbia skottsbergii* var. *skottsbergii*) Survey Report (Tetra Tech 2021)

cc: Pacific Islands Fish and Wildlife Office, USFWS
Tiffany Agostini, Tetra Tech
Leslie McClain, Tetra Tech

Barbers Point Solar Project

Figure 1
Conceptual Project Overview

HONOLULU COUNTY, HI

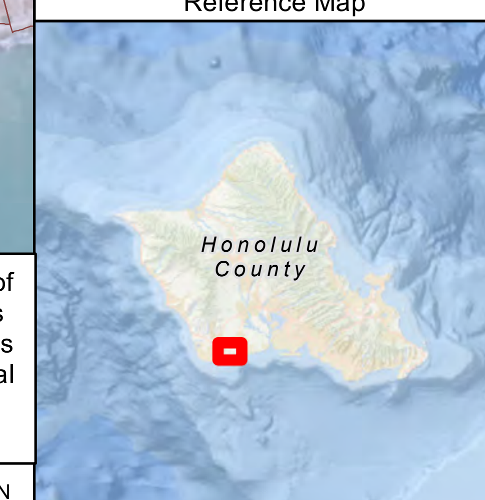


- Project Study Area
- Security Fence
- Solar Array
- Collector Line
- Project Substation
- Power Conversion System
- Temporary Laydown (Staging) Area
- Site Access Road & Collector Line
- 46-kV Transmission Line (Overhead and Underground)
- Existing Seconday Road
- TMK Boundary

Respecting archaeological, cultural, and environmental features of any site that Innergex develops is a priority. Studies and analyses will be conducted to gain a thorough understanding of the features on the site. The intent would be to arrive at the best possible final layout that balances these aspects along with technical and community considerations.

Innergex Renewable Development USA LLC

Reference Map



1:14,000 WGS 1984 UTM Zone 4N

0 0.25 0.5 1 Miles

NOT FOR CONSTRUCTION

P:\GIS_PROJECTS\Innergex\BarbersPoint_Solar\MXD\Preconsult_Letter_20210601\Innergex_BarbersPoint_PublicOutreach_Figure1_ProjectOverview_11x17_20210603.mxd

McClain, Leslie

Subject: FW: [EXTERNAL] FW: Barbers Point Solar Project

From: Asman, Lindsy <Lindsy_Asman@fws.gov>
Sent: Wednesday, July 21, 2021 8:49 AM
To: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Subject: Re: [EXTERNAL] FW: Barbers Point Solar Project

Hi Tiffany, thank you for checking. I did get the reports. Sounds like there is no federal nexus, so the applicant won't be pursuing section 7 consultation.

Let me know if I can be of any further assistance.

From: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Sent: Wednesday, July 21, 2021 8:28 AM
To: Asman, Lindsy <Lindsy_Asman@fws.gov>
Subject: RE: [EXTERNAL] FW: Barbers Point Solar Project

Aloha Lindsy –

I just wanted to check in to make sure you received the 2 reports and see if you have any questions.

Hope you are well!

Thanks,
Tiffany

From: Agostini, Tiffany
Sent: Friday, July 9, 2021 9:23 AM
To: Asman, Lindsy <Lindsy_Asman@fws.gov>
Subject: RE: [EXTERNAL] FW: Barbers Point Solar Project

Hi Lindsy –

Here is the akoko report. If you could confirm receipt of both reports that would be great.

Happy Friday,
Tiffany

From: Asman, Lindsy <Lindsy_Asman@fws.gov>
Sent: Friday, July 9, 2021 7:22 AM
To: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Subject: Re: [EXTERNAL] FW: Barbers Point Solar Project

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Thank you for the letter Tiffany, can you also send the two reports referenced in the letter. Thank you!

Lindsy

From: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Sent: Thursday, July 8, 2021 4:54 PM
To: Asman, Lindsy <Lindsy_Asman@fws.gov>
Subject: [EXTERNAL] FW: Barbers Point Solar Project

This email has been received from outside of DOI - Use caution before clicking on links, opening attachments, or responding.

Hi Lindy,

I sent you the 2 Barbers Point Solar survey reports yesterday, but the file size was pretty big. Can you please confirm you received them?

Thanks,
Tiffany

From: Agostini, Tiffany
Sent: Tuesday, July 6, 2021 6:02 PM
To: Asman, Lindsy <Lindsy_Asman@fws.gov>
Cc: Julia Mancinelli <jmancinelli@innergex.com>; McClain, Leslie <Leslie.McClain@tetratech.com>; pifwo_admin@fws.gov
Subject: RE: Barbers Point Solar Project

Aloha Lindsy,

Thank you so much for your previous coordination and input on the Barbers Point Solar Project. Since our previous meeting, Barbers Point Solar LLC has modified the Project Study Area, as shown in Figure 1. No federally owned lands will be utilized for the Project and no federal action is required. Additional information is provided in the attached letter. I am also attaching our Revised Draft Biological Resources Survey Report and the Project's Draft ʻAkoko (*Euphorbia skottsbergii* var. *skottsbergii)* Survey Report.

Please feel free to reach out if you have any questions. We look forward to receiving your input.

Thank you,
Tiffany

Tiffany Bovino Agostini | Senior Biologist/ Project Manager
Tiffany.Agostini@tetratech.com

Tetra Tech | **Honolulu**
737 Bishop St., Suite 2340 | Mauka Tower | Honolulu, HI 96813-3201

Direct: 808.441.6652 | Fax: 808.836.1689 | Cell: 808.271.7274
www.tetratech.com

From: Asman, Lindsy <Lindsy_Asman@fws.gov>
Sent: Monday, March 29, 2021 10:09 AM
To: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Cc: Julia Mancinelli <jmancinelli@innergex.com>; McClain, Leslie <Leslie.McClain@tetratech.com>
Subject: Re: [EXTERNAL] RE: Barbers Point solar project.

Good morning all. The survey methodology looks great. Our biologists have recently been surveying the refuge south of the NTSR and STSR and are seeing ‘akoko sprouting up in dense buffel grass and other non-native vegetation. They say they were literally standing right next to it and did not see it. Good luck and please let us know if we can be of any assistance.

Mahalo,

Lindsy

From: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Sent: Tuesday, March 23, 2021 9:10 AM
To: Asman, Lindsy <Lindsy_Asman@fws.gov>
Cc: Julia Mancinelli <jmancinelli@innergex.com>; McClain, Leslie <Leslie.McClain@tetratech.com>
Subject: RE: [EXTERNAL] RE: Barbers Point solar project.

Aloha Lindsy –

Please see attached for our proposed survey methods for the wet season ‘akoko survey for Barbers Point Solar. We are planning to start our surveys on April 8th. We greatly appreciate your timely review of this document so that we don’t miss the wet season survey window.

Following up on our question about *Euphorbia skottsbergii* var. *skottsbergii* in the STSR, can you tell us when it was recorded there and generally what area? That will help with our efforts in Survey Area 4 (see attached figure) if surveying that area is required for the project.

Feel free to call me if you have any questions or concerns. 808-271-7274.

Thanks,

Tiffany

From: Agostini, Tiffany
Sent: Thursday, March 4, 2021 7:39 AM
To: Asman, Lindsy <Lindsy_Asman@fws.gov>
Cc: Julia Mancinelli <jmancinelli@innergex.com>; McClain, Leslie <Leslie.McClain@tetratech.com>
Subject: RE: [EXTERNAL] RE: Barbers Point solar project.

Mahalo Lindsy for the thorough feedback. Please see our responses and questions in **blue** below.

Aloha,
Tiffany

From: Asman, Lindsy <Lindsy_Asman@fws.gov>
Sent: Tuesday, March 2, 2021 3:52 AM
To: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Cc: Julia Mancinelli <jmancinelli@innergex.com>; McClain, Leslie <Leslie.McClain@tetratech.com>
Subject: Re: [EXTERNAL] RE: Barbers Point solar project.

Hello Tiffany, Leslie, and Julia,

I have attached the 2008 and 2012 survey reports for ʻakoko at the Barbers Point NTSR (Northern Trap and Skeet Range) and STSR (Southern Trap and Skeet Range). A few thoughts for your consideration:

1. The 2008 report is outdated and much of the content no longer applies. For example, the 2008 report was written prior genetic analysis, which demonstrated the Molokaʻi ʻakoko were a different genetic species. The ʻakoko on the NTSR are the last remaining wild population which requires special consideration. The only other ʻakoko populations are transplanted populations 1) within critical habitat on the Wildlife Refuge at Kalaeloa (outplanted), and 2) at the Heritage Site, adjacent to the NTSR. **We agree.**
2. The 2012 survey was considered a comprehensive survey for ʻakoko on the STSR and NTSR. ʻAkoko were documented to be present within the STSR parcel (Parcel ID 9-1-103042) and the NTSR (Parcel ID 9-1-103039) in 2012. We recommend you survey the STSR and western side of the NTSR in the

same manner as proposed for the northern portion of the NTSR as discussed (i.e., within 110 m of any proposed activity associated with the project). Site conditions change and the NTSR and STSR contains habitat features that foster the likelihood of ‘akoko establishment (i.e., raised coral outcrop, seed bank, adjacent occupancy [Heritage site], former occupancy, etc.) given conducive conditions, like precipitation. ‘Akoko plants may be present within the NTSR and STSR including within areas where there is invasive vegetation. We expect the NTSR and STSR may contain areas where ‘akoko could have established since the 2012 surveys. **You state above akoko was present in the STSR, but Art’s 2012 report states the species was not observed within STSR, and “Prime ‘akoko habitat was not observed in this parcel either because there was no organic substrate to grow on the exposed bedrock, or the area was covered by thick non-native vegetation.” Which year was akoko last recorded in the STSR, and can you tell us rough abundance in the STSR when it was last recorded?**

3. The 2008 and 2012 surveys were considered comprehensive assessments of ‘akoko at that time. However, currently we do not rely on these surveys to determine ‘akoko presence. We consider characteristics of a site to determine whether ‘akoko, and the other 16 plants for which the site is designated as critical habitat, are present on a site or whether the plants could potentially occupy the site if restored. Current comprehensive surveys of the sites are necessary to assess occupancy or likelihood of future occupancy. We recommend consideration of future site conditions and likelihood of listed plant presence adjacent to your project site in the future. If the critical habitat is restored to increase the ‘akoko distribution and abundance, and/or the other listed plants are outplanted to the critical habitat here, these plants may disperse and become established onto your adjacent parcels. This would require future consultation for associated effects from the maintenance and operations of the solar development (the plants are protected where ever they are found). Should this occur, reinitiation of the consultation would be necessary to evaluate effects that were not considered in the original consultation. Surveying the portions of the STSR and NTSR within 110 m of your project would a) establish a baseline should future occupancy occur, and b) aid in your evaluation of potential need to reinitiate the consultation. **Understood. Does the Service have data on the likely natural dispersal distance of *Euphorbia skottsbergii* var. *skottsbergii*?**
4. I spoke with our botanists and biologists who have been part of the Barbers Point ‘akoko listing and critical habitat designation process. Due to the density of vegetation currently at the site we do not believe ‘akoko present on the sites would be visible at 10-meter distances between surveyors. The methodology I sent you previously includes 10-meter distances between surveyors, which was considered sufficient during the 2008 and 2012 surveys, when there was higher abundance and distribution of ‘akoko and lower density of invasive vegetation (it was easier to see ‘akoko then). Currently, based on our recent visit to the sites (Feb 2020), we expect the current density of invasive vegetation on the NTSR/STSR would be prohibitive of seeing ‘akoko and the distance between surveyors needs to be shortened to account for this. During our site visit in 2020 the buffel grass was relatively dense, which would not prohibit the establishment of ‘akoko, but would prohibit a clear view of ‘akoko plants, especially young plants or those without leaves. We suggest a maximum of 5 meters between surveyors to ensure adequate visibility of ‘akoko. **Understood. We are ok with 5 m with 2-3 botanists.**
5. I did a quick review of the survey report and don't have any comments at this time. I will go through the report again in finer detail later, next week, and provide any comments if I have any. **Great, thanks!**

Thank you for your early coordination and please reach out to me with any questions or if I can be of any assistance.

Thank you,

Lindsy

From: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Sent: Thursday, February 25, 2021 10:01 AM
To: Asman, Lindsy <Lindsy_Asman@fws.gov>
Cc: Julia Mancinelli <jmancinelli@innergex.com>; McClain, Leslie <Leslie.McClain@tetratech.com>
Subject: RE: [EXTERNAL] RE: Barbers Point solar project.

Mahalo, Lindsy! These methods align closely with what we had planned. I will send you a more formal methodology, incorporating some new info including resumes of the 3 botanists.

Are you able to also send us the survey data from the 2008 and 2012 surveys? We had digitized the points from Art's report, but the more accurate points would be great.

Thanks,
Tiffany

From: Asman, Lindsy <Lindsy_Asman@fws.gov>
Sent: Wednesday, February 24, 2021 1:48 PM
To: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Cc: Julia Mancinelli <jmancinelli@innergex.com>; McClain, Leslie <Leslie.McClain@tetratech.com>
Subject: Re: [EXTERNAL] RE: Barbers Point solar project.

Hello everyone,
It was great talking with you all. I will review the report you attached and get back to you with any comments or suggestions.

In the interim I have attached a survey methodology for surveying ʻakoko.

Please let me know if there are any questions or if I can be helpful in any way.

From: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Sent: Friday, February 19, 2021 8:16 AM
To: Asman, Lindsy <Lindsy_Asman@fws.gov>
Cc: Julia Mancinelli <jmancinelli@innergex.com>; McClain, Leslie <Leslie.McClain@tetratech.com>
Subject: [EXTERNAL] RE: Barbers Point solar project.

Aloha Lindsy,

Thanks again for your time to discuss the Barbers Point Solar Project.

Attached is the draft biological report that was provided to Becca and DOFAW. Please note that after this draft was submitted we have conducted additional pueo surveys and initiated planning for wet season ‘akoko surveys in portions of the Study Area and in the adjacent occupied Navy parcel. Upon receiving comments from you folks we will update the biological report to reflect any changes.

We look forward to receiving your comments, ‘akoko location data on TMK 9-1-013:039, as well as the recommended plant survey protocol you mentioned during our call.

Mahalo,
Tiffany

From: Asman, Lindsy <Lindsy_Asman@fws.gov>
Sent: Monday, February 8, 2021 9:03 AM
To: Agostini, Tiffany <Tiffany.Agostini@tetratech.com>
Subject: Barbers Point solar project.

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Hi Tiffany, Darren assigned the Barbers Point solar project to me. Let's set up a time to chat on the phone and discuss the project.

I am free tomorrow after 11 am flexible the remainder of the week. Email me a good time to talk.

Lindsy

Lindsy Asman
U.S. Fish and Wildlife Service
Pacific Island Fish and Wildlife Office
300 Ala Moana Blvd., Room 3-122, Honolulu, HI 96850
Office Phone 808-792-9490
Check out our website! https://www.fws.gov/pacificislands/

APPENDIX E. CULTURAL IMPACT ASSESSMENT

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Pacific Legacy

Historic Preservation

REVISED DRAFT

CULTURAL IMPACT ASSESSMENT OF THE BARBERS POINT SOLAR PROJECT, HONOULIULI AHUPUAʻA, ʻEWA DISTRICT, ISLAND OF OʻAHU

[TMK: (1) 9-1-013:038, (1) 9-1-013:040, AND (1) 9-1-016:027 (POR.)]

Cultural Resources Consultants

Hawaiʻi Offices:
Kailua, Oʻahu

California Offices:
Business Office
Bay Area
Sierra/Central Valley

Pacific Legacy: Exploring the past, informing the present, enriching the future.

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REVISED DRAFT

CULTURAL IMPACT ASSESSMENT OF THE BARBERS POINT SOLAR PROJECT, HONOULIULI AHUPUAʻA, ʻEWA DISTRICT, ISLAND OF OʻAHU

[TMK: (1) 9-1-013:038, (1) 9-1-013:040, AND (1) 9-1-016:027 (POR.)]

Prepared by:
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and
Krickette M. Pacubas, B.A.

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Prepared for:
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c/o Innergex Renewable Energy Inc.
888 Dunsmuir Street, Suite 1100
Vancouver, British Columbia V6C 3K4

November 2021

ABSTRACT

As part of the Environmental Assessment process, Barbers Point Solar, LLC, requested a Cultural Impact Assessment (CIA) for the proposed Barbers Point Solar Project, located in Honouliuli Ahupuaʻa, ʻEwa District, Oʻahu [TMK: (1) 9-1-013:038 and 040]. This assessment is based upon archival research as well as ethnographic interviews. Under Act 50, the Hawaii State Department of Health "Guidelines for Cultural Impact Assessments" mandate that the subject property be studied as well as surrounding areas where construction or development have impact potential. These guidelines also recommend personal interviews with traditional cultural practitioners and knowledgeable informants on cultural practices.

The results of archival research indicate that the general area of ʻEwa Plain has a long and rich cultural history. From the archaeological record, traditional stories and myths, and historic documents attributed to the vast plain, it is evident that these lands have been the backdrop to many significant acts in Oʻahu's pre- and post-Contact history. Archival research indicated that a major feature of pre-Contact and early post-Contact Honouliuli, the Kualakaʻi Trail, passed near to the project area. Though the trail is no longer discernible within the project area, cultural resources, such as archaeological features attributed to this trail, may exist beneath the plantation-era soil. Numerous archaeological and architectural studies have been conducted within the project area and surrounding region, and these studies highlight the intensive use of this area during the pre-Contact period as well as the post-Contact period, including extensive military development during the 20th century.

For this study, two interviews were conducted and information was shared by one cultural informant via email. A site visit with the three participants was also arranged. Based on these consultations, previously identified archaeological resources, including deposits that are potentially contained within the numerous limestone pits in the area, were identified as being potentially impacted by the proposed development. This includes the possible presence of *iwi kūpuna*, or human ancestral remains. Through interviews conducted as part of this CIA, one feature that had been previously identified as a military or ranching feature was identified as a *kahua* used during Makahiki. No traditional cultural practices were noted as being carried out currently within the project area.

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Note: In this report, the spellings and the use of diacritical marks (glottal stops and macrons) follow conventions issued by Pukui and Elbert (1986) and Pukui et al. (1974) with limited exceptions – spellings and diacritical marks are used as the original sources used them in quotations, titles, and proprietary names. For example, MCAS Ewa is used without the glottal stop in "Ewa" because it is part of the name of the installation, but when referring to the region in general, the Hawaiian name ʻEwa is used.

Cover Image: Overview of invasive vegetation within the *kahua* (Makahiki grounds) in Parcel 40.

GLOSSARY OF HAWAIIAN WORDS USED IN THE TEXT

Most of these definitions are from the *Hawaiian Dictionary* by Mary Kawena Pukui and Samuel H. Elbert, published in 1986.

ahupuaʻa	traditional land division usually extending from the mountains to the sea and encompassing a range of environmental zones that were known and used by the land's early Hawaiian residents. It was "so called because the boundary was marked by a heap (*ahu*) of stones surmounted by an image of a pig (*puaʻa*), or because a pig or other tribute was laid on the altar as tax to the chief" (Pukui and Elbert 1971:8).
ʻāina	land, earth
aliʻi	the chiefly class in Hawaiian society
ʻāpana	land parcel portion, a term commonly used in *kuleana* land claims in the Māhele
heiau	traditional temple or shrine
helu	number, a term commonly used in *kuleana* land claims in the Māhele, e.g., LCA Helu 1004
hōlua	sled used on grassy slopes; the sled course
ʻili	land section, next in importance to *ahupuaʻa* and usually a subdivision of an *ahupuaʻa*
imu	underground oven
iwi kupuna	ancestral remains; pl. *iwi kūpuna*
kahua	an open place for camping or sports, such as *ʻulu maika* or *hōlua* sliding
kapu	taboo; ancient Hawaiian code of conduct covering all aspects of life, including lifestyle, gender roles, politics, and religion, that was strictly enforced until its abolishment in 1819.
kauhale	group of houses comprising a Hawaiian home
kiawe	Algaroba tree (*Prosopis pallida*), first planted in 1828 in Hawaiʻi. In dry areas, it has become one of the commonest trees.
konohiki	head of an *ahupuaʻa* land division under the chief. In some cases, land or fishing rights were under control of the *konohiki*.
kuleana	right, responsibility, property; the term is often used to refer to lands awarded to native claimants during the Māhele ʻAina, the land division of 1848, native tenant land holding
loʻi	irrigated terrace , especially for taro, but also for rice
makaʻāinana	the commoner class of native Hawaiians who tended to the land under the pre-Māhele land system
makai	seaward
mālama	to care for; to preserve and protect
manaʻo	thoughts, ideas, opinions, beliefs
mauka	inland

moku	land division, district; usually a subdivision of an island and containing several *ahupuaʻa*
moʻolelo	story; a tradition
ʻuala	sweet potato (*Ipomoea batatas*), a tuber that is a valuable staple food in Hawaiian culture.
ʻulu	breadfruit (*Artocarpus altilis*)
ʻulu maika	stone used in a game similar to bowling
wahi kūpuna	ancestral place

1.0 INTRODUCTION

Pacific Legacy, Inc. was contracted by Barbers Point Solar, LLC to prepare a Cultural Impact Assessment (CIA) for the proposed development of the Barbers Point Solar Project in Honouliuli Ahupuaʻa, ʻEwa District, Oʻahu Island.

Barbers Point Solar LLC is proposing to build and operate the Barbers Point Solar Project that will consist of a 15-megawatt (MW) solar photovoltaic (PV) system coupled with a 4-hour, 15-MW, 60-megawatt-hour (MWh) PV-coupled battery energy storage system. The Project will be primarily located on tax map keys (TMK) (1) 9-1-013:038 and 9-1-013:040, which are owned by Department of Hawaiian Home Lands (DHHL). Project electrical collector and transmission lines will also be located within rights-of-way owned by Hawaiʻi Department of Transportation (HDOT) (Coral Sea Road and Roosevelt Avenue), as well as within a portion of TMK: (1) 9-1-016:027, owned by Kapolei Infrastructure, LLC (Figure 1). Most of the project area was developed during the mid-twentieth century into the Marine Corps Air Station Ewa (MCAS Ewa) and was later expanded into the Naval Air Station Barber's Point (NASBP).

1.1 PURPOSE

Pacific Legacy, Inc. has prepared this CIA in keeping with Articles IX and XII of the state constitution, that requires government agencies to promote and protect cultural beliefs, practices, and resources of Native Hawaiians and other ethnic and collective groups in accordance with the Office of Environmental Quality Control's (OEQC) Guidelines for Assessing Cultural Impacts adopted by the State of Hawaiʻi Environmental Council in 1997 and amended in 2000 (Appendix A). Through archival research and cultural consultation efforts, this CIA provides an assessment of potential impacts to cultural beliefs, cultural practices, traditional cultural properties, and any physical properties human-made or natural that support these cultural practices or beliefs.

To determine the effects of the proposed development on cultural practices, resources, and beliefs, the OEQC's Guidelines for Assessing Cultural Impacts recommends the following tasks be undertaken:

1) identify and consult with individuals and organizations knowledgeable about cultural practices that may have taken place in the area;
2) conduct archival research about traditional practices that may have been conducted in the area;
3) describe the cultural practices that took place within the potentially affected area;
4) assess the impact of the proposed development on the cultural practices that may have taken place within the potentially affected area; and
5) prepare a report on the findings resulting from the above investigations.

