Section 6 Historic Property Descriptions

A total of four historic properties, three previously identified and one newly identified, were located within or encompassed by the project area during the present archaeological inventory survey. The historic properties are summarized in Table 21 and their distributions are depicted on Figure 96. Detailed descriptions of the historic properties are included in this section

Table 21. Historic Properties Identified within or near the Current Project Area

SIHP #	Feature Type	Function	# of Features	Age	Previous Documentation
-B006	Puhi Camp Cemetery	Human interment	1 feature	Plantation era	Palama 1973; Kikuchi and Remoaldo 1992
-2179	Irrigation complex	Water control	16 features and 33 sub-features	Plantation era	Palama 1973; Hunkin et al. 2014
-2220	Hawaii Territory Survey Marker and Transit Station	Survey marker	1 feature	Historic era	Hunkin et al. 2014
-2307	Historic trash pit	Refuse disposal	1 feature	Historic era	N/A

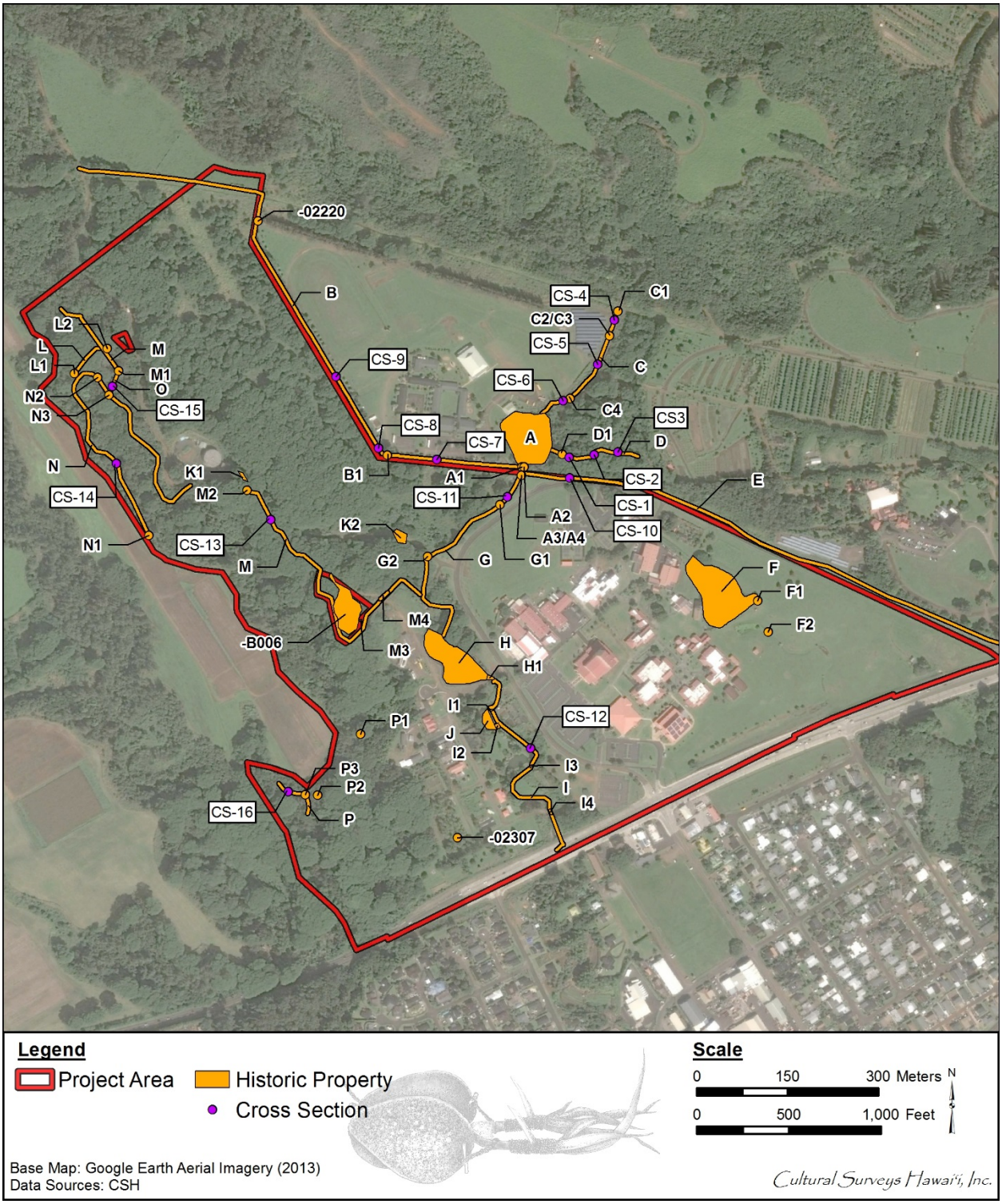

Figure 96. Aerial photo (Google Earth 2013), showing historic properties found within or encompassed by the project area