Hawaiʻi Supreme Court Rulings
In addition, this CIA is done in accordance with a series of Hawaiʻi Supreme Court cases. The rulings reaffirmed the customary and traditional gathering rights of *ahupuaʻa* tenants, including *Kalipi*, *Pele Defense Fund v. Paty*, *Public Access Shoreline Haw. Cnty. Planning Comm'n* (commonly known as PASH), and *Ka Paʻakai O Ka ʻĀina v. Land Use Com'n, State of Hawaiʻi.*

Native Hawaiian subsistence lifestyle in the pre-Contact era centered around the *ahupuaʻa*:

> *Ahupuaʻa* varied in size and shape. A typical *ahupuaʻa* was a long strip of land, narrow at its mountain summit top and becoming wider as it ran down a valley into the sea to the outer edge of the reef. If there was no reef then the sea boundary would be about one and a half miles from the shore […] People living in one *ahupuaʻa* were free to use whatever grew wild in that *ahupuaʻa* […] Why did the chiefs divide the land into sections running from the mountains to the sea? They realized that within these sections were three different areas important to life in early Hawaiʻi: upland, plain and sea. They knew that together these three areas contained the range of products and resources their people needed to survive. (Williams 1996:13–16)

In the pre-Contact Native Hawaiian way of life, every environ from mountain to sea, and its resources, were accessible to all, in support of not just subsistence practices, but cultural and religious practices, as well. The introduction of private land ownership from the West affected this former way of life, which brought about the need for protection of Native Hawaiian gathering rights.

These indigenous cultural practices are protected in Hawaiʻi under the State Constitution. The Hawaiʻi Constitution, Article XII, Section 7, states

> The State reaffirms and shall protect all rights, customarily and traditionally exercised for subsistence, cultural and religious purposes and possessed by ahupuaʻa tenants who are descendants of native Hawaiians who inhabited the Hawaiian Islands prior to 1778, subject to the right of the State to regulate such rights.

A series of Hawaiʻi Supreme Court cases reaffirmed the customary and traditional gathering rights of *ahupuaʻa* tenants, most notably *Ka Paʻakai O Ka ʻĀina v. Land Use Com'n, State of Hawaiʻi.*

> In *Ka Paʻakai O Ka ʻĀina*, the Supreme Court provided further direction on the constitutional and statutory responsibility of state agencies to preserve and protect the rights of native Hawaiians to carry-out their traditional and customary practices to the extent feasible and, in so doing, "the Court introduced an analytical framework that governmental agencies must specifically consider when balancing their obligations to protect traditional and customary practices against private property (as well as competing public) interests." (MacKenzie et al. 2015:1109).
>
> In *Ka Paʻakai O Ka ʻĀina*, 94 Haw. at 35, 7 P.3d at 1072, the Court held that the State Land Use Commission (LUC) failed to satisfy its constitutional and statutory obligations to preserve and protect customary and traditional rights of native Hawaiians (Belatti 2003) […]
>
> The Court stated that the LUC, as the reviewing state agency, must consider and make express findings of fact and conclusions of law regarding the cultural, historical, and natural resources of a subject property as they relate to Native Hawaiian rights when determining what restrictions should be placed on land use. […]

> The Court […] remanded the case to the LUC to make findings of fact and conclusions of law relating to:
>
> > (1) the identity and scope of "valued cultural, historical, or natural resources" in the petition area, including the extent to which traditional and customary native Hawaiian rights are exercised in the petition area;
> >
> > (2) the extent to which those resources - including traditional and customary native Hawaiian rights - will be affected or impaired by the proposed action; and,
> >
> > (3) the feasible action, if any, to be taken by the LUC to reasonably protect native Hawaiian rights if they are found to exist.
>
> The Court's framework seeks "to effectuate the State's obligation to protect native Hawaiian customary and traditional practices while reasonably accommodating competing private [property] interests." (Lee-Greig et al. 2020:84–87)

In the case of *Kalipi*, the Hawai'i Supreme Court ruled that any argument diminishing traditional native rights is invalid if based on the inconsistency of the exercising of the native rights with today's system of land tenure (private ownership). The Supreme Court extended the rights of native tenants beyond the boundaries of the *ahupua'a* in which they reside in *Pele Defense Fund v. Paty*. In *Public Access Shoreline Haw. v. Haw. Cnty. Planning Comm'n* (commonly known as PASH), the Court ruled that "legitimate customary and traditional practices must be protected to the extent feasible in accordance with article XII, section 7" (Lee-Greig et al. 2020:85).

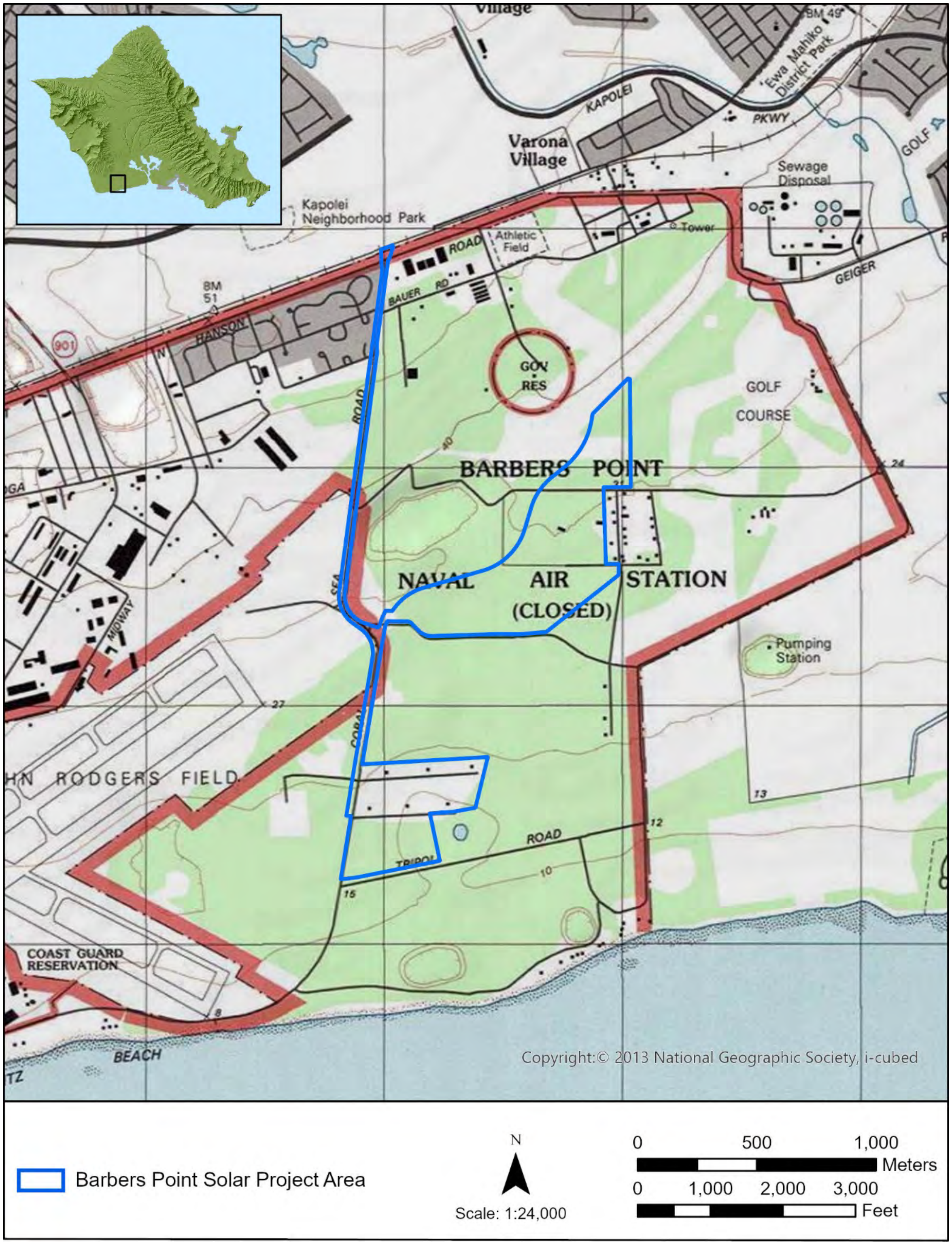

Figure 1. Location of Barbers Point Solar Project Area on USGS Ewa Quadrangle, 2003.

1.2 PROJECT AREA DESCRIPTION

The project area is east of the current Kalaeloa Airport (former NASBP), bounded by Tripoli Street on the south, Coral Sea Road on the west, and Roosevelt Boulevard on the north. The survey area includes three proposed solar array areas (Areas 1, 2, and 3), as well as access roads, electrical collector, and transmission line corridors (Figure 2). The revetment area, situated between Areas 1 and 2, was also included in the survey.

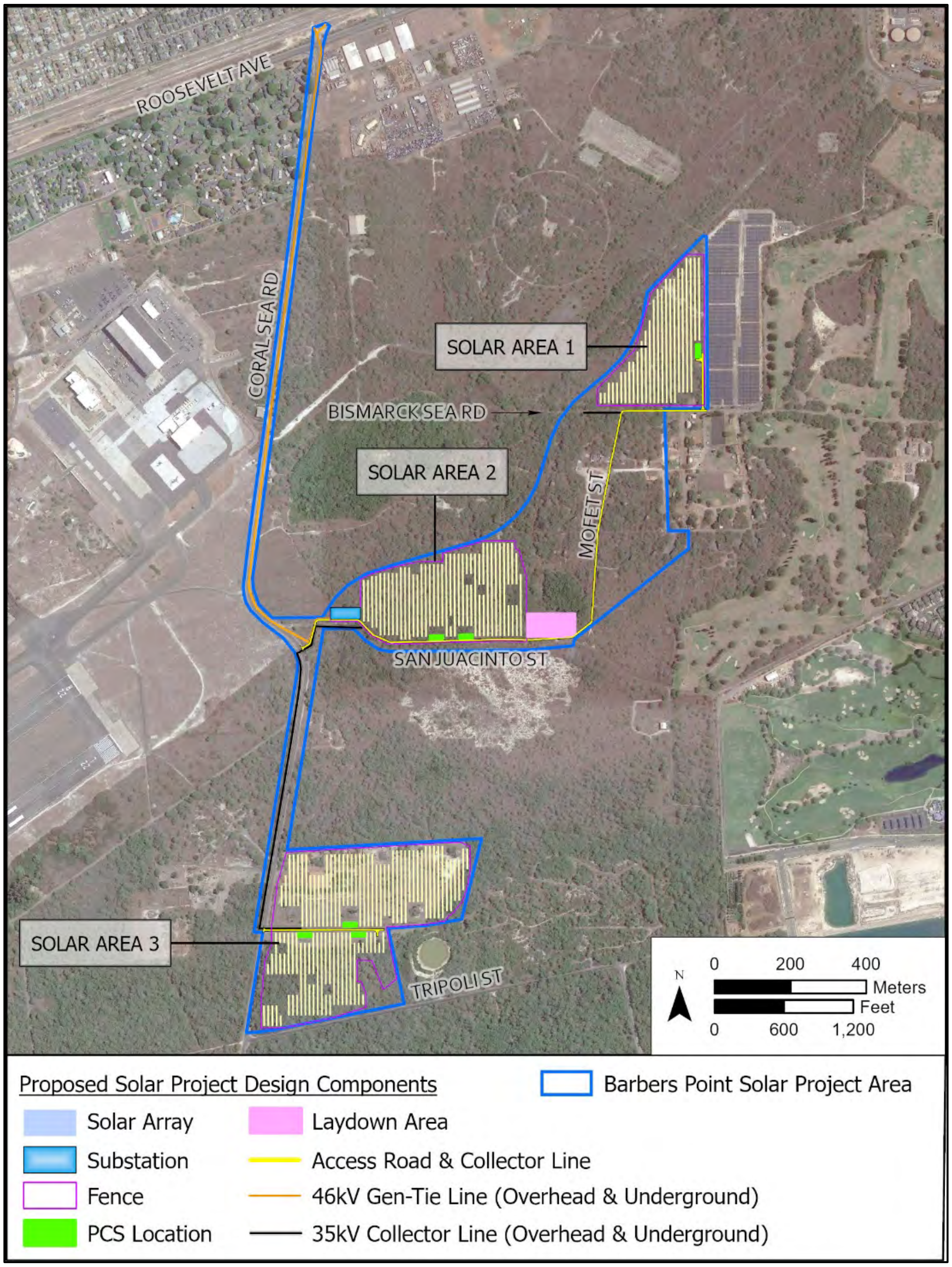

Figure 2. Proposed Barbers Point Solar Project area.

A portion of the survey area is situated in between Solar Area 1 and Solar Area 2 and a portion of this area is proposed for use by the Barbers Point Solar Project to connect the two solar array areas. This area contains historic aircraft revetments and associated structures. Much of the survey area has been modified extensively during construction of these and other twentieth-century U.S. military facilities.

1.3 CIA Study Area

In keeping with the guidelines of the OEQC, in addition to the Hawai‘i Supreme Court rulings on the aforementioned court cases, the CIA study area includes the entire *ahupua‘a* of Honouliuli. The present report includes descriptions of the environment, traditional accounts, and post-Contact records concerning the activities conducted throughout Honouliuli Ahupua‘a.

1.4 Environment

The project area is located on the ‘Ewa Plain in the southwestern corner of O‘ahu Island, ascending gradually from approximately 10 to 40 ft above mean sea level. The project area lies between 0.6 and 2.6 km north-northeast of the ‘Ewa Plain's southern coastline.

The project area is composed of Pleistocene limestone outcrop formed from coral reefs when sea levels were upwards of 7.5 m (24.6 ft) above current sea levels (McDonald et al. 1983:420–421). Following a drop in sea level and uplifting of O‘ahu Island, the exposed coral reef was eroded into a karst topography characterized by limestone sinks and subsurface caverns (Ziegler 2002:96). The sinks are typically "bell-shaped" in cross-section because of rainwater erosion that was more corrosive in the sink interiors due to a slower evaporation rate and mixing with groundwater (Ziegler 2002:97).

The limestone outcrop is covered with terrigenous soils eroded from the Wai‘anae Mountains in the northern portion of the project area. These soils are classified as Mamala cobbly silty clay loam with 0 to 12 percent slopes (Figure 3). A former airfield also in the northern portion of the project area is classified as land fill.

Annual rainfall on the ‘Ewa Plain averages 20 inches with the greatest amount of rainfall occurring in January with an average of 4.1 inches (Tuggle and Tomonari-Tuggle 1997:5). The variable rainfall throughout the year indicates the ‘Ewa Plain endured periods of drought and sometimes heavy rain. Although no intermittent or permanent streams exist in the project area, the water table was likely higher during the pre-Contact era and once provided an important water source. When the water table lowered, water was captured in the multitude of limestone sinks on the ‘Ewa Plain, including a large water-filled sink (Ordy Pond) adjacent to the project area (Tuggle and Tomonari-Tuggle 1994:8).

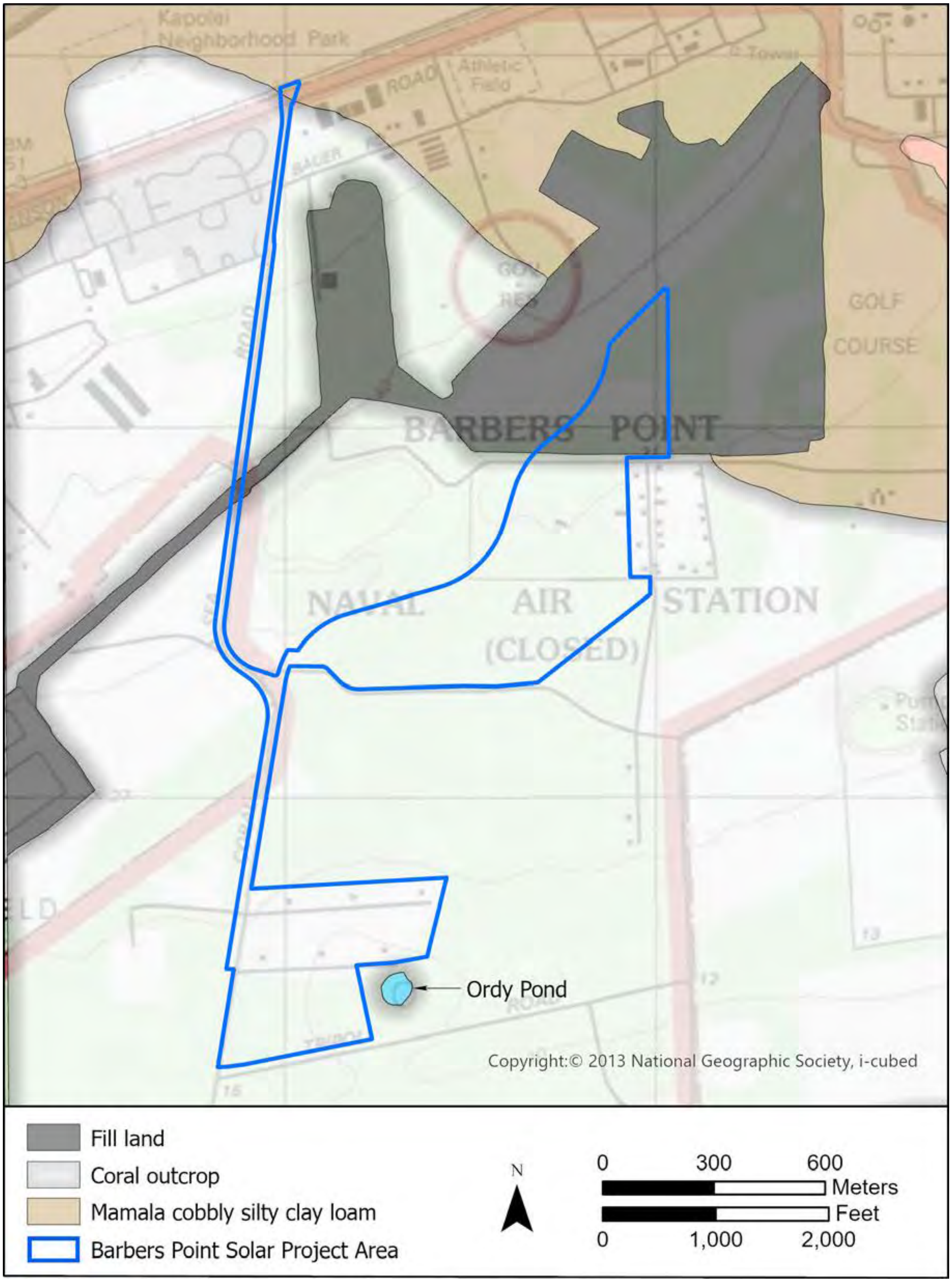

Figure 3. Soil classifications in the project area (Soil Survey Staff 2020).

2.0 METHODS

The methodology used in the preparation of this CIA followed the OEQC's Guidelines for Assessing Cultural Impacts (Appendix A).

2.1 ARCHIVAL RESEARCH

Pacific Legacy, Inc. conducted extensive archival research including the compilations of historic maps from the Hawai‘i State Survey office, previous archaeological studies from the Hawai‘i State Historic Preservation Division Office, relevant cultural impact studies from the Office of Environmental Quality Control (OEQC) online library. Information on mid-nineteenth-century Land Commission Awards (LCAs) was obtained from Waihona ‘Aina Corporation's database (Waihona ‘Aina 2000).

2.2 CONSULTATION

Initial letters soliciting participation in the proposed Barbers Point Solar Project CIA and requesting identification of knowledgeable individuals to be interviewed for the CIA were either mailed or emailed to 16 individuals, cultural groups, and government entities. Section 4 includes a list of these recipients, their affiliation with the proposed project area, and participation, if any, with the current CIA. While no response was received from 10 of the groups or individuals, 6 responded with referrals or additional information about the proposed project and 3 individuals agreed to participate in consultation for the CIA. The results of the interviews and correspondence are submitted in this CIA.

3.0 ARCHIVAL RESEARCH

3.1 TRADITIONAL HISTORY

The division of Oʻahu lands into political districts occurred in the 15th century under the rule of Māʻilikūkahi. This division resulted in the creation of 12 districts or *moku* during traditional times: ʻEwa, Kona, Koʻolaupoko, Koʻolauloa, Waialua and Waiʻanae. The Barbers Point Solar Project is located in the traditional land division called Honouliuli Ahupuaʻa, in the ʻEwa District. Honouliuli is the largest *ahupuaʻa* on the island of Oʻahu and forms a portion of the ʻEwa Plain. In general, an *ahupuaʻa* is a land division that extends from mountain to sea, so that people residing there have access to the range of resources in those environments, from marine resources to upland agriculture and everything in between (Alexander 1882:4).

3.1.1 Land Divisions and Named Places

In traditional Native Hawaiian culture, names are given to places of significance, and those names carry meaning. Thus, place names can convey much about the mythology of a place, the physical characteristics of a place, the qualities of the people who resided there, etc. Pukui et al. (1974) published a glossary entitled *Place Names of Hawaii*. In the preface, Samuel Elbert writes

> Hawaiians named taro patches, rocks and trees that represented deities and ancestors, sites of houses and *heiau* (places of worship), canoe landings, fishing stations in the sea, resting places in the forests, and the tiniest spots where miraculous or interesting events are believed to have taken place. (Pukui et al. 1976:x)

The Barbers Point Solar Project area is within the *ahupuaʻa* of Honouliuli, in the *moku* of ʻEwa. The traditional name for Barbers Point is Kalaeloa. See Table 1 for the definitions of these place names, as well as the places shown on the Figure 4 map.

Table 1. Place Names Associated with the Project Area

Place Name	Meaning, Description	Pg. No. in Pukui et al. 1974
ʻEwa	"crooked"	28
Honouliuli	"dark bay"	51
Kalaeloa	"the long point"; the southwest point of Oʻahu	72
Kanehili	Not listed in Pukui et al. 1974; however, *kane* is defined in Pukui and Elbert 1986 as Tinea, a fungus skin disease (ringworm). *Kāne* (note the diacritical) may be related and has the following potentially applicable definitions: 1. male; 2. the leading of the four great Hawaiian gods; 3. name given at ʻEwa for the Tahitian banana known as *polapola* and *hēʻī*. The following definitions for *hili* from Pukui and Elbert 1986 may be applicable: 1. to braid or plait; 2. to turn aside, deviate, wander, stray; 3. to whip, smite, thrash, batter.	n/a
Kaupeʻa	Crisscross, interwoven (Pukui and Elbert 1992:55); bat's perch, Southern Cross (Kane 2011)	n/a
Keahi	"the fire"; point west of Pearl Harbor noted for *ʻōʻio* fish and as a surfing site	100

Place Name	Meaning, Description	Pg. No. in Pukui et al. 1974
Kualaka‘i	*Tethys* (a sea creature); a spring here is called Hoaka-lei (lei reflection) because Hi‘iaka picked *lehua* flowers here to make a lei and saw her reflection in the water	119
Pu‘ukapolei	Variantly as Pu‘u-o-kapolei. Kapolei means “beloved Kapo” (a sister of Pele). Pu‘u means “hill.” The pig-man demigod, Kamapua‘a, established his grandmother here as queen after conquering most of O‘ahu.	203
Pu‘uloa	“long hill”; land section, camp, salt works, station, street, playground, beach park, village, area east of Pearl Harbor, and old name for Pearl Harbor; it is said that breadfruit were brought here from Samoa	200–201
Pu‘upālailai	“young *lai* fish hill”	205
Waimānalo	“potable water”; land division, road, and gulch in Barber’s Pt. quad; site of the home of Chief Kākuhihewa	225

The name of the rains in Honouliuli is Nāulu. In the *mo‘olelo* of the journey of Hi‘iaka, sister of the goddess Pele, Hi‘iaka travels to ‘Ewa and describes it as dry, calling out to the Nāulu clouds to relieve the people.

‘A‘ole au e hele i ke kaha o Kaupe‘a	*I shall not tread Kaupe‘a’s expanse*
Kēlā kaha kūpā koili a ka lā i ke kula	*That stretch where the sun beats down on the plain*
Ua kūpono a‘ela ka lā i ka piko o Wākea	*The sun is right overhead, at the navel of Wākea*
Ola i ke ahe a ka makani Māunuunu	*I am spared by the Māunuunu wind*
I ka hapahapai mai a ka makani ‘Ao‘aoa	*By the uplifting ‘Ao‘aoa breeze*
*Ke koi lā i ke ao o ka **Nāulu** e hanini i ka wai*	*Urging the **Nāulu** storm clouds to pour down their waters*
Ola ihola nā kupa kama‘āina i ka wai a ka ‘ōpua	*The natives here survive on water from the clouds*
Ke halihali a‘ela nā ‘ōpua i ke awa lau	*Which billowing clouds carry along to the branching lochs*

(Akana and Gonzalez 2015:195)

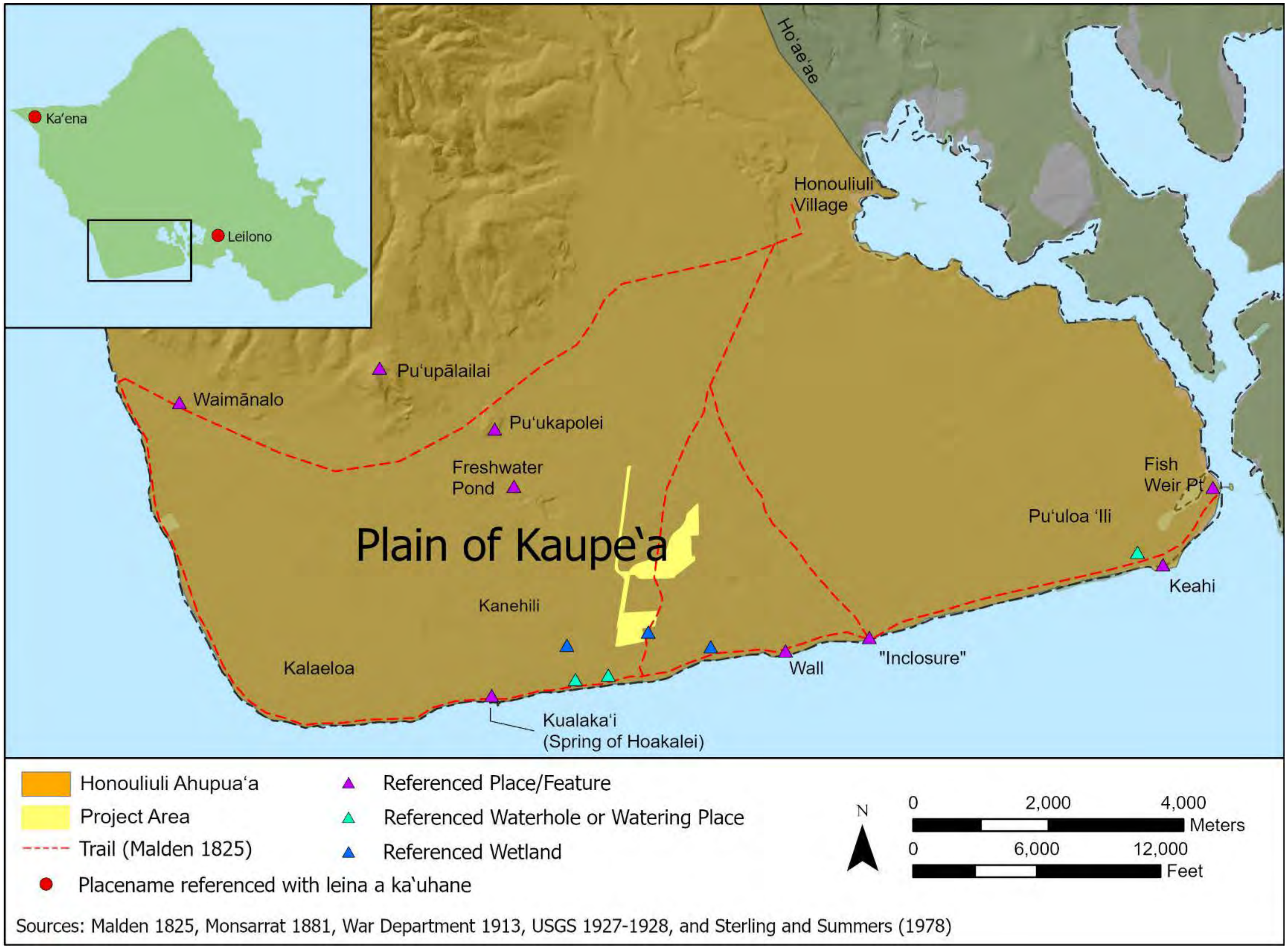

Figure 4. Traditional Hawaiian place names of ʻEwa Moku.

3.1.2 ʻŌlelo Noʻeau

Hawaiian proverbs, or *ʻōlelo noʻeau*, have been passed down through oral traditions. Many *ʻōlelo noʻeau* have been collected and published in Hawaiian language newspapers and other primary and secondary sources. The *ʻōlelo noʻeau* presented below were compiled by Mary Kawena Pukui in the book entitled *ʻŌlelo Noʻeau Hawaiian Proverbs and Poetical Sayings* (Pukui 1983). These *ʻōlelo noʻeau* often have both a literal and metaphorical meaning (called *kaona*). *ʻŌlelo noʻeau* about geographical features and areas can help us to understand natural phenomenon, land use, and the history of a place. There is one *ʻōlelo noʻeau* that is specifically attributed to Honouliuli Ahupuaʻa because of the *ʻanaeholo* fish that would populate the area.

> Ka iʻa hali a ka makani. (1330)
>
> The fish fetched by the wind.
>
> The ʻanaeholo, a fish that travels from Honouliuli, where it breeds, to Kaiapāpaʻu on the windward side of Oʻahu. It then turns about and returns to its original home. It is driven closer to shore when the wind is strong.

According to Pukui, there are fifteen *ʻōlelo noʻeau* that describe the people and attributes of the ʻEwa Moku.

> ʻĀina koi ʻula i ka lepo. (80)
>
> Land reddened by the rising dust.
>
> Said of ʻEwa, Oʻahu.

> Anu o ʻEwa i ka iʻa hāmau leo e. E hāmau! (123)
>
> ʻEwa is made cold by the fish that silences the voice. Hush!
>
> A warning to keep still. First uttered by Hiʻiaka to her friend Wahineʻomaʻo to warn her not to speak to Lohiʻau while they were in a canoe near ʻEwa.

> ʻEwa kai lumalumaʻi. (385)
>
> ʻEwa of the drowning sea.
>
> An epithet applied to ʻEwa, where kauwā were drowned prior to offering their bodies in sacrifice.

> ʻEwa nui a Laʻakona. (386)
>
> Great ʻEwa of Laʻakona.
>
> Laʻakona was a chief of ʻEwa, which was propserous in his day.

Haunāele ʻEwa i ka Moaʻe. (493)

ʻEwa is disturbed by the Moaʻe wind.

Used about something disturbing, like a violent argument. When the people of ʻEwa went to gather the pipi (pearl oyster), they did so in silence, for if they spoke, a Moaʻe breeze would suddenly blow across the water, repilling it, and the oysters would disappear.

He kai puhi nehu, puhi lala ke kai o ʻEwa. (661)

A sea that blows up nehu fish, blows up a quantity of them, is the sea of ʻEwa.

He lōʻihi o ʻEwa; he pali o Nuʻuanu; he kula o Kulaokahuʻa; he hiki mai koe. (768)

ʻEwa is a long way off; Nuʻuanu is a cliff; Kulaokahuʻa is a dry plain; but all will be here before long.

Said of an unkept promise of food, fish, etc. Oʻahu was once peopled by evil beings who invited canoe travelers ashore with promises of food and other things. When the travelers asked when these things were coming, this was the reply. When the visitors were fast asleep at night, the evil ones would creep in and kill them.

I Waialua ka poʻina a ke kai, o ka leo ka ʻEwa e hoʻolono nei. (1263)

The dashing of the waves is at Waialua but the sound is being heard at ʻEwa.

Sounds of fighting in one locality are quickly heard in another.

Ka iʻa hāmau leo o ʻEwa. (1331)

The fish of ʻEwa that silences the voice.

The pearl oyster, which has to be gathered in silence.

Ka iʻa kuhi lima o ʻEwa. (1357)

The gesturing fish of ʻEwa.

The pipi, or pearl osyter. Fishermen did not speak when fishing for them but gestured to each other like deaf-mutes.

Ke kai heʻe nehu o ʻEwa. (1721)

The sea where the nehu come to schools to ʻEwa.

Nehu (anchovy) come by the millions into Pearl Harbor. They are used as bait for fishing, or eaten dried or fresh.

Ke one kuilima laula o ʻEwa. (1776)

The sand on which there was a linking of arms on the breadth of ʻEwa.

ʻEwa, Oʻahu. The chiefs of Waikīkī and Waikele were brothers. The former wished to destroy the latter and laid his plot. He went fishing and caught a large niuhi, whose skin he stretched over a framework. Then he sent a messenger to ask his brother if he would keep a fish for him. Having gained his consent, the chief left Waikīkī, hidden with his best warriors in the "fish." Other warriors joined them along the way until there was a large army. The surrounded the residence of the chief of Waikele and linked arms to form a wall, while the Waikīkī warriors poured out of the "fish" and destroyed those of Waikele.

Ku aʻe ʻEwa; Noho iho ʻEwa. (1855)

Stand-up ʻEwa; Sit-down ʻEwa.

The names of two stones, now destroyed, that once marked the boundary between the chiefs' land (Kuaʻe ʻEwa) and that of the commoners (Noho iho ʻEwa) in ʻEwa, Oʻahu.

O ʻEwa, ʻāina kai ʻula i ka lepo. (2357)

ʻEwa, land of the sea reddened by earth.

ʻEwa was once noted for being dusty, and its sea was reddened by mud in time of rain.

Ua ʻai i ke kāi-koi o ʻEwa. (2770)

He has eaten the kāi-koi taro of ʻEwa.

Kāi is Oʻahu's best eating taro; one who has easten it will always like it. Said of a youth or a maiden of ʻEwa, who, like the kāi taro, is not easily forgotten.

3.1.3 Spiritual Realms (Ao)

Kamakau (2000:53) describes four spiritual realms recognized by Native Hawaiians: 1) the world we live in; 2) the realm of homeless or wandering souls (*ao kuewa* or ʻ*auwana*), 3) the ʻ*aumakua* realm (*ao* ʻ*aumakua*), and 4) the realm of endless darkness, the *po pauʻole*", also referred to as the *Milu*.

The plains of Honouliuli are traditionally referred to as Kānehili and Kaupeʻa, an area known as a wandering place of the spirits of the dead, or realm of ao *kuewa* or ao ʻ*auwana* (Maly 2012:18). Described as an uninhabited plain with *wiliwili* (*Erythrina*) and ʻ*ōhai* (Sesbania tomentosa), Kaupeʻa was affiliated with the placename Kānehili and Leiolono (a *leina* in Moanalua) and from Kaupe'a, "one may see Leiolono where unclaimed spirits are lost on never ending darkness" (Maly and Maly 2012:24).

Kaupeʻa is translated as "crisscross," "interwoven" (Pukui and Elbert 1986) or the "Bat's Perch" (*peʻa* translated as bat) in relation to the Southern Cross constellation or Hanaiakamalama (as defined in Polynesian Voyaging Society, Hōkūleʻa) with its upside down cross (Kane 2011:3). Used as a significant navigational tool, Kane believes the Southern Cross constellation with only a lone star visible from the ʻEwa plain marked the geographic area of Kaupeʻa and Kahiki:

> As it rises, it is an indication that one is moving into the southern latitudes. As it descends it is an indication that that one is moving toward the northern latitudes. Thus, to our ancestors or the Poe Kakiko, Kaupeʻa pointed to the lone star and the way home to Kahiki.

Ka leina a kaʻuhane (leaping places of the spirit) is a place where wandering spirits, if guided by relatives or ʻ*aumakua*, passed into the *ao* ʻ*aumakua*—a realm believed to be "a good place that one day we all want to get to and restore those acquaintances with our ancestors" (Kane 2011:3). If a wandering soil is unguided or unworthy of entering the ao ʻ*aumakua*, their soul would perish in the *po pau ole o Milu* (Kamakau 2000:48).

As translated by Maly and Maly (2012:85), S.M Kamakau in *Ka Moolelo Hawaii* provides the following description of a a *leina a kaʻuhane* near Kaʻena:

> The leina a ka ʻuhane on Oahu was close to the cape of Kaʻena, on its right (or north, ʻakau) side, as it turns toward Waialua, and near the cutoff (alanui ʻoki) that goes down to Keaokuʻukuʻu. The boundaries of this leina a ka ʻuhane, it is said, were Kahoʻihoʻina-Wakea, a little below Kakaheʻe, and the leaping place (kawa-kai) of Kilauea at Keawaʻula.

Others believe the *leina a kaʻuhane* is located in Moanalua along the inland side of Āliamanu, east of a rock at Kapukakī and directly in line with a burial mound at Aliamanu (Maly and Maly 2012:16). Some of the wandering souls "passed this leaping place, went on to the care of their ʻ*aumakua*, others, who had no one to help them, drifted down to Kaupeʻa, Kamaʻomaʻo, and Kānehili [the plains around Puʻu o Kapolei], where they would wander aimlessly in hope that someone would direct them to the spirit world" (Maly and Maly 2012:16).

3.1.4 The Mythical Era

Preserved in *moʻolelo* (story) are tales about a period in Hawaiʻi before *kānaka* (humans), when gods and deities inhabited the islands, often bringing about the creation of lands and resources. Below are excerpts of *moʻolelo* that occur in Honouliuli Ahupuaʻa and the larger ʻEwa Moku.

The Name of Honouliuli
An explanation of the name Honouliuli is provided by Westervelt (1915) who attributes the name of this *ʻāina* (land) to an Oʻahu chief who had the same name. In the *moʻolelo Lepe-a-moa,* Chief Honouliuli lives with his wife Chiefess Kapālama. Together they raise their granddaughter Lepe-a-moa in the uplands of Kapālama. As a descendant of Ke-ao-lewa (the-moving-cloud), a bird-woman who lived in the sky, Lepe-a-moa could change into a bird and "her body shone with beauty like the red path of the sunlight on the sea, or the rainbow bending in the sky" (Westervelt 1915). As she grew, she cared for her grandparents and "her grandfather gave his name, Honouliuli, to a land district west of Honolulu, while Kapālama gave hers to the place where they lived" (Westervelt 1915).

The Name of ʻEwa
For *kānaka maoli* (Native Hawaiians), names were indicators of the history and geographical features of that *wahi* (place). Sterling and Summers note that the name may originate from a *moʻolelo* (story) about two gods, Kāne and Kanaloa.

> When Kane and Kanaloa were surveying the islands they came to Oahu and when they reached Red Hill saw below them the broad plains of what is now Ewa. To mark boundaries of the land they would throw a stone and where the stone fell would be the boundary line. When they saw the beautiful land lying below them, it was their thought to include as much

of the flat level land as possible. They hurled the stone as far as the Waianae range and it landed somewhere, in the Waimanalo section. When they went to find it, they could not locate the spot where it fell. So Ewa (strayed) became known by the name. The stone that strayed. (Told to E. Sterling by Simeon Nawaa, March 22, 1954; Sterling and Summers 1978:1)

Hiʻiakaikapoliopele

In the Hawaiian epic story of Hiʻiakaikapoliopele, the youngest sister of Pele travels from Hawaiʻi Island to Kauaʻi and back. On her journey back to Kīlauea, Hawaiʻi Hiʻiaka travels across Keahumoa, the plain between the *ahupuaʻa* of Waipiʻo and Honouliuli. There she sees a group of women gathering *maʻo* blossoms and she offers them the following *ʻoli* (chant):

E lei ana ke kula o Keahumoa i ka maʻo

ʻOhuʻohu wale nā wahine kui lei o ke kanahele

Ua like no a like me ka lehua o Hōpoe

Me he pua koili lehua ala i ka lā

Ka oni pua koaiʻa i ka pali

I nā kaupoku hale o ʻĀpuku

Ke ku no i ke alo o ka pali o Puʻukuʻua

He aliʻi no naʻe ka ʻāina

He kauwā no naʻe ke kanaka

I kauwā no naʻe wau i ke aloha

Na ke aloha no naʻe i kono e haele no māua

E hele no wau a—

The plain of Keahumoa wears the maʻo blossoms as its lei

Adorning the women who string garlands in the wild

It is like the lehua blossoms of Hōpoe

Lehua blossom upon which the sun beats down

On the nodding koaiʻa flowers of the cliff

On the rooftops of the houses at ʻĀpuku

Rising in the presence of the cliff of Puʻukuʻua

The land is indeed the chief

Man is indeed a slave

I am indeed a slave to aloha–love

It is love which invites us to two–come

I come

(Ka Hoku o Hawaii 1927)

Legend of Nāmakaokapaoʻo

Nāmakaokapaoʻo was the son of a great chief, but lived with his mother, Pokai, in Keahumoa, an area on the plains of Honouliuli. Although small in stature, Nāmakaokapaoʻo was a brave, strong child, but he did not get along with his step-father Pualiʻi. One day Nāmakaokapaoʻo pulled up the *ʻuala* (sweet potatoes) that Pualiʻi had planted near their home. Angry at what Nāmakaokapaoʻo had done, Pualiʻi came after him with an axe. Nāmakaokapoʻo used his *mana* (power) to say a death prayer against Pualiʻi before slaying him and hurling his head into Waipouli, a cave on the beach in Honouliuli (Fornander and Thrum 1916:274–276).

Story of Palila

The *moʻolelo* entitled *He Kaʻao no Palila*, recorded by Fornander (1918), depicts the tale of Palila, a famous Kauaʻi *kupua* (demigod) who ventured from Kaʻena, Kauaʻi to Waikele, Oʻahu. Palila quickly traveled across the ʻEwa Plain with the aid of his *lāʻau pālau* (war club).

Haʻalele keia ia Kaʻena, hele mai la a Kalena, a Pōhākea, Maunauna, Kānehoa, a ke kula o Keahumoa, nana ia ʻEwa. Kū kēia i laila nānā i ke kū a ka ea o ka lepo i nā kānaka, e pahu aku ana kēia i ka laʻau palau aia nei i kai o Honouliuli, kū ka ea o ka lepo, nu lalo o ka honua, me he olai la, makau nā kānaka holo a hiki i Waikele. A hiki o Palila, i laila, e paʻapu ana nā kānaka i ka nānā lealea a ke liʻi o Oʻahu nei, oai o Ahuapau.

After leaving Kaʻena, he came to Kalena, then to Pōhākea, then to Manuanua [a peak in Honouliuli], then to Kānehoa [a peak in Honouliuli], then to the plain of Keahumoa [upland plain from Honouliuli to Waipiʻo] and looked toward ʻEwa. At this place he stood and looked at the dust as it ascended into the sky caused by the people who had gathered there; he then pushed his war club toward Honouliuli. When the people heard something roar like an earthquake they were afraid and they all ran to Waikele. When Palila arrived at Waikele he saw the people gathered there to witness the athletic games that were being given by the king of Oʻahu, Ahuapau by name. (Fornander 1918:136–153)

Kānekuaʻana

Kānekuaʻana is the *moʻo* (lizard) goddess who maintained the abundant resources at Ke-awa-lau o Puʻuloa (the many harbored seas of Pearl Harbor). This *ʻāina* stretched from Pāʻakule, near the harbor's inlet, to the many *loko iʻa* (fishpond) along the shore. Kānekuaʻana was known as the guardian or the protector of the *pipi* (Hawaiian pearl oyster) that were found throughout Puʻuloa. She was loved by the people of ʻEwa who built *heiau* in her honor and heeded her *kapu* (taboo, restrictions). It was believed that making any noise while harvesting from the waters would cause the wind to blow, and the rippling waters would scare the fish and shellfish away. This belief was captured in an *ʻōlelo noʻeau* for the area: "*ka iʻa hāmau leo o ʻEwa*" meaning "ʻEwa's fish that silence voices."

According to a *moʻolelo* recorded by Pukui and Curtis (1994), a *wahine* (woman) gathered *pipi* during a period of *kapu* when it was forbidden to do so. A *konohiki* (landlord) saw her and as punishment she returned the *pipi* and was sent home empty-handed. Later that day the *konohiki* appeared at her house and demanded money as a fine for breaking the *kapu*. The *wahine* was very poor and only had one coin, but the *konohiki* took her money anyway. Kānekuaʻana saw what the *konohiki* had done and became very upset, and as a result she took the *pipi* away and went back to Kahiki (Pukui and Curtis 1994).

Kaʻahupāhau and the Sharks at Puʻuloa
Kaʻahupāhau is the beloved shark goddess who guards the waters of ʻEwa. She lived in an underwater cave near Mokuʻumeʻume (Ford Island) at Keanapuaʻa Point near the entrance of East Loch. Her brother, Kahiʻukā was famous for his tail that he would use to attack enemies or warn fishermen if danger was nearby.

The people of Puʻuloa (Pearl Harbor) treated Kaʻahupāhau with kindness and respect. They would feed her and scrap the barnacles off of her back. In return, she protected the people from man-eating sharks. The *ʻōlelo noʻeau*, "*Alahula o Puʻuloa, he alahele na Kaʻahupāhau*" (Everywhere in Puʻuloa is the trail of Kaʻahupāhau) was "said of a person who goes everywhere, looking, peering, seeing all, or of a person familiar with every nook and corner of a place" (Pukui 1983:4). It was a reminder of her viligance and dedication to guard the people of Puʻuloa.

In one *moʻolelo,* Mikololou, a man-eating shark from the island of Maui, visited Kaʻahupāhau at Puʻuloa. He rested on the shores, enjoying the hospitality of his host and the people of Puʻuloa; however, after a while he became hungry and angry when Kaʻahupāhau and her brother denied his request to eat his favorite food—humans. Furious, he killed all the men, women, and children in the village so he could satisfy his hunger.

Kaʻahupāhau and Kahiʻukā quickly learned about what had happened and conspired with their friends to avenge Mikololou. The next night, they made a feast in his honor at the top of the Waipahu river. There they provided him with so much food and *ʻawa* that he became stupefied. At the same time, people gathered at the base of the river, ready to trap and attack Mikololou. When he swam downstream, the people attacked him from the rear, and as he tried to swim away he became tangled and trapped in the nets. His body was then dragged onto the shore and burned, while the people were happy to be safe.

The special relation of the people to Kaʻahupāhau is also recorded in the *mele* Pūpū Aʻo ʻEwa (Shells of ʻEwa) that was written by Elbert & Mahoe:

Pūpū (aʻo ʻEwa) i ka nuʻa (nā kānaka)
E naue mai (a e ʻike)
I ka mea hou (o ka ʻāina)
Ahe ʻāina (ua kaulana)
Mai nā kūpuna mai
Alahula Puʻuloa he ala hele nō
Kaʻahupāhau, (Kaʻahupāhau)
Alahula Puʻuloa he ala hele nō
Kaʻahupāhau, Kaʻahupāhau

Nani Kaʻala hemolele i ka mālie
Kuahiwi kaulana aʻo ʻEwa
E kiʻi ana i ka makani o ka ʻāina
Hea ka Moaʻe eia au e ke aloha

Kilakila ʻo Polea noho i ka ʻolu
Ia home hoʻohihi a ka malihini
E walea ana i ka ʻolu o ke kiawe
I ka pā kolonahe a ke Kiu

Shells of ʻEwa throngs of people
Coming to learn
The news of the land
A land famous
From the ancient times
All of Puʻuloa, the path trod upon by
Kaʻahupāhau
All of Puʻuloa, the path trod upon by
Kaʻahupāhau

Beautiful Kaʻala, sublime in the calm
Famous mountain of ʻEwa
That fetches the wind of the land
The tradewind calls, "here I am, beloved"

Majestic Polea in the coolness
Home delightful to visitors
Relaxing in the coolness of the kiawe
And the soft blowing of the Kiu wind

(Elbert and Mahoe 1970)

3.1.5 Aliʻi of ʻEwa

The *moʻolelo* of ʻEwa *aliʻi* (chiefs) document the famous battles, journeys, alliances, romances, and accomplishments that occurred throughout history and often reveal a little bit about the places where these events occurred. The excerpts below come from some of these *moʻolelo* and highlight events that are said to have occurred in Honouliuli Ahupuaʻa and the larger ʻEwa Moku.

Māweke
ʻEwa was once known as the political epicenter of Oʻahu. Fornander and Grant (Fornander and Grant 1996:47) write about Māweke, a great chief, who lived in ʻEwa in the mid-eleventh century. It is said that his son, Keaunui, navigated his way out of Puʻuloa (Pearl Harbor) by creating a path with his canoe. His descendants ruled Oʻahu until Chief Haka was defeated in around 1540 (Cordy 2002:24).

Kalaʻimanuia
Kalaʻimanuia, a powerful *wahine aliʻi* (female ruler), united Oʻahu around 1600–1620 (Cordy 2002). She divided the island amongst her four children, giving Haʻo responsibility of the ʻEwa and Waiʻanae districts. Her eldest son, Kū, was given the title of *mōʻī* (king) and the *kuleana* (responsibility) to ensure the safety and peace of all the districts. Kū however wanted full control and tried to take the land from his siblings. To stop him, Haʻo and his brother Kaʻihikapu fought together and defeated Kū. Kaʻihikapu became the new *mōʻī*; however, over time Kaʻihikapu grew jealous of the wealth and abundance of resources that Haʻo had in ʻEwa. In one *moʻolelo*, Kaʻihikapu sent a Trojan-horse-like surprise to Haʻo.

The chiefs of Waikīkī and Waikele were brothers. The former wished to destroy the latter and laid his plot. He went fishing and caught a large *niuhi* (man-eating shark), whose skin he stretched over a framework. He then sent a messenger to ask his brother if he would keep a fish for him. Having gained his consent, the chief left Waikīkī hidden with his best warriors in the "fish." Other warriors joined them along the way until there was a large army. They surrounded the residence of the chief of Waikele and linked arms to form a wall, while the Waikīkī warriors poured out of the fish, and destroyed those of Waikele (Pukui 1983:191).

In another version of the story, as told by Fornander, Kaʻihikapu sent the carcass of a man-eating shark to Haʻo and instructed him to sacrifice it at his *heiau* in Waikele (Fornander and Grant 1996:270–271). Seeing this as moment of vulnerability, Kaʻihikapu and his men attacked Haʻo and his priests during the ceremony, killing them all and taking control of ʻEwa.

A third version of the story seems to be a combination of the previous two (Kamakau 1991:67). Kaʻihikapu catches a shark in Waikīkī and offers it to Haʻo to sacrifice at his *heiau* in Waikele. When the shark is on the altar, Kaʻihikapu and his men jump out of the shark and kill Haʻo and the priests. Kaʻihikapu's men then place their bodies into the shark and offer it as a sacrifice. According to McAllister, this *heiau* is called Hapupu and is in the area of Paumakua, which means "all fiery eyed" (Kamakau 1991:61–67; Thrum 1922:65). The once peaceful relationship between the brothers—Kū, Haʻo, and Kaʻihikapu—is reflected in the *ʻōlelo noʻeau* "*Ke one kuilima laula o ʻEwa*. The sand on which there was a linking of arms [*kuilima*] on the breadth of ʻEwa" (Pukui 1983:191).

Kahahana
Chief Kahahana was the last independent ruler of Oʻahu. Born into a high ranking family on Oʻahu, Kahahana was sent to Maui to grow up in the court of his relative Chief Kahekili—ruler of Maui, Molokaʻi, Lānaʻi and Kahoʻolawe (Cordy 2002:42).

According to one *moʻolelo*, Kahahana was sent by Chief Kahekili to Waikīkī to meet with a *kahuna* (priest) named Kaʻōpulupulu. At first, Kahahana was a benevolent leader and cared for the people of Waikīkī; however, over time he grew ruthless and violent towards the people. Angry at Kahahana's behavior, Kaʻōpulupulu left Oʻahu and returned to Maui.

When Chief Kahekili learned of what had happened, he was furious. He ordered Kaʻōpulupulu to take his son, Kahulupue, and return to Oʻahu where they were to reunite with Kahahana in Waiʻanae. When they arrived, they were violently abused by Kahahana's men, who were following his order to physically stab and stone Kahulupue. Eventually, Kahekili learned about what had transpired and in retaliation he sent his men out to kill Kahahana, who had escaped with his wife, Kekuapoʻi, and friend Alapaʻi into the depths of ʻEwa.

For two years and four months, the three of them traveled and hid in the depths of ʻEwa, moving from Moanalua down to the lochs of Puʻuloa, before heading *mauka* (upland) to Waipiʻo, Wahiawā, Helemano, and Līhue. Eventually tired of running, Kahahana sent his wife to negotiate with her brother Kekuamanoha in Waikele. After learning the true hiding-place of Kahahana and Alapaʻi, Kekuamanoha sent a message to Kahekili who, at the time, was residing in Waikīkī. Seizing hold of this opportuinty, Kahekili sent his men to kill Kahahana and Alapaʻi at the plains of Hōʻaeʻae in Honouliuli.

Waipiʻo Kīmopō

After Kahahana's death in 1785, his father, ʻElani, conspired with other Oʻahu chiefs to kill Kahekili and his men. The Oʻahu chiefs coordinated to all attack on the same night. ʻElani and his men were to kill the chiefs of ʻEwa; Chief Makaʻioulu and Pupuka would attack Kahekili in Waikīkī; and Konamanu and Kalikoʻonui would kill Huʻeu in Waialua.

Someone informed Kahekili about the plot, and he sent a messenger to ʻEwa and Waiʻalua to warn the other men. The chiefs in ʻEwa escaped to the *moku* of Kona, but the messenger who was sent to Waialua did not make it in time, and so Huʻeu and his men were killed. To avenge the death of Huʻeu, Kahekili gathered his men together to wage war with the districts of ʻEwa and Kona, ultimately killing all of the men, women, and children. It is said that the Kahoaʻaiʻai stream in ʻEwa was filled with dead bodies, and that the water flowed red and tasted bitter from the smashed brains of those who were massacred (Kamakau 1992:138). This incident was known as the Waipiʻo Kīmopō (Waipiʻo assassination) because the plot originated there, and from that day forward, ʻEwa was known as, "the land of deadly plots" (Sterling and Summers 1978).

3.1.6 Ka ʻOihana Mahi ʻAi no Honouliuli—Traditional Agriculture of Honouliuli

The backbone of Hawaiian society were the planters and fishermen, and *mahi ʻai* and *lawaiʻa* are the traditions of farming and fishing in Hawaiʻi. While the ruling *aliʻi* (chiefs) bloodlines fell in and out of power, the people who farmed and fished remained a constant and stable presence in Hawaiian society. In old Hawaiʻi, the upland farmers traded crops for fish with those who lived along the shore, exchanging the things they cultivated or collected to obtain what they could not easily get. This bond between *mauka* and *makai* has been preserved in the following *ʻōlelo noʻeau*: "*Ko koā uka, ko koā kai* (those of the upland, those of the shore)" (Pukui 1983:196).

Most of the people living in any *ahupuaʻa* were *makaʻāinana* (commoners). Literally, *makaʻāinana* means "people that attend the land." They prepared, planted, and harvested their own plots. They also cultivated the lands of whichever *aliʻi* happened to be in control at the time. The land was theirs to use; no one ever held title to it. Despite the absence of ownership, this system enjoyed a fairly high degree of stability. It was in the interest of the *aliʻi* to treat people fairly and maintain the occupancy of industrious *makaʻāinana*, who were free to relocate.

Taste the Kāī-koi of ʻEwa

From the abundance of *wai* grew a renowned variety of *kalo* named Kāī O ʻEwa. There were many sub-varieties of Kāī O ʻEwa: Kāīkeʻokeʻo, Kāīʻeleʻele, Kāīuliuli, Kāīʻulaʻula, Kāīkea, and Kāīkoi. Kāīkeʻokeʻo was said to be beloved by the chiefs for its unique aroma and flavor. Kāīkoi was known to spread out, quickly sending out *huli* (shoots) until it covered the entire *loʻi* (terrace). It was said that anyone who married someone from the area would never leave because the love of the *kāikoi* was so strong. This sentiment is captured in the following *ʻōlelo noʻeau* (Pukui 1983:305):

> Ua ʻai i ke kāi-koi o ʻEwa. (2770)
>
> *He has eaten the* kāi-koi *taro of ʻEwa.*
>
> Kāi *is Oʻahu's best eating taro; one who has easten it will always like it. Said of a youth or a maiden of ʻEwa, who, like the* kāi *taro, is not easily forgotten.*

At the base of Honouliuli Stream where the water deposits into the bay lies an area that was once known for its *loʻi kalo*. The abundance of water in this particular *ʻāina* nourished a bounty of crops that once sustained hundreds of Native Hawaiians.

3.1.7 Ka ʻOihana Lawaiʻa no Honouliuli—Traditional Fishing of Honouliuli

Honouliuli was known for the rich marine life that filled the surrounding waters. An oral history interview with Mark Kahalekulu (2014) revealed the many fish that filled the area, including *moi* (*Polydactylus sexfilis*), *awa* (*Chanos chanos*), *kala* (*Naso unicornis*), *palani* (*Acanthurus dussumieri*), *manini* (*Acanthurus triostegus sandvicensis*), *ʻōhua* (*Acanthurus triostegus sandvicensis*), *ʻamaʻama* (*Mugil cephalus*), *āholehole* (*Kuhlia sandvicensis*), *ʻōpae* (*Halocaridina rubra*), *heʻe* (*Octopus cyanea*) and the prized *ʻanae* (adult mullet, *Mugil cephalus*).

Traditionally *ʻanae* were associated with the waters of ʻEwa. These *ʻanae* traveled along the coast from Honouliuli in ʻEwa to Laʻiemaloʻo in the district of Koʻolauloa and were known *as Kaʻanae o Kaihuopalaʻai* (The *ʻanae* of Kaihuopalaʻai). A *moʻolelo* explains that Kaihuopalaʻai was the father of a supernatural eel named Laumeki, and the area where his family resided lacked fish. So Laumeki made a counter-clockwise circuit of the island, leading the fish from Honouliuli near Puʻuloa (Pearl Harbor) to his home in Laʻiemaloʻo. It's believed that the *ʻanae* of the area still travel this route today.

An alternate *moʻolelo* depicts the migration of the *ʻanae* as *ʻamaʻama,* young mullet. Although in a different life stage, these *iʻa* followed the same migratory pattern, moving from Honouliuli to Laʻie (Titcomb and Pukui 1977:64).

> Kaihuopalaʻai (a place) was famous from olden times down to the time when the foreigner ruled Honouliuli, after which time the famous old name was no longer used [...] It is said that in those days the *ʻamaʻama* heard and understood speech, for it was a fish born of a human being, a supernatural fish. These were the keepers of this fish [...] Kaulu, the husband, and Apokaʻa, the wife, who bore the children, Laniloa, the son, and Awawalei, the daughter. These two children were born with two other

> supernatural children, an eel and a young *ʻamaʻama*. From this *ʻamaʻama* child came all the *ʻamaʻama* of Kaihuopalaʻai, and thus did it gain renown for its *ʻamaʻama* [...] Laniloa went to Laʻie in Koʻolauloa, and there he married. His sister remained in Honouliuli and married Mokueo, and to them were born the poeple who owned the *ʻamaʻama*, including the late Mauliʻawa and others [...] These were fishermen who knew the art of making the fish multiply and make them come up to the sand [...] While Laniloa lived in Laʻie he heard of the great schools of *ʻamaʻama* at Honouliuli. There were no *ʻamaʻama,* large or small, where he lived. He thought of his younger sister, the *ʻamaʻama*, and guessed that [this] was the reason the place was growing so famous. He said to his wife, "I shall ask my sister to send us some fish for I have a longing for *ʻamaʻama*..." Laniloa left Laʻie to go to ʻEwa... He reached the house and found his parents and sister. His parents were quite old for he had been away a long time... He said, "I have come to my *ʻamaʻama* sister for a bit of fish as there is none where I live except for some *au moana* (sea-faring) crabs." [...] After three days and nights he left ʻEwa [...] The fish were divided into two groups, those that were going and those that were staying. As Laniloa's sister went along the shore, she went in her human form. The fish came from, that is, left Honouliuli without being seen on the surface. They went deep under water until they passed Kaʻaʻaliʻi, then they rose to the surface [...] They reached Waikīkī [...] They went on. The sister slept at Nuʻupia while the fish stopped outside of Na Moku Manu [...] Finally she reached Laʻie, and to this day this is the route taken by the *ʻamaʻama*.

The *ʻōlelo noʻeau* "*ka iʻa hali a ka makani* (the fish blown by the wind)" refers to this *moʻolelo* and the annual migration pattern of the *ʻanae* (Pukui 1983:145). When the *ʻanae* migrate they are known as *ʻanae-holo* (running or travelling mullet), but when they remain offshore or in the same area they are refered to as *ʻanae-pali* (cliff mullet).

Within the ʻEwa Moku, Puʻuloa Ahupuaʻa was known for the great variety of shellfish. The *pipi* (Hawaiian pearl oyster) was a highly valued delicacy that was eaten raw. The shells were prized for making attractive fish lures that would be used to catch *aku* (*Katsuwonus pelamis*).

ʻEwa was also known for the *limu* (algae) that covered the coastline. In his interview, Kahalekulu (2014) shared that beds of *limu* could reach a height of two to three feet. This also included various types such as *līpoa* (*Dictyopteris plagiogramma*)*, kala* (*Sargassum echinocarpum*), and *manauea* (*Gracilaria coronopifolia*). During certains seasons, Kahalekulu recalled that as a child he could smell the *limu* from Pōhākea Elementary School. Kahalekulu shared that his parents stressed the importance of managing the natural resources and only taking what one needed; however, due to multiple changes within the region, the *limu* began to dissappear until it was no longer able to replenish itself (Kahalekulu 2014).

3.2 REMNANTS OF THE PAST

The early archaeological survey of Oʻahu by McAllister (1933) lists many sites for the *ahupuaʻa* of Honouliuli, most of which were recorded in the Pearl Harbor area and on the ridgetops of the Waiʻanae Range. Recorded sites include *heiau*, fishing shrines, fishponds, and house sites. For the Kalaeloa (Barbers Point) area of the ʻEwa Plain, McAllister recorded features under a single site number, Site 146. McAllister (1933:109) states

> ʻEwa Plains, throughout which are the remains of many sites. The great extent of old stone walls, particularly near the Puuloa Salt Works, belongs to the ranching period of about 75 years ago [ca. 1850s]. It is probable that the holes and pits in the coral were formerly used by the Hawaiians. Frequently the soil on the floor of

> the larger pits was used for cultivation and even today one comes upon bananas and Hawaiian sugar cane still growing in them. They afford shelter and protection, but I doubt if previous to the time of Cook there was ever a large population here.

During the 1950s and 1960s, Bishop Museum archaeologists recorded burials in sinkholes at the Standard Oil Refinery and the Naval Air Station, as well as a possible fishing shrine and beach midden site in the area (Bishop Museum Anthropology Department Files). During the 1970s, Bishop Museum conducted a 900-acre survey of Kalaeloa (Barrera 1975) and testing at the previously identified beach midden site (Davis & Griffin 1978). Excavations at sinkholes undertaken by Davis in the Kalaeloa area revealed stratigraphic regularities and provide insights into the geologic substrate in the area (Davis 1995). Based on formative conditions of sediments, Allen (1995) defined depositional units, leading to the proposal of a three-phase stratigraphic sequence including a basal deposit characterized by carbonate silts overlain by sediments resulting from structural collapse of the sinkhole walls, over which a dark-colored loamy deposit had formed. Surface architecture dating to the pre-Contact period includes features made of stacked limestone slabs, uprights, and cobbles (see Tuggle 1997).

A multitude of archaeological surveys and excavations conducted over the past four decades documented an archaeological landscape on the ‘Ewa Plain indicative of traditional Hawaiian settlement during the pre-Contact and early post-Contact era, as well as post-Contact land use primarily associated with commercial agriculture, such as sugarcane and sisal, and U.S. military training (discussed below). These include studies by Sinoto 1976, Hammatt and Folk 1981, Welch 1987, Haun 1991, Dunn et al. 1991, Tuggle and Tomonari-Tuggle 1997, Wickler and Tuggle 1997, and Beardsley 2001, among others. All identified traditional Hawaiian archaeological sites were built with locally derived limestone and characterized by various types of enclosures, platforms, walls, alignments (among other limestone features), and walled limestone depressions commonly referred to as pits. An unusual feature type called “vaulted” mounds were also identified on the ‘Ewa Plain and named for their crypt-like spaces (Tuggle and Tomonari-Tuggle 1997; Beardsley 2001). Despite their vaulted character, testing of these features did not identify burials with this feature type, and the archaeological materials identified during testing suggested a storage or cooking function.

The documented traditional Hawaiian sites are often characterized by large concentrations of features revealing settlements of two to three families who subsisted off marine resources and dryland farming, the latter done in enclosed limestone pits and clusters of planting mounds (Tuggle 1997:15). Burials were also identified in stone structures but more commonly within soil floors or beneath overhangs of limestone pits (e.g., Wickler and Tuggle 1997; Beardsley 2001). Using data from 200 radiocarbon dates from the ‘Ewa Plain sites, Tuggle (1997:17) estimated three temporal periods of short-term settlement of the ‘Ewa Plain: 1) AD 1300–1450; 2) AD 1450–1700; and 3) after AD 1700.

Significant fossil remains of extinct or extirpated birds have been identified in the limestone pit features and some in contexts with traditional Hawaiian cultural deposits (e.g., Wickler and Tuggle 1997, discussed below). According to Athens et al. (2002:57), some researchers have attributed bird extinction on the ‘Ewa Plain to Polynesian colonization of the Hawaiian Islands, either through predation or landscape alteration. More recent paleoenvironmental data, however, suggest a “very rapid vegetation change” due to the introduction of the Polynesian rat (*Rattus exulans*) as the main cause of extinction or extirpation of some land birds, particularly flightless taxa and passerines (Athens et al. 2002:75). Archaeological evidence disputing the human predator theory includes the general absence of bird remains in most of the ‘Ewa Plain occupation sites, the natural deposition of fossil bird remains generally found below cultural deposits or in questionable mixed interfaces with cultural deposits (Athens et al. 2002:57), and the lack of cultural use shown on the fossil bird remains, such as burning or breakage patterns (e.g., Wickler and Tuggle 1997:iv).

3.3 POST-CONTACT PERIOD

A significant turning point in Hawaiʻi's history is the arrival of Captain James Cook in 1778 which began an influx of visitors from the West who ultimately left a lasting effect on the landscape and people. The effects of Western influence on Honouliuli are described below.

3.3.1 Barbers Point

The post-Contact name Barbers Point comes from Captain Henry Barber, whose ship, the *Arthur*, ran aground there.

> In October 1796, a ship went aground at Kalaeloa, Oahu. This ship had visited the island on several occasions during the rule of Ka-lani-ku-pule. This was the first time a foreign ship had grounded on these shores. Kamehameha was on Hawaii, but Young had remained on Oahu. All the men on the ship came ashore at night in their boats. At daylight when the ship was seen ashore Ku-i-helani placed a ban on the property of the ship and took care of the foreigners. Hawaiian divers recovered the valuables, and they were given over to the care of Ku-i-helani, but part were given by Captain Barber to the men who had recovered them. (Kamakau 1991:174)

Prasad (2018) summarized the stories about Captain Barber related in Sterling and Summer's *Sites of Oahu* which paint him as an unsavory character.

> Sterling and Summers (1978) describe accounts related to Captain Barber, mostly re-telling the same event(s) with slight variations. One of the stories recalls an incident just prior to the ship running aground when Captain Barber tried to trick Kamehameha by giving the king a gift of a keg of diluted brandy because he felt that providing a keg of good brandy would be a waste. After the wreck of his ship, Barber appealed to the king for assistance in retrieving goods that had been stolen off the ship. During a feast, the ship's captain found the *ʻawa* he was given had been similarly diluted by Kamehameha (Joseph Emerson, as told to Mrs. Beatrice Greenwell, in Sterling and Summers 1978:39). Some accounts describe Barber as an unscrupulous man whose primary interest was in trading sea otter pelts and transporting supplies to and from penal colonies in Australia (Sterling and Summers 1978:39–40). (Prasad 2018:10)

3.3.2 Population and Landscape

One of the earliest Western accounts of Kalaeloa (Barber's Point) is by Captain George Vancouver who led a voyage to Hawaiʻi in 1792. Of Kalaeloa, he wrote "this tract of land was of some extent but did not seem to be populous, nor to possess any great degree of fertility; although we were told that at a little distance from the sea, the soil is rich, and all necessaries of life are abundantly produced" (Vancouver and Vancouver 1798:361–363).

Although it is the driest region of the island, Native Hawaiians did subsist on the ʻEwa Plain. Its residents had access to the resources of the Waiʻanae Mountains, as well as the marine resources in Pearl Harbor; in addition to fishing, wetland agriculture was maintained in the irrigable lowlands of the harbor.

However, in Honouliuli, just as it was across the islands, introduced diseases drastically decreased the Native Hawaiian population. Missionaries first arrived in the islands in the 1820s and undertook census data collection. They recorded a Native Hawaiian population of 1,026 in

1832, but by 1836, it had decreased to 870 (Schmitt 1973:19–22). A Protestant missionary named Artemas Bishop worked in ʻEwa and observed that

> The people of the district are rapidly diminishing, and whole neighborhoods where in former years were numerous families and cultivated lands, there are now no inhabitants, and the land is left to run to waste. The fathers have died off, and the children wander into other parts, and there are none to fill their places. (Bishop 1854)

3.3.3 Māhele, Private Land Ownership, and New Enterprises in Honouliuli

In 1848, King Kamehameha III and 245 *aliʻi* (royalty) and *konohiki* (landlord) came together to divide the lands of the kingdom into three classifications. The Crown and the *aliʻi* received their land titles and awards for both whole *ahupuaʻa* and individual parcels within an *ahupuaʻa* which were then subsequently formally granted in 1850 (Alexander 1890:114). The lands given to the *aliʻi* and *konohiki* were referred to as Konohiki Lands, and lands retained by the King as Crown Lands. The distinction of Crown land is important and defined as

> private lands of His Majesty Kamehameha III., to have and to hold for himself, his heirs and successors forever; and said lands shall be regulated and disposed of according to his royal will and pleasure subject only to the rights of tenants. (Kingdom of Hawaii 1848)

At the death of Kamehameha IV and with lack of a clear heir, there was some confusion as to the inheritance of Crown lands and whether or not it followed the family line or the throne. It was decided by the Supreme Court that under the confirmatory Act of June 7th, 1848, "the inheritance is limited to the *successors* to the *throne* [...] the wearers of the crown which the conqueror had won," and that at the same time, "each successive possessor may regulate and dispose of the same according to his will and pleasure as private property, in the manner as was done by Kamehameha III" (Alexander 1890:121).

The *ahupuaʻa* of Honouliuli was claimed by Kamehameha I following his conquest of Oʻahu. He gave the *ahupuaʻa* to Kalanimoku, who passed the land on to his sister, Wahinepiʻo. The entire *ahupuaʻa* was awarded to Kamehameha's granddaughter, Miriam Keʻahi-Kuni Kekauʻōnohi, except for *kuleana* awards, located primarily within and adjacent to the Honouliuli Gulch. Upon Kekauʻōnohi's death, the lands passed to her third husband, Levi Haʻalelea. Upon his death, the land passed to his surviving wife, who then leased the land to James Dowsett and John Meek for ranching. In 1877, most of the land in Honouliuli was sold to James Campbell. Campbell used much of the land for cattle grazing and agricultural production.

At the time, there was not much water in the dry plains of ʻEwa. In 1879, Campbell imported a well-driller from California and bore 250 feet into the earth where "a sheet of pure water flowing like a dome of glass from all sides of the well casing" gushed forth (Campbell 2003). With the discovery of water and the presence of a new fence, Campbell opened Honouliuli Ranch in 1881 and focused his efforts on cattle ranching (Campbell 2003).

In 1890, the Ewa Plantation Company was established, who controlled over 12,000 acres of land by the 1920s. In the 1920s, the Ewa Plantation Company had great success, being known as the richest sugar plantation in the world, and in the following decade, expanded to become a community with homes, schools, and other infrastructure to support the laborers (Campbell 1994). At that time, the Honouliuli Ranch held the lease on 20,000 acres of land. The OR&L Railway (Oahu Rail & Land Company), established in 1889, crossed the ʻEwa Plain and operated until 1947 (Figure 5). Sugar industry activities continued in the area until the 1970s, and military training activities were conducted in some areas during the 1930s and 1940s. Both had detrimental impacts to the natural and cultural landscape of the ʻEwa Plain (see Tuggle 1997).

Figure 5. OR&L Co. train (Hawai‘i Historic Foundation 2014).

In addition to the Crown Lands passed down by Kamehameha I, some *maka‘āinana* of Honouliuli made claims for their house lots and farm lands. In an act ratified on August 6th, 1850, the gathering rights of the common people for personal use, which included the gathering of both terrestrial and marine resources, in addition to the right to water and the right-of-way on the lands of the *konohiki*, were guaranteed and embodied in Section 10477 of the Civil Code (Alexander 1890:114–115). By this same act, resolutions passed by the Privy Council granted fee-simple titles, free of all commutation, with the exception of awards granted within the towns of Honolulu, Lāhainā, and Hilo, to all native tenants for their cultivated lands and house lots (hereafter referred to as *kuleana* land) (Alexander 1890:115). Claims of the native tenants, or *kuleana* land claims, were presented to and heard by the Land Commission whose duty was to:

> ascertain the nature and extent to each claimant's rights in land, and to issue an Award for the same which is prima facie evidence of title "and shall furnish as good and sufficient a ground upon which to maintain an action for trespass, ejectment or other real action against any other person or persons whatsoever, as if the claimant, his heirs or assigns had received a Royal Patent for the same." (Alexander 1890:110)

Testimony for *kuleana* lands often included claims for multiple *‘ili*, or *‘āpana*, located both *mauka* and *makai*. These claims were recorded under a single *helu*, or case number, and brought before the Land Commission for consideration. *Kuleana* land awards, or *kuleana* claims that were approved by the Land Commission, were granted to tenants of the land, native Hawaiians, naturalized foreigners, non-Hawaiians born in the islands, or long-term resident foreigners, who could prove occupancy on the parcels prior to 1845 (hereafter referred to as Land Commission Awards [LCA]). Despite the effort to allocate lands to the *maka‘āinana*, much of these lands would ultimately be obtained by foreigners in payment for services rendered to the Kingdom or sold as land grants for commercial agriculture enterprises. *Kuleana* land awards for Honouliuli are detailed in Table 2. None of these land awards are in the immediate vicinity of the project area.

Table 2. Kuleana Land Awards associated with Honouliuli

Place Name	LCA No. and Description
Aihonu (mo'o)	LCA 831 to Kaekuna: "Apana 2. Mau loi 2 me ke kula ma ka moo Aihonu, Poohilo, Honouliuli, E.O. [0.126 acre] Apana 3. He kahuahale ma kula o Aihonu, Honouliuli, E.O. [0.365 acres] Apana 4. He loi ma Aihonu, Poohilo, Honouliuli, E.O. [0.085 acre]." Also LCA 847:2 to Hinaa and LCA 1570:1 to Kekua 1. (AB 2:218, 241; 6:137)
Aimea (kō'ele)	Claim no. 1666B by Kuahilo for "an apana moo aina called Kaleipuawa in the ili of Poohilo, Honouliuli, Ewa, Oahu… bounded H[onolulu] by the koele of Aimea" (FT 9:132)
Ako (*lo'i*)	LCA 763 to Keliiaa: "Apana 2. He loi Ako ma Poohilo, Honouliuli, E.O." 0.119 acre. LCA 832 to Opiopio: "He moo kalo Ako, ili o Poohilo, Honouliuli, Ewa, Oahu." 0.669 acre. (AB 2:163, 219)
Alae (*kō'ele, lo'i*)	Claim no. 1580B by Kapioho: "Apana 1. Namooelua [q.v.] is bounded M[auka] by the loi Alae of deponant [Kikala, claim no. 681] & the koele of Alae" (FT 9:133)
Haalelenui (*lo'i*)	LCA 1570 to Kekua 1: "Ap. 2. He loi Haalelenui ma Aihonu, Poohilo, Honouliuli, Ewa. Oahu." 0.248 acre
Hakelo (*lo'i*)	Claim no. 1605B by Nakai is for "a moo aina in 3 pieces, & having 6 lois, one called Hakelo" (FT 9:131.)
Halawa (*mo'o*)	LCA 845 to Kaukahiko: "[Apana 1] Moo aina Halawa, ili o Niukee, Honouliuli, Ewa, Oahu." 1.234 acre (AB 7:258)
Haleokane (*lo'i*)	Claim no. 5654:2 by Kuhiana is for "a loi called Kalokoloa in the moo aina Waianu, ili Poohilo, Honouliuli, Ewa, Oahu… Bounded Makai by the loi Haleokane of Kekua [claim no. 1570 or 1598?]" (FT 9:134)
Halulu (*mo'o*)	LCA 898 to Kaneaola: "Apana 3. Moo aina Halulu, ili o Polapola, Honouliuli, E.O." (AB 2:297)
Haole (*mo'o*)	LCA 839 to Kaaiawaawa: "Ap. 5. He kula mahiai iloko o ka moo aina o Haole." 0.33 acre (IN 765; AB 2:233)
Hiwalalo (*mo'o*)	LCA 1580B to Kapioho: "Section 2 - Is in the moo land of Hinalalo. Mauka by Alae ditch / Honolulu by Kapalakai of Maio moo land / Makai by the konohiki's poalima / Waianae by Lopanui, Kalaoa's moo land." 2 ap., 1.505 acres (RP 2868)
Hiwaluna (*lo'i*)	Claim no. 5653C [LCA 751] by Kalauli for "3 lois called Hiwalalo in the moo aina Malua, ili of Polapola..." is bounded "Makai by the loi Hiwaluna no Keliiaa [claim 763:3]" (FT 9:143)
Hopeiki (*mo'o*)	LCA 1701 to Alauka: "Ap. 1. Ekolu loi, Hopeiki, ili o Poohilo, Honouliuli, Ewa, Oahu." 0.802 acre (AB 6:136)
Hopenui (*mo'o*)	LCA 1701 to Alauka: "Ap. 2. He loi iloko o Hopenui, Poohilo, Honouliuli, Ewa, Oahu." 0.087 acre (AB 6:136)
Iao (*lo'i*)	Claim no. 5653 by Kua: "1st a moo aina of 2 lois & a kula called Kahui in the ili of Maui, Honouliuli, Ewa, Oahu. It is bounded... W[aianae] by the loi called Iao of Leleaupa." (FT 9:142)
Kaaimano (*loko*)	Claim no. 5653B by Kanehekili in the *mo'o* [Ka]Mookahi is bounded "makai by the loko Kaaimano of konohiki." (FT 9:143)
Kaaiopelu (*lo'i*)	Claim no. 1570 by Kekua 1: "Apana 4. 2 lois called Kaaiopelu & Kalokoloa in the moo aina of Waianu, Poohilo, Honouliuli, Ewa, Oahu" (FT 9:139)
Kaakau (*'ili 'aina*)	LCA 755 to Kainohananui for Kaope: "Apana 2. Kahuahale i kula o Kaakau Honouliuli." 1.53 acres (IN 765; AB 2:149)

Place Name	LCA No. and Description
Kaamaikeaha (*lo'i*)	Claim no. 5653C [LCA 751] by Kalauli for "3 lois called Hiwalalo in the moo aina Malua, ili of Polapola" is bounded "Waianae by the loi Kaamaikeaha of Mili." (FT 9:143)
Kaaumakua (*'ili 'aina*)	LCA 1719 to Hiilea is for his "Moo aina Kanuwahine, ili o Kaaumakua, Honouliuli, E.O." 1.01 acres. Also mentioned in LCA 748 to Kalauhala, LCA 756 to Kauouo, LCA 762 to Kalama, LCA 768 to Pio for Wahinenui, LCA 905 to Kaimuena, LCA 910 to Nunu, LCA 917 to Kaulu for Kaoliko, LCA 1570B to Pekane, 1570C to Hanolowaa, LCA 1580 to Kanahuna and LCA 1670 to Moano. Claim no. 883 by Kumupopo was not awarded. (IN 766; AB 6:130; NR 2:502)
Kaauwaiwai (*mo'o*)	LCA 1570C to Naholowaa: "Ap. 2. He moo aina Kaauwaiwai, ili o Kaaumakua, Honouliuli, Ewa, Oahu." 1.674 acres. Written "Kaauwewai" in FT 9:140 (AB 6:138)
Kahakumaka (*lo'i*)	Claim no. 5653 by Kua: "1st a moo aina of 2 lois & a kula called Kahui in the ili of Maui, Honouliuli, Ewa, Oahu. It is bounded M[auka] by the loi called Kahakumaka of Koi" (FT 9:142)
Kahewamakawalu (*mo'o*)	LCA 755 to Kainohananui: "He moo aina Kahewamakawalu, Niukee, Honouliuli, E.O." (AB 2:149)
Kahiwapalaai (*'ili 'aina)*	Claim no. 1580B by Kapioho "consists first of 2 moos named Namooelua [q.v.] & 2d one loi in the moo aina Hiwalalo, both in the ili Kahiwapalaai, Honouliuli, Ewa, Oahu." In the Award Book Namooelua is in the *'ili* of Polapola. This is probably a garble for Kaihuopalaai (q.v.). (FT 9:133)
Kahoopauli (*mo'o*)	LCA 754 to Kaunahi: "Apana 2. He 3 mau loi iloko o ka moo Kahoopauli, Niukee, Honouliuli, W. O." 0.523 acre. (AB 2:147)
Kahui (*mo'o*)	LCA 839 to Kaaiawaawa: "Apana 3, 4. He apana moo aina Kahui, ili o Kamilomilo, Honouliuli, E.O." LCA 5950 to Pihana no Puniawa: "He moo aina, Kahui, ili o Kamoku, Honouliuli, Ewa, Oahu." 1.156 acres. Also recorded in LCA 1580 to Kanahuna: "Ap. 3. Moo aina, Kahui, ili o Kamilomilo, Honouliuli, Ewa, Oahu." (AB 2:233, 6:133, 6:135) Claim no. 5653 by Kua: "1st a moo aina of 2 lois & a kula called Kahui in the ili of Maui, Honouliuli, Ewa, Oahu." (FT 9:142)
Kahuilalo (*mo'o*)	LCA 1713 to Kealani: "Ap. 1. He moo aina, Kahuilalo, ili o Niukee, Honouliuli, Ewa, Oahu." 1.07 acres (AB 6:130)
Kahuiluna (*mo'o*)	LCA 876 to Nohunohu: "Moo aina o Kahuiluna, ili o Niukee, Honouliuli, E.O." 1.047 acres (AB 2:277)
Kahuiopalaai (*'ili 'aina*)	Claim no. 5670B by Kaohai "is called Lopanui in the ili Kaihuopalaai, Honouliuli, Ewa, Oahu" but the LCA is placed in Polapola (q.v.) (FT 9:137)
Kailikahi (*'ili 'aina*)	LCA 752 to Haae: "He ili aina Kailikahi, Honouliuli, Ewa, Oahu." 5.448 acres. LCA 839 to Kaaiawaawa: "Apana 2. Kahuahale, kula o Kailikahi, Poohilo, Honouliuli." 0.426 acre (IN 766; AB 2:143, 233)
Kalahu (*loko*)	Claim no. 1570C by Naholowaa is for "a moo aina called Kaauwewai [sic, Kaauwaiwai] in the ili Kaaumakua, Honouliuli, E.O.... contains 3 lois & a kula mahiai and is bounded... Makai by the loko of konohiki called Kalahu." (FT 9:140)
Kalaipuawa (*mo'o*)	LCA 839 to Kaaiawaawa: "Apana 1. He moo kalo Kalaipuawa, ili o Poohilo, Honouliuli, Ewa, Oahu." 1.127 acres. Misspelt "Kaluipuawa" (q.v.) in LCA 1666B to Kuahilo but written "Kaleipuawa" in FT 9:132
Kalawaha (*lo'i*)	Claim no. 1580 by Kanahuna is for "3 lois and a kahuahale in 2 pieces. The lois are named Kalawaha, Poina & Palakai in the ili Kamilomilo, Honouliuli, Ewa, Oahu.... Apana 2 [kahuahale] is bounded... W[aianae] by the koele Kalawahaiki." (FT 9:133)

Place Name	LCA No. and Description
Kaleipuawa (*mo'o*)	Claim no. 1666B by Kuahilo for "an apana moo aina called Kaleipuawa in the ili of Poohilo, Honouliuli, Ewa, Oahu." (FT 9:132)
Kaloiiki (*lo'i*)	Claim no. 1570 by Kekua 1: "Ap. 2. A loi called Haalelenui in the moo Waianu, ili of Poohilo, bounded M[auka] by the lois Kamalua and Kaloiiki of Kauhailepa (claim no. 911)." (FT 9:139)
Kaloiliilii (*lo'i*)	LCA 901 to Kuahine: "Apana 2. Kaloiliilii, ili o Niukee, Honouliuli, E.O." (AB 2:301)
Kaloiloa (*mo'o*)	Claim no. 1713:1 by Kealani is "a moo aina called Kahui in the ili Niukee, Honouliuli, Ewa, Oahu, contains 3 lois & is bounded... Makai by the moo Kaloiloa of Aoao [claim no. 892], W[aianae] by the auwai & a loi called Kaloiiki." (FT 9:136)
Kalokoeli (*mo'o*)	LCA 1565 to Kaalauahi: "Ap. 1. He moo aina Kalokoeli, N[i]ukee, Honouliuli, Ewa, Oahu." 1.642 acres. (AB 6:131)
Kalokoloa (*lo'i*)	Claim no. 5654:2 by Kuhiana is for "a loi called Kalokoloa in the moo aina Waianu, ili Poohilo, Honouliuli, Ewa, Oahu." (FT 9:134) LCA 914 to Kamaala: "He moo aina Kalokoloa, ili o Niukee, Honouliuli, E.O." 0.791acre. (AB 2:331)
Kalole (*mo'o*)	LCA 768 to Pio: "Ap. 1. He moo aina Kalole, ili o Niukee, Honouliuli, E.O." 0.358 acre. "Apana 2. He kahuahale ma Kalole, ili o Niukee." 0.202 acre. In claim no. 1605B by Nakai, "Kalole is one of 6 lois in the ili Niukee." (AB 2:171; FT 9:131)
Kaluakanaka (*mo'o*)	LCA 832 to Opiopio: "Ap. 2. Elua loi, Kaluakanaka, Poohilo, Honouliuli, E.O." 0.538 acre (AB 2:219)
Kaluamanoiki (*mo'o*)	LCA 832 to Opiopio: "Ap. 2. Elua loi, Kaluakanaka, Poohilo, Honouliuli, E.O." 0.538 acre (AB 2:169)
Kaluamoo (*mo'o*)	LCA 1666 to Mauwele: "He moo kalo Kaluamoo, ili o Poohilo, Honouliuli, Ewa, Oahu." 0.506 acre. LCA 907 to Luana: "Apana 1. He moo aina Kaluamoo, ili Niukee, Honouliuli, Ewa, Oahu." 1.176 acres. (AB 6:135, 7:650)
Kaluamooiki (*'ili 'aina*)	LCA 766 to Paele: "Apana 2. He kahuahale ma kula o Kaluamooiki, Honouliuli." 0.316 acre (IN 766, AB 2:169)
Kaluanonomuku (*kū'ula*)	Claim no. 1570 by Kekua 1: "Apana 3, a kula mahiai called Kaluanonomuku in the moo aina of Aihonu, ili of Poohilo, Honouliuli, Ewa, Oahu." (FT 9:139)
Kamaieleele (*lo'i*)	Claim no. 5653 by Kua: "Apana 2, one loi in the moo aina of Kamalua in the ili Polapola, Honouliuli, Ewa, Oahu & is bounded... W[aianae] by the loi Kamaieleele of Laamaikahiki (no. 874)." (FT 9:142)
Kamaihiili (*mo'o*)	LCA 831 to Kaekuna: "He moo aina Kamaihiili, Poohilo, Honouliuli, E.O." 1.030 acres. (AB 2:217)
Kamaipipipi (*'ili 'aina*)	LCA 760 to Kuhemu: "Apana 2. He kahuahale ma kula o Kamaipipipi, Honouliuli." 0.198 acre. Also LCA 907 to Luana. (IN 766; AB 2:157, 7:260)
Kamalua (*lo'i, mo'o*)	Claim no. 5950 by Pihana: "Apana 2. 1 loi o Kamalua ka inoa iloko o ka moo o Kekee ma ka ili o Kamoku i Honouliuli, Ewa, Oahu." Written "Malua" in FT. (NT 9:287; FT 9:141) LCA 911 to Kauhailopa: "He moo aina Kamalua, Poohilo, Honouliuli, E.O." 1.245 acres. (AB 2:327) Claim no. 5653 by Kua: "Apana 2, one loi in the moo aina of Kamalua in the ili Polapola, Honouliuli, Ewa, Oahu & is bounded... Makai by the loi Kamalua of Kikala (no. 881)." Claim no. 5653C [LCA 751] by Kalauli is for "3 lois called Hiwalalo in the moo aina Malua, ili of Polapola." (FT 9:142, 143).

Place Name	LCA No. and Description
Kamilomilo (*‘ili ‘aina*)	LCA 839 to Kaaiawaawa: “Apana 3. He apana moo aina Kahui, ili o Kamilomilo, Honouliuli, E.O.” Also Apana 4. LCA 917 to Kaulu: “Ap. 1. He moo aina Kumuniu, ili o Kamilomilo, Honouliuli, Ewa, Oahu.” Also LCA 1703 to Aemaikai. Claim no. 757 by Kaniau was not awarded. (IN 766; AB 2:233, 333, 6:139; NR 2:414)
Kamoku (*‘ili ‘aina*)	LCA 886 to Kahalewai: “[Apana 1.] He moo aina Pi, ili Kamoku, Honouliuli, E.O.” Claim no. 5950 by Pihana: “Apana 2. 1 loi o Kamalua ka inoa iloko o ka moo o Kekee ma ka ili o Kamoku i Honouliuli, Ewa, Oahu.” Also LCA 751 to Kalauli, LCA 753 to Manuwa, LCA 906 to Kanoho for Abrahamson, LCA 1672 to Makue. (IN 766; AB 2:141, 145, 309, 6:133, 7:259)
Kamooiki (*lo‘i*)	LCA 911 to Kauhailopa: “Ap. 2. He loi Kamooiki, Hopenui, Poohilo, Honouliuli, E.O.” 0.389 acre. (AB 2:327)
Kamookahi (*mo‘o*)	LCA 5653B to Kanehekili: “Ap. 1. He kula iloko o Kamookahi, Poohilo, Honouliuli, Ewa. Oahu. Ap. 2. He loi iloko o Kamookahi, Poohilo...” 0.833 acre in the two apana. Written “Mookahi” in FT 9:143. (AB 6:138)
Kamoomuku (*mo‘o*)	LCA 933 to Uia: “Ap. 1. He moo aina, Kamoomuku, ili o Niukee, Honouliuli, Ewa. Oahu.” 0.637 acre. (AB 6:132)
Kamuku (*mo‘o*)	LCA 892 to Samuela Aoao: “Apana 1. He moo aina Kamuku ili o Niukee, Honouliuli, E.O.” 1.387 acres. (IN 767; AB 2:291)
Kamumuku (*mo‘o*)	LCA 1573 to Kawahamana: “Ap. 1. He moo aina Kamumuku, ili o Niukee, Honouliuli, Ewa, Oahu.” 0.671 acre. (AB 6:131)
Kaneakiha (*mo‘o*)	LCA 1672 to Makue: “He moo aina Kaneakiha, ili o Kamoku, Honouliuli, Ewa, Oahu.” 1.699 acres. (AB 6:133)
Kanenelu (*mo‘o*)	LCA 990 & 1688 to Poopuu: “He moo aina Kanenelu, ili Loloulu, Honouliuli, Ewa, Oahu.” 0.712 acre (AB 6:133)
Kanuoopu (*mo‘o*)	LCA 762 to Kalama: “He moo aina Kanuoopu, ili o Kaaumakua, Honouliuli, E.O.” 5.0 acres. Written “Kanuoopa” in FT 9:140. (AB 2:161)
Kanuwahine (*mo‘o*)	LCA 1719 to Hiilea: “Moo aina Kanuwahine, ili o Kaaumakua, Honouliuli, Ewa, Oahu.” 1.01 acre. (AB 6:130)
Kapaiokiha (*mo‘o*)	LCA 5654 to Kuhiena: “He moo kalo Kapaiokiha, ili o Maui, Honouliuli, Ewa, Oahu.” 0.606 acre. (AB 6:135)
Kapalaha (*lo‘i*)	Claim no. 5670C by Kumupopo: “Apana 2. A loi called Mooiki in the ili Loloulu, Honouliuli, Ewa, Oahu, is bounded M[auka] by the loi Kapalaha of Kekua (claim no. 1570 or 1598).” (FT 9:138)
Kapapapuhi (*‘ili ‘aina*)	LCA 887 to Kaihikapu: “Ap. 2. He kahuahalae ma Kapapapuhi, Honouliuli, E.O.” 0.45 eka. Also LCA 767 to Hapauea, LCA 845 to Kukahiko, LCA 892 to Aoao, LCA 914 to Kamaala, LCA 1565 to Kaalauahi, LCA 1598 to Kekua 2, LCA 173 to Healani, 10933 to Uwia. Kapapapuhi is misfiled in Hoaeae in IN 765, and misspelt “Kapapahi” in IN 766–767. (IN 765; AB 2:285,291,331, 6:130,131,132, 7:258,265, 9:382; Sterling and Summers 1978:34)
Kapaua (*mo‘o*)	LCA 874 to Laamaikahiki: “Apana 1. Elua loi ma Kapaua, ili o Polapola, Honouliuli. (AB 2:273)
Kapoepoe (*lo‘i*)	Claim no. 5653 by Kua: “Apana 2, one loi in the moo aina of Kamalua in the ili Polapola, Honouliuli, Ewa, Oahu & is bounded... M[auka] by the loi Kapoepoe of Kikala (no. 881).” (FT 9:142)
Kauakahimalolo (*mo‘o*)	LCA 933 to Uwia: “Ap. 2. Moo Kauakahimalolo, ili o Niukee, Honouliuli, Ewa, Oahu.” 1.299 acres. (AB 6:132)
Kauhikuakua (*mo‘o*)	LCA 1570 to Moano: “Ap. 1. He moo aina Kauhikuakua, ili o Loloulu, Honouliuli, Ewa, Oahu.” 0.605 acre. (AB 6:134)
Kauilahanau (*mo‘o*)	Claim no. 764 by Maeaea is “ma Kauilahanau ma Lihue i Honouliuli... [Apana 1]... ma ka Akau Pumaialau, ma ka Hikina Kalahiki, ma ka Hema Kawaipapa. [Apana 2]... ma ka Akau o Kawaipapa, ma ka Hikina o Kalahiki, ma ka Hema ke alapii o Pohakea, ma ke Komohana o Pohakea.” (NR 2:420)

Place Name	LCA No. and Description
Kaulaula (*‘ili ‘aina*)	LCA 749 to Mahina is for “He ili aina o Kaulaula, Honouliuli, Ewa, Oahu. 1.358 acres” less 20 *lo‘i* of Makaula containing 0.412 acre, net 0.946 acre. (IN 767; AB 9:435)
Kaumaka (*mo‘o*)	LCA 1605B to Nakai: “Ap. 1. He kahuahale ma Kaumaka, ili o Niukee, Honouliuli, Ewa, Oahu.” 0.255 acre. (AB 6:140)
Kauwahine (*mo‘o*)	LCA 754 to Kaunahi: “Apana 1. He auwai me ka pahale ma Kauwahine, ili Niukee, Honouliuli, Ewa, Oahu.” 0.456 acre. (AB 2:147)
Keaniani (*mo‘o*)	LCA 768 to Pio for Wahinenui: “Apana 3. He moo aina Keanini, ili o Kaaumakua, Honouliuli, E.O.” 1.687 acres. (AB 2:171)
Kekee (*mo‘o*)	Claim no. 5950 by Pihana: “a loi called Malua in the moo of Kekee, ili of Kamuku [sic, Kamoku], Honouliuli, Ewa, Oahu... bounded M[auka] by the loi Kekee of Makue (no. 1672)... Makai by the moo aina Kekee...” Written “Kamalua” in NT. (FT 9:141)
Kepoe (*mo‘o*, *‘ili ‘aina*)	LCA 5670C to Kumupopo: “Ap. 1. He moo aina Kepoe, ili o Kepoe, Honuliuli. E.O.” 1.369 acres. (IN 767; AB 6:141)
Kepoi (*mo‘o*)	Claim no. 5670C by Kumupopo: “Apana 1 is a moo aina called Kepoi in the ili Poohilo, Honouliuli, Ewa, Oahu. It contains 7 lois and a kula kahuahale.” (FT 9:138)
Kihewamakawalu (*loko*)	Claim no. 1605B by Nakai for a moo aina in Niukee: “Apana 1 is bounded M[auka] by the kula of konohiki & the loko Kihewamakawalu... W[aianae] by the loi called Kapaiki of Kaunahi [claim 754] & a part of Kihewamakawalu... M[akai] by the pali of Kihewamakawalu.” (FT 9:131)
Kohepalaoa (place)	Claim no. 5584 by Kauhi (not awarded) “is situated in the place called Kohepalaoa, Puuloa, Ewa, Oahu.” (FT) “...kona pahale ma Kohepalaoa, he wahi pana aia ma ka ili o Puuloa, E.O.” (NT) Claims no. 5977 by Mahoe, no. 5594 by Kauhane were not awarded (FT 9:144, 195; NT 9:290)
Kohumakahou (*kū‘ula*)	Claim no. 1570B by Pekane: “Apana 2, the fishpond [Mokumeha] is bounded... W[aianae] by the kula alialia Kohumakahou.” (FT 9:140)
Koula (*mo‘o*)	LCA 917 to Kaulu: “Ap.2 [deleted] He moo aina o Koula, ili o Kamilomilo, Honouliuli, E.O.” 1.958 acres. Also LCA 1703 to Aemaikai: “He moo aina Koula, ili o Kamilomilo.” 1.296 acres. (AB 2:333, 6:139)
Kuaihee (*mo‘o*)	LCA 1570B to Pekane: “Ap. 2. Elua moo aina i Mooiki me Kuaihee, ili o Kaaumakua, Honouliuli, Ewa, Oahu.” 2.876 acres (AB 6:140)
Kuaihoe (*lo‘i*)	Claim no. 5653C [751] by Kalauli for “Ap. 3, a kahuahale & a loi in Puaaluu ili of Honouliuli, E.O., bounded... W[aianae] by the loi Kuaihoe of konohiki.” (FT 9:143)
Kuaiopelu (*lo‘i*)	Claim no. 5653C [751] by Kalauli for “Ap. 3, a kahuahale & a loi in Puaaluu ili of Honouliuli, E.O., bounded... W[aianae] by the loi Kuaihoe of konohiki.” (AB 6:137)
Kuaipuaa (*lo‘i*)	Claim no. 5670B:2 by Kaohai is for “a loi called Kuamano in the moo Makawela & ili Kaihuopalaai, Honouliuli, Ewa, Oahu. It is bounded H[onolulu] by the loi Kuaipuaa.” (FT 9:137)
Kuaka (*lo‘i*)	LCA 901 to Kuahine: “He loi o Kuaka, ili o Niukee, Honouliuli, E.O.” (AB 2:301)
Kuamano (*lo‘i*)	Claim no. 5670B:2 by Kaohai is for “a loi called Kuamano in the moo Makawela & ili Kaihuopalaai, Honouliuli, Ewa, Oahu. It is bounded M[auka] by the loi Kuamanoiki.” (FT 9:137)
Kumuhahane (*mo‘o*)	LCA 827 to Kauakahilau: “He moo aina Kumuhahane, Poohilo, Honouliuli, E.O.” 1.597 acres. Also claim no. 9351 by Kauakahilau (AB 2:213; NR 4:444)
Kumuhau (*mo‘o*)	LCA 848 to Kapule: “Apana 1. He moo aina Kumuhau, ili Poohilo, Honouliuli, E.O.” 0.984 acre. (AB 7:260)
Kumuniu (*mo‘o*)	LCA 917 to Kaulu: “Ap. 1. He moo aina Kumuniu, ili o Kamilomilo, Honouliuli, Ewa, Oahu.” 0.713 acre. LCA 898 to Kaneaola: “Ap. 1. He moo Kumuniu, ili o Polapola, Honouliuli, E.O.” (AB 2:333, 2:297)

Place Name	LCA No. and Description
Kumupali (*lo'i, mo'o*)	Claim no. 8658 by Kapoli for "he loi a me kahi kula no, a me kahi kio, o Kumupali ka inoa o ua loi nei aia i Loloulu i Honouliuli" was not awarded. (NR 4:365) LCA 881 to Kikala: "He moo aina Kumupali, ili o Polapola, Honouliuli, E.O." 2.61 acres. (AB 2:281)
Kumuula (*mo'o*)	LCA 905 to Kaimuena: "Apana 2. He moo kalo, Kumuula, ili o Kaaumakua, Honouliuli, E.O." (AB 2:307)
Kumuulu (*kō'ele*)	Claim no. 1580 by Kanahuna is for "3 lois and a kahuahale in 2 pieces. The lois are named Kalawaha, Poina & Palakai in the ili Kamilomilo, Honouliuli, Ewa, Oahu. Apana 1 is bounded makai by the koele Kumuulu... Apana 2 [kahuahale] is bounded mauka by the koele Kumuulu." (FT 9:133)
Kunia (*'ili 'aina*)	Claim no. 764 by Maeaea (not awarded) for two parcels in Lihue, each "bounded Honolulu by vacant land called Kunia." (FT 2:285)
Kupaihi (*mo'o*)	LCA 1605B to Nakai: "Ap. 3. He loi ma Kupaihi, ili o Niukee, Honouliuli, Ewa. Oahu." 0.162 acre. (AB 6:141)
Lihue (*'ili 'aina*)	Claim no. 764 by Maeaea (not awarded) "is in Lihue, Honouli [sic], Ewa, in two pieces. [Part] 1 is bounded Honolulu by Kunia (land), *mauka* Kanehoa (land), *makai* by Opunahaa (land). Waianae by Pohakea (Pali). [Part] 2. Second lot: bounded *mauka* by Nakai [LCA 1605B], Honolulu by vacant land called Kunia, *makai* by Opunaha [sic] stream, Waianae by a ravine." See Kauilahanau for another description. Lihue is shown on the USGS 1928 Schofield and Wai'anae quads at about N21-27-00, W158-06-00, in Honouliuli. It is named in a survey of Ho'āeae as lying north and west of that land, south of Kunia Camp. Some sources extend the region northward to include Wahiawā and Wai'anae Uka (see catalog no. 176.02.027) (FT 2:285; BCT 1:133; USGS 1928 (Schofield, Waianae); Coulter 1935:179.)
Loloulu (*'ili 'aina*)	LCA 872 to Kahakuliilii: "He moo aina Paakai ili Loloulu, Honouliuli, E.O." 1.66 acres. Also LCA 860 & 1688 to Poopuu, 916 to Kama, LCA1598 to Kekua 2, LCA1670 to Moana, LCA 5670C:4 to Kumupopo. Claims no. 759 by Liliu, LCA 883 by Kumupopo, LCA 1566 by Kaheananui, LCA 1688 by Poopuu, LCA 8658 by Kapoli were not awarded. (IN 767; AB 2:271, 6:141; NR 2:415,502, 3:165,210, 4:376.)
Lopanui (*lo'i*)	LCA 5670B to Kaohai: "Elua mau loi Lopanui, ili Polapola, Honouliuli, Ewa, Oahu." 0.678 acre. Placed in the ili Kaihuopalaai in FT 9:137 (AB 6:137)
Mahuna (*lo'i*)	LCA 1605B to Nakai: "Ap. 2. He moo aina ma ka ili o Mahuna, Honouliuli, E.O." 0.885 acre. But in FT 9:131, Mahuna is a lo'i in the 'ili Niukee (IN 767; AB 6:141; FT 9:131; NT 9:277)
Makaii (*'ili 'aina*)	LCA 1670 to Moano: "Ap. 2. He kahuahale, ma Makaii, ili o Kaaumakua [Honouliuli, Ewa, Oahu]." 0.091 acre. LCA 916 to Kama: "He kahuahale ma Makaii, Honouliuli, E.O." 0.135 acre. Claim no. 914 by Kamaala in Niukee is bounded on the south by "ka muliwai o Makaii". (NR) (IN 767; AB 6:134, 7:259; NR 2:526.)
Makawela (*mo'o*)	LCA 5204 to Kalama 2: "He moo aina Makawela ili o Polapola, Honouliuli, Ewa, Oahu." 0.925 acre. (AB 7:539)
Makawelaiki (*mo'o*)	LCA 881 to Kikala: "Apana 2. Moo Makawelaiki, ili Polapola, Honouliuli, E.O." 1.114 acres. (AB 2:281)
Makue (*mo'o*)	Claim no. 5950 by Pihana "i Kamoku i Honouliuli Ewa mokupuni o Oahu.... Eia ka lua o ko'u kuleana aina i ka moo aina o Makue." (NR 5:187)
Manaole (*kū'ula*)	Claim no. 1570 by Kekua 1: "Ap. 2. A loi called Haalelenui in the moo Waianu, ili of Poohilo, bounded M[akai] by the lois & kula called Manaole (claim no. 911). (FT 9:139)

Place Name	LCA No. and Description
Maukapuaa (*‘ili ‘aina*)	Claim no. 763 by Keliiaa: “Eia ke kolu o ko‘u kuleana aina. Aia ma Mauakapuaa i Honouliuli.” Not awarded (NR 2:419)
Maui (*mo‘o, ‘ili ‘aina*)	LCA 756 to Kauouo: “Moo aina Maui, ili Kaaumakua, Honouliuli, E.O.” 1.922 acres. LCA 1580 to Kanahuna: “He pahale ma kula o Maui, ili o Kaaumakua, Honouliuli, Ewa, Oahu.” (AB 2:151, 6:135) LCA 763 to Keliiaa: “Apana 1. He kahuahale me kula mahiai, kula o Maui, Hono. E.O.” 3.66 acres. LCA 869 to Pue: “Apana 1. Moo aina Kumupali, ili o Maui, Honouliuli, E.O.” Also LCA 910:2 to Nunu, 5653 to Kua, 1699 to Leleiupa (IN 767; AB 2:163,269,313, 6:130, 7:26)
Mauiau (*mo‘o*)	Claim no. 1570B:1 by Pekane is for “3 moo ainas in one piece, called Mauiau, Mooiki & Kuaihee, being 10 lois & a kahuahale in the ili of Kaaumakua, Honouliuli, E.O.” (FT 9:140)
Mokumehua (*pu‘uone*)	LCA 1570B to Pekane: “Ap. 1. He puuone, Mokumeha, ili o Kaaumakua, Honouliuli, Ewa, Oahu.” 1.739 acres. (AB 6:140)
Mooiki (*lo‘i, mo‘o*)	Claim no. 5670C by Kumupopo: “Apana 2. A loi called Mooiki in the ili Loloulu, Honouliuli, Ewa, Oahu.” (FT 9:138) LCA 1570B to Pekane: “Ap. 2. Elua moo aina i Mooiki me Kuaihee, ili o Kaaumakua, Honouliuli, Ewa, Oahu.” 2.876 acres. LCA 5670C to Kumupopo: “Ap. 2. Elua loi Mooiki, ili o Puaaluu, Honouliuli, Ewa, Oahu.” 0.44 acre. (AB 6:140-141)
Mooloihi (*mo‘o*)	LCA 753 to Manuwa: “Apana 2. He moo aina Mooloihi, Kamoku [Ewa, Oahu].” 0.5 acre. “Apana 3. Ma Mooloihi.” 1.349 acres. (AB 2:145)
Namooelua (*mo‘o*)	LCA 1580B to Kapioho: “Ap. 1. He moo aina, Namooelua, ili o Polapola, Honouliuli, Ewa, Oahu.” 1.256 acres. “...in the ili Kahiwapalaai.” in FT 9:133 (AB 6:139)
Naopala (*mo‘o*)	LCA 760 to Kuhemu: “He moo aina Naopala, ili o Niukeee, Honouliuli, E.O.” 1.548 acres. (IN 767; AB 2:157)
Nihola (*mo‘o*)	LCA 767 to Hapauea: “Apana 1. He moo aina Nihola, ili o Niukee, Honouliuli, Ewa, Oahu.” 0.984 acre. (AB 9:382)
Niukee (*mo‘o*)	LCA 758 to Nihua: “He moo aina Niukee, ili Niukee, Honouliuli, E.O.” 1.449 acres. Often written “Nukee” in NR (AB 2:155) LCA 892 to Samuela Aoao: “Apana 1. He moo aina Kamuku ili o Niukee, Honouliuli, E.O.” 1.387 acres. Also 17 other LCA. Frequently written “Nukee” in NR. (IN 767; AB 2:291)
Paakai (*mo‘o*)	LCA 872 to Kahakuliiiii: “He moo aina Paakai ili Loloulu, Honouliuli, E.O.” 1.66 acres. (AB 2:271)
Paeokiha (*mo‘o*)	Claim no. 5654:1 by Kuhiana is for “a moo aina called Paeokiha in the ili of Maui, Honouliuli, Ewa, Oahu.” (FT 9:134)
Palaau (*lo‘i*)	LCA 848 to Kapule: “Apana 2. Ekolu mau loi Palaau, Poohilo.” 0.673 acre
Palahemo (*mo‘o*)	LCA 761 to Kinolua: “Apana 2. He kahuahale ma kula o Palahemo, Honouliuli.” 0.256 acre. Also LCA 765 to Kamalae. Perhaps named for the famous “water hole inland from South Point Ka‘ū, Hawai‘i.” (PEM 176) (IN 768; AB 2:159, 167)
Palakai (*lo‘i*)	Claim no. 1580 by Kanahuna is for “3 lois and a kahuahale in 2 pieces. The lois are named Kalawaha, Poina & Palakai in the ili Kamilomilo, Honouliuli, Ewa, Oahu.” (FT 9:133)
Panaenui (*‘auwai*)	Claim no. 5670B:2 by Kaohai is for “a loi called Kuamano in the moo Makawela & ili Kaihuopalaai, Honouliuli, Ewa, Oahu. It is bounded W[aianae] by the auwai Panaenui.” (FT 9:137)

Place Name	LCA No. and Description
Panahaha (*mo'o*)	LCA 748 to Kalauhala: "Apana 1. He moo aina Panahaha ili Kaaumakua, Honouliuli, E.O.... Apana 2. He kahua hale ma kula o Panahaha, ili o Kaaumakua." Total 1.294 acres. (AB 2:135)
Paneenui (*mo'o*)	LCA 898 to Kaneaola: "Ap. 2. He loko kalo, Paneenui, ili o Polapola, Honouliuli, E.O." (AB 2:297)
Pi (*mo'o*)	LCA 886 to Kahalewai: "[Apana 1.] He moo aina Pi, ili Kamoku, Honouliuli, E.O." 1.359 acres. "Apana 2. He loi i mokuaku i ke koele maloko o Pi." 0.137 acre. (AB 7:259)
Poaiwaikele (*'ili 'aina*)	LCA 1699 to Leleiupa: "Apana 1. He kahuahale ma ke kula o Poaiwaikele, Honouliuli." 0.193 acre. (IN 768; AB 7:261)
Poepoe (*lo'i*)	Claim no. 1570 by Kekua 1: "Apana 3, a kula mahiai called Kaluanonomuku in the moo aina of Aihonu, ili of Poohilo, Honouliuli, Ewa, Oahu. It is bounded... H[onolulu] by the loi called Poepoe of Manaole (q.v.)." (FT 9:139)
Poina (*mo'o*)	LCA 1580 to Kanahuna: "Ap. 2. Moo aina Poina, ili o Kamilomilo, Honouliuli, Ewa, Oahu." (AB 6:135)
Polapola (*'ili 'aina*)	LCA 1720 to Hilinae: "Apana 1. Moo aina iloko o ka ili o Polapola, Honouliuli, Ewa, Oahu. 0.781 eka. Apana 2. He pahale ma kula o Polapola. 0.146 eka." Also LCA 763:3 to Keliiaa: "He moo aina Hiwa, ili o Polapola, Honouliuli, E.O." 5.534 acres. Also LCA 751 to Kalauli, 874 to Laamaikahiki, 881 to Kikala, 898 to Kaneaola, 1580B to Kapioho, 5204 to Kalama 2, 5670B to Kaohai. Polapola is also known as Kaihuopalaai in Foreign Testimony. (IN 768; AB 9:383)
Poohilo (*'ili 'aina*)	LCA 1701 to Alauka: "Ap. 1. Ekolu loi, Hopeiki, ili o Poohilo, Honouliuli, Ewa, Oahu. Ap. 2. He loi iloko o Hopenui, Poohilo, Honouliuli, Ewa, Oahu." 0.802 acre and 0.087 acre. Also claims no. 763 by Keliiaa, 827 by Kauakahilau, 828 by Kawahaea, 831 by Kaekuna, 832 by Opiopio, 834 by Oni, 839 by Kaaiawaawa, 847 by Hinaa, 848 by Kapule, 911 by Kauahailepa, 1570 by Kekua 1, 1666 by Mauwele, 1666B by Kuahilo, 5653B by Kanehekili; claim no. 9351 by Kauakahilau was not awarded (see no. 827). Claims no. 844 by Kuailau, no. 883 by Kumupopo, no. 946 by Kauinui were not awarded. (IN 768–769; AB 6:136; NR 2:466,471,502,553, 4:444)
Poopoo (*mo'o*)	LCA 828 to Kawahaea: "He pahale ma ke kula o Poopoo, ili o Poohilo, Honouliuli, Ewa, Oahu." 0.255 acre. (AB 2:215)
Puaaluu (*'ili 'aina*)	LCA 5670C to Kumupopo: "Ap. 2. Elua loi Mooiki, ili o Puaaluu, Honouliuli, Ewa, Oahu." 0.44 acre. Also claim no. 5653C {751} by Kalauli: "Ap. 3, a kahuahale & a loi in Pualuu [sic] ili of Honouliuli, E.O." Claim no. 883 by Kumupopo was not awarded. (IN 769; AB 6:141; FT 9:143; NR 2:502)
Puehuehu (*mo'o*)	LCA 1670 to Moano: "Ap. 3. Moo aina Puehuehu, ili o Kaaumakua, Honolulu [sic; Honouliuli]." 0.824 acre. Claim no. 844 by Kuailau was not awarded. (AB 6:134; NR 2:471)
Pulehu (*lo'i*)	Claim no. 5670B:2 by Kaohai is for "a loi called Kuamano in the moo Makawela & ili Kaihuopalaai, Honouliuli, Ewa, Oahu. It is bounded M[akai] by the loi Pulehu." (FT 9:137)
Puowaikele (*lo'i*)	Claim no. 5653 by Kua: "1st a moo aina of 2 lois & a kula called Kahui in the ili of Maui, Honouliuli, Ewa, Oahu. It is bounded... Makai by the loi called Puowaikele of konohiki." (FT 9:142)
Waianu (*mo'o*)	Claim no. 5654:2 by Kuhiana is for "a loi called Kalokoloa in the moo aina Waianu, ili Poohilo, Honouliuli, Ewa, Oahu." (FT 9:134)
Waimanana (*'ili 'aina*)	Claim no. 902 by Haakue "ma Waimanana i Honouliuli, Ewa" was not awarded (NR 2:516)

Place Name	LCA No. and Description
Waioha (*mo'o*)	LCA 768 to Pio for Wahinenui: "Apana 4. He pahale ma kula o Waioha, ili o Kaaumakua, E.O." 0.387 acre. Also LCA 905 to Kaimuena, 1570C to Naholowaa. (AB 2:171, 307, 6:138) LCA 917 to Kaulu: "Ap. 3. He puuone ma Waioha, ili o Kamilomilo, Honouliuli, E.O." 0.693 acre. (AB 2:333)
Waioipu (*kōʻula*)	Claim no. 5584 by Kauhi (not awarded) "is situated in the place called Kohepalaoa, Puuloa, Ewa, Oahu... and is bounded... H[onolulu] by the kula Waioipu." (FT 9:144)

3.3.4 Military

There was a major shift in land use in Honouliuli from agricultural to military in the late nineteenth century as interest grew from the U.S. in Hawaiʻi as a geographically strategic base. Although the main interest lay in utilization of the lochs of Pearl Harbor, the adjacent plains of ʻEwa at Barbers Point were also a focal point for U.S. military development in Hawaiʻi. An in-depth account of the military history at Barbers Point can be found in Appendix B of the Cultural Resource Survey done by Tuggle and Tomonari-Tuggle in 1997 (Denfeld 1995). The interested reader should seek the full account there. The following is a summary of the details relevant to the project from that account, in addition to various other military archival resources. The reader is referred to the archaeological inventory survey (AIS) report for the Barbers Point Solar project (Robins et al. 2021) for additional information about identified military properties within the project area.

The military presence in the area started with a reciprocity treaty in 1887 which granted the US exclusive rights to Ke-Awa-Lau-o-Puʻuloa, better known today as Pearl Harbor. Strategically, having use of the lochs of Puʻuloa was a great advantage to the US military operations because of Hawaiʻi's central location within the Pacific.

In 1921, the Barbers Point Military Reservation was established. In July 1931, a battery of two 16-inch guns named Battery Hatch was started:

> Battery Hatch was comprised of two gun emplacements with 360 degree fields of fire. There was also a railroad connecting the dispersed emplacements, barracks, and pillboxes for machine guns to provide local defense. (Denfeld 1995:175)

Battery Hatch was named after Brigadier General Henry J. Hatch, who served in Hawaiʻi as a captain. The battery stood at the Fort Barrette military reservation (Denfeld 1995:175).

The Ewa Mooring Mast Field, which later became known as the Marine Corps Air Station Ewa (MCAS Ewa), was established at the project area:

> In 1932, the Navy leased 206 acres of the Campbell ranch to build a steel tower mooring mast for dirigibles [...] An oil-surfaced, 150 by 1500 foot emergency landing field was also constructed [n.a. 1947]. A few blimps were anchored here, but no dirigibles were ever brought to the field [...] Active military use of the mooring mast area was reinstituted in 1940 when the Navy increased its leased area to 3,500 acres. A Marine Corps airfield, known as Ewa Mooring Mast Field [...] was built on the original leased area and completed in June 1941 [n.a. 1947:144]. The larger area of over 3,000 acres was used for development of Naval Air Station, Barbers Point, with construction beginning in November 1941. (Tuggle and Tomonari-Tuggle 1997:27)

On December 7, 1941, the day of the attack on Pearl Harbor, the outline of the future Barbers Point runway was visible, the naval air station had been laid out, and clearing had begun (Denfeld 1995:177).

> The original design for Barbers Point was permanent concrete construction. Much of the cement and reinforcing steel bars had been received and was in warehouses at the time of the attack on Pearl Harbor. It was going to be a small base to support the NAS Pearl Harbor on Ford Island. The consortium of Pacific Naval Air Base (PNAB) was to build facilities for two aircraft carrier groups and station personnel. This would include two runways, two hangars, shops, warehouses, and barracks for 2,000 enlisted, 250 officers, and 800 civilian workers (US Navy Bureau of Yards and Docks, 1947:141–142). (Denfeld 1995:178)

However, the function of the station shifted from an auxiliary airfield to a full naval air station because of the onset of WWII and construction plans were modified accordingly (n.a. 1947). The new plans increased the capacity of the station to four carrier groups (Tuggle and Tomonari-Tuggle 1997:35,38).

Construction proceeded at a blistering speed, and the Naval Air Station (NAS) Barbers Point was commissioned by Commander H.F. MacComsey on April 15, 1942. In 1943, the runways were completed (Denfeld 1995:177).

Ewa Mooring Mast Field

The Ewa Mooring Mast Field was meant to be incorporated into the Barbers Point base, but instead was retained as a Marine Corps airfield. The new airfield became known as Marine Corps Air Station (MCAS) Ewa and functioned as a staging field for Marine Corps air units and planes during WWII. MCAS Ewa serviced many planes.

> Construction was completed by [the consortium of the Pacific Naval Air Base (PNAB)] with minor work and finish activities by the 16th Seabees who arrived April 1943. The Seabees took over the former contractors' camp, located between the Ewa and the Barbers Point landing fields. The 16th Seabees were replaced by the Construction Battalion Maintenance Unit (CBMU) 522 on March 1, 1944. In November 1944 a detachment of the 14th Seabees arrived to do some final work. (Denfeld 1995:179)

The Ewa Mooring Mast Field was added to the National Register of Historic Places in 2016 for eligibility under Criterion A, for its association with the attack on Pearl Harbor on December 7, 1941. The NRHP nomination form lists these structures which "convey direct and important contributing resources that were present on December 7, 1941":

- The 1941 asphalt runways
- A concrete warming-up platform with visible attack damage
- The concrete foundation of former Hangar 123
- An asphalt mooring apron
- The remains of a swimming pool marking the location of a key defensive position

There are remnants of other features as well, which are not considered part of the NRHP site, but may contain information. "Portions of the 1941 installation, such as the former camp area, that were part of the battlefield core area but no longer retain significant features associated with the battle, have been determined to lack sufficient integrity and are not included within the eligible site" (NRHP Registration Form 2014:5).

Many military features were constructed after the December 7, 1941 attack, in association with US involvement in World War II. Ewa Mooring Mast Field was renamed Marine Corps Air

Station Ewa (MCAS Ewa) in 1942 and the installation boundary was increased to encompass 900 acres. Over 600 new buildings and structures were constructed on the expanded installation, including barracks, storehouses, shops, operations buildings, and recreation facilities. Less than 100 of the 600 buildings constructed remain, many of which are concrete aircraft revetments located south of the battlefield site (NRHP Registration Form 2014:7,10).

The Ewa Mooring Mast Field has been inactive since the 1950s. The area has been substantially disturbed by post-war demolition and overgrowth of dense vegetation. However, the 206-acre installation still retains characteristics that convey its significant association with the 1941 Japanese attack. The NRHP nomination form described the current condition of the Ewa Mooring Mast Field:

> All of the approximately 100 buildings, tents, and other structures that stood within Ewa Mooring Mast Field during the attack are missing today, which alters the appearance of the installation, especially in the former camp area and other locations to the north of the eligible site boundary, the former camp area now holds several Cold War-era buildings and structures, as well as scattered concrete elements such as fragments of curbing, pads and foundations. Areas immediately outside of the proposed eligible site boundary also contain additional World War II-era aviation features such as a concrete compass rose and the remains of the expanded asphalt runway system. Other subsequent developments which have altered the character of surrounding areas include a golf course and wastewater treatment plant, both constructed to the east of the proposed eligible site, and a solar field, located directly south of the site. North of the former installation boundary, some areas of the former Varona plantation village and Oahu Railway & Land Company (OR&L) rail line remain. (NRHP Registration Form 2014:7)

Ewa Plain Battlefield Historic District

On Sunday, December 7, 1941 at 7:55 AM the United States Pacific Fleet base at Pearl Harbor Naval Base was attacked by the Imperial Japanese Navy. More than 2,400 Americans died in the attack and another 1,000 people were wounded. Nearly half of the planes stationed at the neighboring Barbers Point Station were destroyed.

Two minutes prior to the attack on Pearl Harbor, an attack was made on the ʻEwa Plains. Located approximately 5.5 miles southwest of Ford Island, the ʻEwa Marine Corps Air Station was established in January 1941 on land that was previously owned by the Campbell Estate (Sigall 2020). As a result of the attack, 24 planes were destroyed, 13 individuals were wounded, and four had been killed. In the weeks to follow, the Imperial Japanese Navy submarines awaited offshore, and continued to threaten the area until December 31, 1941. Throughout World War II the ʻEwa Marine Corps Air Station was known as the "Crossroads of the Pacific." In 1952, the ʻEwa Marine Corps Air Station became a part of the Barbers Point Naval Station. In the months and years to follow, Barbers Point Naval Air Station became an important site for military operations and support. Operations continued at Barbers Point until 1998 when it was decomissioned by the US Navy and taken over by the State of Hawaiʻi to use as the Kalaeloa Airport. The site of the attack was officially registered as the ʻEwa Plain Battlefield on the National Register of Historic Places on May 23, 2016 (National Park Service 2016).

Revetments

A Historic American Buildings Survey (HABS) was completed for the aircraft revetments at Naval Air Station Barbers Point, Marine Corps Air Station Ewa.

> The 75 revetments are located on Naval Air Station Barbers Point, in an area to the south of the former Marine Corps Air Station Ewa air field in an area bounded by Bismark Sea Road to the north, Brown Road to the east, and Tomes Road on the west. They extend below Hamilton Road at the south. Except for the pavements leading to and interconnecting the revetments, they are typically surrounded by dense growths of trees and brush...

> [T]hese revetments were erected in 1942 to provide protection “for carrier based planes,” according to the drawings dated April 25, 1942…
>
> The revetments are built with a parabolic-shaped cast-in-place concrete beam over the one opening to each revetment. Each beam is 6 feet high and 12 inches thick. Although the title of the drawings says they are “44’ Clear Span” they actually span about 53 feet. The 44-foot clear span measurement is based on the span between points at which there is a 7-foot vertical clearance. The maximum clear height of the front arch is 16’9”. The beam is further reinforced with five concrete fins, each six inches thick, which act as buttresses for the beam and as a further interconnection between the beam and the revetment shell…
>
> The perimeter footings of the shell are relatively small: only 2’-0” wide by 1’-6” deep. They are set on a solid coral bed and the footings were connected to that coral rock base by 5/8” steel dowels grouted into three-foot deep holes in the coral at four feet on center.
>
> After completion, the revetments were covered with about ten feet of sand. Many of the revetments are still completely covered by the sand, with grass and trees growing from the mounds. The top surface[s] of some revetments are partially exposed due to erosion. The floors of the revetments are covered with asphalt paving.
>
> …All the revetments at MCAS Ewa were completed by February 1943…
>
> Today, approximately 14 of the revetments are used as stables for horses. Paddock areas in front of those revetments have been fenced with white-painted wood fences. A couple of other revetments are used sporadically for parking vehicles. One revetment is being used for a lizard research project. The remaining structures are abandoned. (Mason 1995, HABS No. HI-279-A)

Seabee Camp

Historical logs of the 5th Naval Construction Battalion (a.k.a. CBs or Seabees) show that the Seabees arrived at Pearl Harbor on 21 June 1942. Although only Pearl Harbor is named, it is likely that the battalion was deployed to other installations on the island of Oʻahu, including at Honouliuli. According to a roster dated 15 September 1942, there were 8 officers and 61 men, a total of 69, located at Pearl Harbor. The number increased by 18 January 1943 to 8 officers and 130 men—138 total. In April 1943, all detachments sent out to other locations in the Pacific were reassembled at Pearl Harbor, swelling the number of Seabees to a recorded 910 total in July 1943. The 5th battalion was recorded to have left Pearl Harbor to travel back to the U.S. in March 1944 (Naval History & Heritage Command n.d.-a).

> Detail KOALA deployed from Gulfport in September, 1971, to Oahu, Hawaii, where the Detail was headquartered at the Naval Air Station, Barbers Point […] At Barbers Point, a sewage collection system was completed for cottages on Officers Beach […] Throughout the deployment, the Detail spent much time and effort upgrading the quarters to which they were assigned. This workload involved painting the exterior of the quarters, replacing the roofing, panelling the TV and recreation rooms, and finishing the transformation of the cubicles into rooms. (Naval History and Heritage Command n.d.-b:109)

3.4 SUMMARY OF ARCHIVAL RESEARCH

The numerous named places, myths, and proverbs associated with Honouliuli intimate that in the traditional era, the region was populated and traversed. This is further shown by the many *kuleana* claims that were submitted during the Māhele by the residents who were living on and cultivating the land. In the post-Contact period, as Western influence in the islands grew, the area was also under agricultural use from the late nineteenth to early twentieth centuries when it transitioned to use for sugarcane and ranching.

In the 1930s, in the Barbers Point Solar project area, Ewa Mooring Mast Field was developed, which would eventually be expanded into the Naval Air Station Barbers Point. This was a result of the air station being targeted in the 1941 Japanese attack which led to the U.S.'s engagement in World War II. Plans morphed into an air station with greater capacity because of the involvement in the war. The U.S. Coast Guard remained in Honouliuli, but the U.S. Navy closed the air field in 1999, and it became Kalaeloa Airport, as it remains today.

Many remnants of traditional use in the Barbers Point Solar project area that may have existed are most likely disturbed, if not destroyed. Because of the history of agriculture followed by military development, extensive ground disturbance has occurred in the Barbers Point Solar Project area. However, structures from the military era, such as revetments, and remnants from the 1941 attack still exist and are recognized in the National Register of Historic Places.

4.0 CONSULTATION METHODS AND RESULTS

4.1 SCOPING AND COMMUNITY OUTREACH

In order to identify individuals with knowledge of traditional cultural practices carried out within and adjacent to the area of the proposed project as it relates to this study, government agencies, advisory councils, local community organizations, and individuals with generational ties to the proposed project area was initiated. Letters and project area maps were mailed or emailed to individuals containing the following text:

> Pacific Legacy is conducting a cultural impact assessment (CIA) for the proposed Barber's Point Solar Project, which is planned for an area of approximately 100 acres that will be leased from the Department of Hawaiian Home Lands (DHHL). The project area is located in the *ahupuaʻa* of Honouliuli, ʻEwa Moku, Oʻahu [TMK (1) 9-1-013:016 (por.), 038 (por.), 039 (por.) 040, 043 (por.), 096 (por.)] (Attachment 1, Figures 1 and 2).
>
> The proposed project is a 15 MW_{AC} solar photovoltaic system coupled with a 15 MW, 4-hour (60MWh) DC-coupled battery energy storage system (DC-ESS). The Project infrastructure would include solar fields with solar photovoltaic panels that would be arranged in rows, a network of electrical collector lines, battery energy storage and inverter units, step-up transformers, collector substation and transformer, overhead generation tie-line, and access roads. The project is proposed to be located on land owned by DHHL in the former Naval Air Station (NAS) Barber's Point. The solar array and associated infrastructure would utilize approximately 100 acres. A 46-kilovolt (kV) generator-tie line would extend approximately 0.25-miles northeast from the solar array to connect into the existing Hawaiian Electric grid. Once in operation, the proposed project would power approximately 6,200 Oʻahu households with clean, renewable energy. Based on the proposed Power Purchase Agreement (PPA) with Hawaiian Electric, the Project is expected to have an operational period of approximately 25 years. At that point in time, the Project may be re-powered under a re-negotiated PPA or other contract (with subsequent permits/approvals) or decommissioned. Decommissioning will involve removal of all equipment associated with the Project and returning the Project Study Area to substantially the same condition as existed prior to Project development. Decommissioning would include consideration of local environmental factors to minimize effects such as erosion during the removal process, and the recycling of materials demolished or removed from the site to the extent feasible.
>
> The purpose of the CIA is to evaluate potential impacts to traditional cultural practices as a result of the proposed project, in accordance with the guidelines for assessing cultural impacts, which were adopted by the State of Hawaiʻi Environmental Council on Nov. 19, 1997. For the CIA, the *ahupuaʻa* of Honouliuli is considered the overall study area, while the project area is defined as the 100-acre area shown in Figure 2. We are reaching out to you for this assessment because you have been identified as a source of knowledge of Honouliuli.
>
> We are seeking your *kōkua* regarding the following components of our study:
>
> - Cultural associations of Honouliuli Ahupuaʻa such as *moʻolelo* or connections to legendary accounts.
> - Knowledge of past and present land use within and near the project area.
> - Knowledge of past and present traditional gathering practices in Honouliuli.
> - Knowledge of cultural resources which may be impacted by the proposed project, including traditional plant and animal gathering sites, traditional access trails, archaeological sites, historic sites, and burials.
> - Any other cultural concerns that community members may have in relation to traditional Hawaiian or other cultural practices within or near the proposed project area.

- Referrals to other knowledgeable individuals who may be willing to share their cultural knowledge of the proposed project area and wider Honouliuli Ahupuaʻa.

Table 3. Outreach Summary

Name	Affiliation	Contacted (Y/N)	Comments
Mr. Mana Caceres	Oʻahu Island Burial Council	Y	Agreed to participate
Ms. Kimberly Kalama	Hoakalei Cultural Foundation	Y	No response; emailed 07/20/20
Ms. Momiala Kamahele	University of Hawaii, Leeward Community College	Y	Declined to participate
Mr. Shad Kane	Kalaeloa Heritage and Legacy Foundation	Y	Agreed to participate
Ms. Celene Kuahiwinui	State of Hawaii, Kapolei High School	N	Could not obtain contact info; no longer employed at Kapolei HS
Mr. Kai Markell	Office of Hawaiian Affairs, Native Hawaiian Preservation Council	Y	No response; mailed letter 07/20/20
Mr. Kepā Maly	Hoakalei Cultural Foundation	Y	Declined to participate
Ms. Manulani Meyer	Leeward Community College	Y	Declined to participate
Ms. Kandiss Nahulu-Mahelona	State of Hawaii, Kapolei High School	N	Could not obtain contact info; no longer employed at Kapolei HS
Ms. Keala Norman	ʻOhana Keaweamahi	Y	Agreed to participate
Mr. McD Philpotts	Community Member	Y	No response; emailed 07/30/20
Mr. Kawika Shook	Kalaeloa Heritage and Legacy Foundation	Y	No response; emailed 08/13/20
Ms. Kaʻāhiki Solis	State Historic Preservation Division	Y	No response; emailed 07/30/20
-	Ewa Pu'uloa Hawaiian Civic Club	Y	No response; emailed 07/29/20
-	Siwila Hawai'i o Kapolei	Y	No response; emailed 07/30/20

4.2 COMMUNITY OUTREACH INTERVIEWS AND RESULTS

Scoping letters were sent to individuals who are affiliated with a range of organizations. Contacted individuals included representatives of Native Hawaiian Organizations (NHOs) including the Office of Hawaiian Affairs (OHA), as well as local NHOs based in the *moku* of ʻEwa and the city of Kapolei. In addition, Pacific Legacy delivered an informational presentation to the Oʻahu Island Burial Council as part of the outreach for both the AIS and CIA for this project.

Three people responded and were interviewed as part of the CIA, either in person, via Zoom videoconferencing, or through email correspondence. Collectively, those interviewed shared important *moʻolelo* (oral traditions) specific to the region and emphasized significant archaeological features, including the presence of trails, the use of limestone sinks/pit caves for the interment of *iwi kupuna*, gathering of *limu* and other coastal resources, and traditional agricultural practices that were carried out in the area. They also emphasized the dramatic changes to the landscape during the recent past. The generation tie-line corridor of the project area was changed following the initial outreach for the Project. The three CIA participants were sent a Project Update Notice, and the change in project area was also discussed during a site visit with CIA participants in June 2021.

4.2.1 Mr. Shad Kane

Born to Hattie and Tazoni Kane in Honolulu on February 23, 1945, Shad Spearman Kane grew up in Wahiawa and later moved to Kalihi where he resided for most of his teenage years. After attending Kamehameha Schools, he graduated from the University of Hawaiʻi then went on to Central Michigan University, where he earned a master's degree in public administration. Following his university studies, he joined the Honolulu Police Department, and is now a retired Lieutenant. Mr. Kane has served as president of Ahahui Siwila Hawaii O Kapolei Hawaiian Civic Club and Chair of the Makakilo-Kapolei Neighborhood Board as well as a member of the State Environmental Council, the Hawaii Energy Policy Forum, the Kapolei Outdoor Circle, the Friends of Honouliuli, Ka Papa O Kakuhihewa and the Kapolei Lions Club. He also previously served as the representative for the ʻEwa District on the Oʻahu Island Burial Council.

Uncle Shad is acclaimed as the resident historian for the *ahupuaʻa* of Honouliuli and has done a great deal of archival research on the subject in addition to being a recipient of oral histories from local *kūpuna* on the cultural history of the ʻEwa District, including Arline Eaton and Thelma Parrish. In researching the history of the ʻEwa Moku and the *ahupuaʻa* of Honouliuli, he also worked closely with Rubellite Kawena Johnson, a historian at the University of Hawaiʻi at Mānoa. Her research draws from the scholarly works of John Papa ʻĪʻī, Samuel Kamakau, and Joseph Emerson. As with other localities of Honouliuli Ahupuaʻa, Mr. Kane has an impressive knowledge of traditional chronicles and myths associated with the project area. He identifies the general area as the backdrop of several ancient legends.

In recalling his earliest memories of the area, Uncle Shad describes Honouliuli as a place of agriculture (namely sugarcane production), *kiawe*, and military bases. He didn't come to realize the cultural significance of the area until he joined the Ahahui Siwila Hawaii O Kapolei Hawaiian Civic Club and consulted with Campbell regarding the master planning of Kapolei. It was then that he began studying the history of the ʻEwa Plain, where Hawaiians settled and subsisted on shellfish, lobster, crab, shoreline fishing, and *limu* gathering along the coast and planted sweet potatoes and taro in limestone mounds and sinkholes, which were also used as final resting places for *iwi kūpuna*.

During the 1990s, Uncle Shad also consulted with archaeologists Dave Tuggle and Myra Tomonari-Tuggle regarding the features they documented in the immediate vicinity of the project area. He noted the presence of interesting structures in the former southern trap and skeet range along Tripoli Road [immediately east of the Barbers Point Solar project area]. Of particular significance is a *kahua*, or Makahiki grounds, that is filled with sand [within the project area, in Parcel 40], as well as many features in the area that utilize the Tahitian style of construction using upright slabs as foundation stones. The settlement pattern was dispersed, with individual families occupying spaces near water sources. As the steward for the Kalaeloa Heritage Park, which is immediately west of Parcel 40 on the western side of Coral Sea Road, Uncle Shad has restored and cared for many archaeological features, as well as ‘*akoko* plants that are only present within this area. [There are no *‘akoko* on parcels 038 and 040; *‘akoko* was only noted in parcel 039 (Tetra Tech 2021).] He noted the presence of a trail within the Kalaeloa Heritage Park parcel that connects with the *kahua* and Ordy Pond [east of Parcel 40]. With regards to the recent history of the area, Uncle Shad noted the leasing of a portion of the area to Paradise Lua and the construction of a racetrack.

When asked what he thought about the project proposal, Uncle Shad noted that he is a big supporter of renewable energy and getting away from fossil fuels. He expressed interest in seeing the project design and participating in a site visit.

4.2.2 Ms. Keala Norman

Keala Norman grew up in ‘Ewa Beach. She shared the following information via email:

> I will say that Pu‘u o Kapolei was once the home of Kamapua‘a’s grandmother. I believe there is literature available online about that. Also, when I was a young girl, I was told that Pu‘u o Kapolei was a bird sanctuary, I’m not real sure about that though.
>
> One‘ula a.k.a. Hau Bush a.k.a. “Shark Country” is a story of Ka‘ahupahau the shark god and her grandmother that you will be able to find online. As a young girl, I loved to sing the song Pupu A O Ewa, not realizing that the song speaks of Ka‘ahupahau because I did not and still don’t speak fluent Hawaiian. You can find the lyrics with a little story below the lyrics on Huapala.org, although there may be small kine inaccuracies in the story like they say that Pu‘uloa means Pearl Harbor which is wrong. You may be able to find more accurate information elsewhere.
>
> I have canoe paddled and surfed at Pu‘uloa beach aka Ewa Beach park. Growing up there we always called it Pu‘uloa beach park. I don’t know when it has changed to Ewa Beach park anyway, I have never seen a shark. I have seen turtles, dolphins, sting ray and flying fish but, never a shark. When I was a teenager, I used to drop my brother and his friends off at One‘ula beach park so that they could go surfing and my brother used to say that they would be bumped by reef sharks but, they were never bit by a shark. Growing up and until this day, I have never heard of anyone dying on O‘ahu from a shark bite. I tend to believe that it's because of the protection of Ka‘ahupahau.
>
> Ka‘ahupahau and her brother Kahi‘ukā who is also a shark god, resided in the waters of Pu‘uloa a.k.a. West Loch and East Loch.
>
> When we paddled our canoes in the wintertime, there would be mounds of limu about 2 feet high all along the coast. We had to paddle our canoe out about 30 ft from the shore to clear all the limu that once drifted into shore. The limu was so abundant that we could smell the limu when we were at school. We no longer see limu like that in the winter.

I do remember several years ago, One‘ula beach, Haseko project, Iwi Kupuna were impacted. I could be wrong because it's been a while but, I believe this Kupuna was female with a niho palaoa.

I also recall hearing that there were families that had land in Ewa Beach and once raised cattle there.

As a child, the night drive from the freeway on the way to our home in Ewa Beach seemed to be a long drive because we had to go pass miles of sugar cane and a cemetery (the one next to Zippys) with no street lights. In the 70s there was only 1 lane into Ewa Beach and 1 lane out. Even with just the 2 lanes there wasn’t a lot of traffic. Ewa Beach was surrounded by sugar cane all the way to Kapolei except for Barbers Point.

Every now and then when I pass the junction where Kahi Mohala is and the Pu‘u o Kapolei, I still look for pueo hoping that they are still around. These were the areas I used to see them the most. I believe that Mike Lee wrote something about the pueo and was trying to protect them in the Ewa plains.

Gosh, recalling all these things makes me miss those days. Mahalo for letting me share the memories of my childhood.

There used to be Hawaii Raceway Park at Campbell Industrial Park. It was located on the Ewa mauka corner of Kalaeloa Blvd and Malakole. My childhood, best friend’s father used to race cars there. She used to live on the corner of Hanakahi Street and North Road a couple of blocks away from where I used to live, we lived in an area call Ewa Estate, anyway one night, I went to visit my friend and while we were sitting on her brick wall talking we could hear engines rumbling and then cars racing. I didn’t know what that noise was so, I asked my friend and she said that it was the raceway park. Isn’t that something? We could actually hear the cars circling the raceway from that distance. I would suppose it’s because there weren’t a lot of buildings back then that allowed the noise from the raceway park to carry miles away.

We used to swim in a freshwater stream it might have been a large punawai that was located on a dead-end street off the mauka side of Hanaloa St. I don’t know the name of this stream but, it looked like an oasis to me because it had date trees that lined the stream. I remember the water being really cold. After we swam, we would pick the dates and eat them on the way home which was only a 10 or 15 minute walk. I don’t know if that stream is still there. It might have been filled in when the Hawaii Prince Golf course was put in.

In the area we called Hono‘uli‘uli, the beginning of Old Fort Weaver Rd, there were pig farms and farther down the road, coming into Ewa Beach there was Kahua farm that had cows. When you traveled further down Fort Weaver Rd, to the right where the Child and Family Services are now, there used to be Saint Barnabas Church with a water flume before it that crossed over Fort Weaver Rd and then there was the cemetery. When you come to the Renton Rd traffic light (there wasn’t a traffic light back then though), to the left there was a chicken farm where we would buy our eggs. All those things except for the cemetery are no longer there. Back then Ewa Beach was considered country…lol…I hardly consider it country today.

4.2.3 Mr. Mana Caceres

Norman Kaleilani "Mana" Caceres was born in Orange County, California on October 7, 1976. He and his family moved to Kapolei in 2004 and he currently serves as the ʻEwa representative on the Oʻahu Island Burial Council (OIBC). He and his wife have genealogical ties to the ʻEwa region and specifically to Kapolei. He and his wife are recognized cultural descendants who care for *iwi kūpuna* in the area.

Mana's familiarity with the region began when he was a child visiting his grandparents. His earliest memory of the area was when he was around 6 or 7 years old and was able to visit the Naval Air Station Barbers Point with his grandfather, who retired from the Army and had base access. They went to a beach, and Mana remembers the area having open space and less *kiawe* back then. He remembered seeing bunkers and broken-down buildings in the area, as well as many coral mounds, which we now recognize as cultural features.

When asked about the types of features in the area, Mana noted that he was familiar with temporary housing structures, many of which were related to fishing. He also spoke about how there may have been permanent structures near where water sources were situated in the past. He wonders about the gulches coming down from Makakilo into Kapolei and is interested to know how recently water flowed down these areas, as he is curious to see what events led to the lack of water in these areas. Mike Lee observed that there was a karst system, and Mana would like to follow up on that. With regard to more historic uses of the area, these unfortunately led to a lot of pushing over of the cultural sites, now considered push piles. Mana noted that he was very impressed with the preserves in the Haseko area, as he observed that the structures there are very pristine when he was involved in the reinterment in the preserve area. He noted that it would be interesting to see if we have similar features intact within the current project area.

With regards to traditional cultural practices being carried out in the area, Mana noted that he was not aware of any, aside from Shad Kane's group caring for the *ʻāina* [at the Kalaeloa Heritage Center]. Mana learned a lot from Shad Kane, having participated in OIBC meetings when Shad was the representative for the ʻEwa Moku. Another person he has learned from is Kawika McKeague, who used to be the chair of the OIBC. Mana considers both Shad and Kawika to be resources for cultural information on Honouliuli. Most of Mana's familiarity with the *ahupuaʻa* is centered on the care of *iwi kūpuna* and his involvement in the community is centered around this role. He noted that Honouliuli has burial locations in either a karst/underground cave or on the ground surface covered with coral cobbles. In the past, some burial features were mistaken as agricultural mounds, but human remains were found within after further investigation.

Mana noted that he has had positive experiences with the solar developments in the area. In his experience, cultural sites were always preserved as-is, and solar panels were placed to avoid features and create pockets of preservation areas. He noted that you can't go wrong with the sun. He had a question of whether it is safe for the people and would contribute towards the preservation of culture. Mana has no reason to believe that our own *kūpuna* wouldn't have done it. His specific request was that "the project do everything in its power to preserve what is found on-site, work around it, if that is the case, we will give full support of the project from start to finish. Whenever possible, we realize that it is not always possible to preserve everything."

4.2.4 Site Visit with CIA Participants

On June 17, 2021, a site visit was organized. All three CIA participants came together to visit significant archaeological sites in portions of the project area. The site visit was facilitated by Mara Mulrooney, Krickette Pacubas, and Myriam Bernede-Martin (Barbers Point Solar LLC). The group visited the *kahua* and neighboring habitation and agricultural features that are recommended for preservation (portions of SIHP 50-80-12-05106) in Parcel 40. During the site visit, the group discussed how to best care for these sites, including possibly clearing the *kahua* and reactivating the space for Makahiki activities. The trail that Uncle Shad had mentioned was not relocated; he noted that the thick vegetation was likely obscuring it. The group also visited a *kauhale* (traditional Hawaiian habitation complex; SIHP 50-80-12-05100) located in Parcel 38 and also recommended for preservation. Discussion centered on a vaulted platform that had been excavated previously and was interpreted as a cooking house. During the site visit, Mana and Uncle Shad noted that the interpretation of this feature as an above-ground oven made sense, as the digging of a traditional subsurface *imu (*underground oven) would not be possible due to the limestone karst substrate. The CIA participants remarked at how well-preserved many of the sites are in the Barbers Point area.

5.0 SUMMARY AND RECOMMENDATIONS

The State of Hawai‘i is under a constitutional and statutory obligation to protect Native Hawaiian customary and traditional gathering rights. Guidelines provided by the Office of Environmental Quality Control (OEQC) outline acceptable methods to identify the types of cultural practices and beliefs that are subject to a Cultural Impact Assessment (CIA). In addition, a series of Hawai‘i Supreme Court cases reaffirmed the customary and traditional gathering rights of *ahupua‘a* tenants, including *Kalipi*, *Pele Defense Fund v. Paty*, *Public Access Shoreline Haw. Cnty. Planning Comm’n* (commonly known as PASH), and *Ka Pa‘akai O Ka ‘Āina v. Land Use Com’n, State of Hawai‘i.*

To carry out the CIA for the Barbers Point Solar Project, archival research was conducted, followed by community consultations to identify cultural practices, cultural resources, and beliefs associated with the area. Cultural practices are typically customs relating to subsistence, commerce, residency, agriculture, recreation, religion, spirituality, and collection of cultural resources, which may be carried out by Hawaiian practitioners or practitioners from other ethnic groups. Cultural resources, such as natural feature and archaeological sites associated with these types of customs are also subject to this CIA.

The following sections provide an analysis of potential effects to known traditional and cultural practices within and adjacent to the Barbers Point Solar Project area. Recommendations for managing potential impacts to cultural practices and preserving the integrity of cultural resources in the area are presented below.

5.1 ANALYSIS OF POTENTIAL PROJECT-RELATED EFFECTS TO TRADITIONAL AND CUSTOMARY PRACTICES

5.1.1 Traditional Cultural Resources and Customary Practices Specific to the Proposed Project Area

The archaeological record within the project area provides insights into pre-Contact and post-Contact use of this area for dryland agricultural, habitation, and ceremonial activities. Many of the sites that have been identified in this area are reflective of the traditional land use practices described in Section 3.1.5, Ka ‘Oihana Mahi ‘Ai no Honouliuli—Traditional Agriculture of Honouliuli. The identification of a *kahua* (Makahiki grounds) within the project area and the wider region of the ‘Ewa Plain in the Ahupua‘a of Honouliuli provides a rare window into the annual Makahiki ceremony in traditional Hawaiian culture as a highly significant ceremonial space. Flora and fauna that were identified in the project area through the biological survey (Tetra Tech 2021) may have been used for *lā‘au lapa‘au* in the past, but as of this writing, there are no known individuals who are currently engaged in traditional or customary gathering practices in the area.

5.1.2 Traditional Cultural Resources and Customary Practices Identified within Honouliuli Ahupua‘a and Adjacent to the Proposed Project

The ‘Ewa Plain and Honouliuli Ahupua‘a hold much significance for Native Hawaiians, as demonstrated by ethnographic data as well as the archaeological record. Numerous *mo‘olelo* attest to the traditional and historic significance of the region, and cultural uses of the wider area continue to the present day. There are active initiatives to restore and reactivate many of the *wahi kūpuna* (ancestral sites), including those located within the Kalaeloa Heritage Park, directly west of the Barbers Point Solar Project area. Although access to the wider area within which the project is situated was limited due to the presence of NASBP during much of the 20th century, cultural traditions centered on the preservation and protection of archaeological sites and burial places in the area adjacent to the project area and throughout the *ahupuaʻa* reflect a continued connection to the land by cultural descendants in the area.

5.2 SUMMARY OF FINDINGS

Archival research has revealed that, in general, the ʻEwa Plain in which the proposed solar development is to be built has a long and interesting history. From the archaeological record, *moʻolelo*, and historic documents attributed to the vast area, it is evident that these lands have been the stage of many significant events in Oʻahu's pre- and post-Contact history.

Archaeological research conducted within the project area has identified historic properties that were constructed during the pre-Contact period as well as more recent times. It is possible that a major feature of pre-Contact and early Contact Honouliuli, the Kualakaʻi Trail, cut across or passed near to the project area according to the Malden (1825) map featuring the south coast of Oʻahu (Figure 6). This prominent trail once connected Honouliuli Village to the coastal settlements of Oneʻula and Kualakaʻi, and would have been crucial to life on the ʻEwa Plain and its coast.

Ethnographical evidence supports the possibility of cultural practices occurring on the property prior to the large-scale modification of large portions of the area by military activity. Based on information shared by Shad Kane, portions of the project area were used by Hawaiians for a variety of activities. For example, sinkholes in the larger general area were utilized as natural planters for *kalo* (taro, dry-land variety), temporary shelters, storage features, and sources of water. Shad Kane also recalled the existence of a *kahua*, or Makahiki grounds, as well as numerous trails in the area that connected to trails in the Kalaeloa Heritage Park.

It has not been demonstrated that any cultural practices have been ongoing from the pre-Contact era or post-Contact era to the present. As the majority of the project area has been heavily disturbed by military activities prior to this CIA, contemporary cultural practices taking place in the project area related to *lāʻau lapaʻau* (medicine) are not currently being carried out. In the adjacent Kalaeloa Heritage Park parcel, cultural practices center on caring for archaeological features and natural resources.

CIA participants did not identify any direct or indirect effects that the Barbers Point Solar Project will have on traditional cultural practices in the area; however, during the site visit, they collectively expressed a desire to *mālama* (take care of) the traditional Hawaiian sites within the project area, which they observed were in very good condition. They envisioned clearing the invasive vegetation and reactivating the *kahua* for Makahiki activities and caring for nearby archaeological features. Preservation is recommended for these features, with possible interpretation and reactivation through traditional cultural practices in the future.

5.3 RECOMMENDATIONS

Consultation undertaken through the current CIA complements the extensive archaeological studies that have been undertaken within and adjacent to the project area, which have identified significant archaeological features dating to the pre-Contact period as well as the more recent past. A primary concern of those interviewed was the potential for limestone pit features in the area to contain *iwi kūpuna*. As such, a program of archaeological data recovery of pits that will be impacted by the project is recommended, as is an archaeological monitoring program during construction of the project.

The cultural descendants who participated in this study should be further consulted to develop protocols for the appropriate protection and preservation of sites, and these protocols should be recognized in future land uses and transactions. Their *mana'o* (thoughts, ideas, opinions) on procedures for clearing, caring for, and reactivating the *kahua* would be invaluable as well. Given the existence of Hawaiian burials in close proximity to the project area, there is potential for natural limestone pit features to contain burials. Should a burial be identified during the construction of the Barbers Point Solar Project, the CIA participants and other cultural descendants should also be involved in the decision-making process in accordance with State law.

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APPENDIX A

Guidelines for Assessing Cultural Impacts
Obtained from the Office of Environmental Quality Control Website

Guidelines for Assessing Cultural Impacts

Adopted by the Environmental Council, State of Hawaii

November 19, 1997

1. INTRODUCTION

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

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

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

Background

Prior to the arrival of westerners and the ideas of private land ownership, Hawaiians freely accessed and gathered resources of the land and seas to fulfill their community responsibilities. During the Mahele of 1848, large tracts of land were divided, and control was given to private individuals. When King Kamehameha the III was forced to set up this new system of land ownership, he reserved the right of access to privately owned lands for Native Hawaiian ahupuaʻa tenants. However, with the later emergence of the western concept of land ownership, many Hawaiians were denied access to previously available traditional resources.

In 1978, the Hawaii constitution was amended to protect and preserve traditional and customary rights of Native Hawaiians. Then in 1995 the Hawaii Supreme Court confirmed that Native Hawaiians have rights to access undeveloped and under-developed private lands. Recently, state lawmakers clarified that government agencies and private developers must assess the impacts of their development on the traditional practices of Native Hawaiians as well as the cultural resources of all people of Hawaii. These Hawaii laws, and the National Historic Preservation Act, clearly mandate federal agencies in Hawaii, including the military, to evaluate the impacts of their actions on traditional practices and cultural resources.

If you own or control undeveloped or under-developed lands in Hawaii, here are some hints as to whether traditional practices are occurring or may have occurred on your lands. If there is a trail on your property, that may be an indication of traditional practices or customary usage. Other clues include streams, caves and native plants. Another important point to remember is that, although traditional practices may have been interrupted for many years, these customary practices cannot be denied in the future.

These traditional practices of Native Hawaiians were primarily for subsistence, medicinal, religious, and cultural purposes. Examples of traditional subsistence practices include fishing, picking opihi and collecting limu or seaweed. The collection of herbs to cure the sick is an example of a traditional medicinal practice. The underlying purpose for conducting these traditional practices is to fulfill one's community responsibilities, such as feeding people or healing the sick.

As it is the responsibility of Native Hawaiians to conduct these traditional practices, government agencies and private developers also have a responsibility to follow the law and assess the impacts of their actions on traditional and cultural resources.

The State Environmental Council has prepared guidelines for assessing cultural resources and has compiled a directory of cultural consultants who can conduct such studies. The State Historic Preservation Division has drafted guidelines on how to conduct ethnographic inventory surveys. And the Office of Planning has recently completed a case study on traditional gathering rights on Kaua‘i.

The most important element of preparing Cultural Impact Assessments is consulting with community groups, especially with expert and responsible cultural records and review of transcripts of previous ethnographic interviews. Once all the information has been collected, and verified by the community experts, the assessment can then be used to protect and preserve these valuable traditional practices.

Native Hawaiians performed these traditional and customary practices out of a sense of responsibility: to feed their families, cure the sick, nurture the land, and honor their ancestors. As stewards of this sacred land, we too have a responsibility to preserve, protect and restore these cultural resources for future generations.

TEXT OF ACT 50, SLH 2000

A BILL FOR AN ACT RELATING TO ENVIRONMENTAL IMPACT STATEMENTS

UNOFFICIAL VERSION

HOUSE OF REPRESENTATIVES H.B. NO, 2895 H.D.1

TWENTIETH LEGISLATURE, 2000

STATE OF HAWAII

A BILL FOR AN ACT

RELATING TO ENVIRONMENTAL IMPACT STATEMENTS.

BE IT ENACTED BY THE LEGISLATURE OF THE STATE OF HAWAII:

SECTION 1. The legislature finds that there is a need to clarify that the preparation of environmental assessments or environmental impact statements should identify and address effects on Hawaiʻi's culture, and traditional and customary rights.

The legislature also finds that native Hawaiian culture plays a vital role in preserving and advancing the unique quality of life and the "aloha spirit" in Hawaii. Articles IX and XII of the state constitution, other state laws, and the courts of the State impose on government agencies a duty to promote and protect cultural beliefs, practices, and resources of native Hawaiians as well as other ethnic groups.

Moreover, the past failure to require native Hawaiian cultural impact assessments has resulted in the loss and destruction of many important cultural resources and has interfered with the exercise of native Hawaiian culture. The legislature further finds that due consideration of the effects of human activities on native Hawaiian culture and the exercise thereof is necessary to ensure the continued existence, development, and exercise of native Hawaiian culture.

The purpose of this Act is to: (1) Require that environmental impact statements include the disclosure of the effects of a proposed action on the cultural practices of the community and State; and (2) Amend the definition of "significant effect" to include adverse effects on cultural practices.

SECTION 2. Section 343-2, Hawaiʻi Revised Statutes, is amended by amending the definitions of "environmental impact statement" or "statement" and "significant effect", to read as follows:

“Environmental impact statement” or “statement” means an informational document prepared in compliance with the rules adopted under section 343-6 and which discloses the environmental effects of a proposed action, effects of a proposed action on the economic [and] welfare, social welfare, and cultural practices of the community and State, effects of the economic activities arising out of the proposed action, measures proposed to minimize adverse effects, and alternatives to the action and their environmental effects.

The initial statement filed for public review shall be referred to as the draft statement and shall be distinguished from the final statement which is the document that has incorporated the public's comments and the responses to those comments. The final statement is the document that shall be evaluated for acceptability by the respective accepting authority.

“Significant effect” means the sum of effects on the quality of the environment, including actions that irrevocably commit a natural resource, curtail the range of beneficial uses of the environment, are contrary to the State's environmental policies or long-term environmental goals as established by law, or adversely affect the economic [or] welfare, social welfare[.], or cultural practices of the community and State.”

SECTION 3. Statutory material to be repealed is bracketed. New statutory material is underscored.

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

Approved by the Governor as Act 50 on April 26, 2000

2. CULTURAL IMPACT ASSESSMENT METHODOLOGY

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

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

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

The historical period studied in a cultural impact assessment should commence with the initial presence in the area of the particular group whose cultural practices and features are being assessed. The types of cultural practices and beliefs subject to assessment may include subsistence, commercial, residential, agricultural, access-related, recreational, and religious and spiritual customs.

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

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

1. identify and consult with individuals and organizations with expertise concerning the types of cultural resources, practices and beliefs found within the broad geographical area, e.g., district or ahupuaʻa;

2. identify and consult with individuals and organizations with knowledge of the area potentially affected by the proposed action;

3. receive information from or conduct ethnographic interviews and oral histories with persons having knowledge of the potentially affected area;

4. conduct ethnographic, historical, anthropological, sociological, and other culturally related documentary research;

5. identify and describe the cultural resources, practices and beliefs located within the potentially affected area; and

6. assess the impact of the proposed action, alternatives to the proposed action, and mitigation measures, on the cultural resources, practices and beliefs identified.

Interviews and oral histories with knowledgeable individuals may be recorded, if consent is given, and field visits by preparers accompanied by informants are encouraged. Persons interviewed should be afforded an opportunity to review the record of the interview, and consent to publish the record should be obtained whenever possible. For example, the Primary source materials reviewed and analyzed may include, as appropriate: Mahele, land court, census and tax records, including testimonies; vital statistics records; family histories and genealogies; previously published or recorded ethnographic interviews and oral histories; community studies, old maps and photographs; and other archival documents, including correspondence, newspaper or almanac articles, and visitor journals. Secondary source materials such as historical, sociological, and anthropological texts, manuscripts, and similar materials, published and unpublished, should also be consulted. Other materials which should be examined include prior land use proposals, decisions, and rulings which pertain to the study area.

3. CULTURAL IMPACT ASSESSMENT CONTENTS

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

1. A discussion of the methods applied and results of consultation with individuals and organizations identified by the preparer as being familiar with cultural practices and features associated with the project area, including any constraints or limitations which might have affected the quality of the information obtained.

2. A description of methods adopted by the preparer to identify, locate, and select the persons interviewed, including a discussion of the level of effort undertaken.

3. Ethnographic and oral history interview procedures, including the institutions and repositories searched, and the level of effort undertaken. This discussion should include, if appropriate, the particular perspective of the authors, any opposing views, and any other relevant constraints, limitations or biases.

6. A discussion concerning the cultural resources, practices and beliefs identified, and, for resources and practices, their location within the broad geographical area in which the proposed action is located, as well as their direct or indirect significance or connection to the project site.

7. A discussion concerning the nature of the cultural practices and beliefs, and the significance of the cultural resources within the project area, affected directly or indirectly by the proposed project.

8. An explanation of confidential information that has been withheld from public disclosure in the assessment.

9. A discussion concerning any conflicting information in regard to identified cultural resources, practices and beliefs.

10. An analysis of the potential effect of any proposed physical alteration on cultural resources, practices or beliefs; the potential of the proposed action to isolate cultural resources, practices or beliefs from their setting; and the potential of the proposed action to introduce elements which may alter the setting in which cultural practices take place.

11. A bibliography of references, and attached records of interviews which were allowed to be disclosed.

The inclusion of this information will help make environmental assessments and environmental impact statements complete and meet the requirements of Chapter 343, HRS. If you have any questions, please call 586-4185.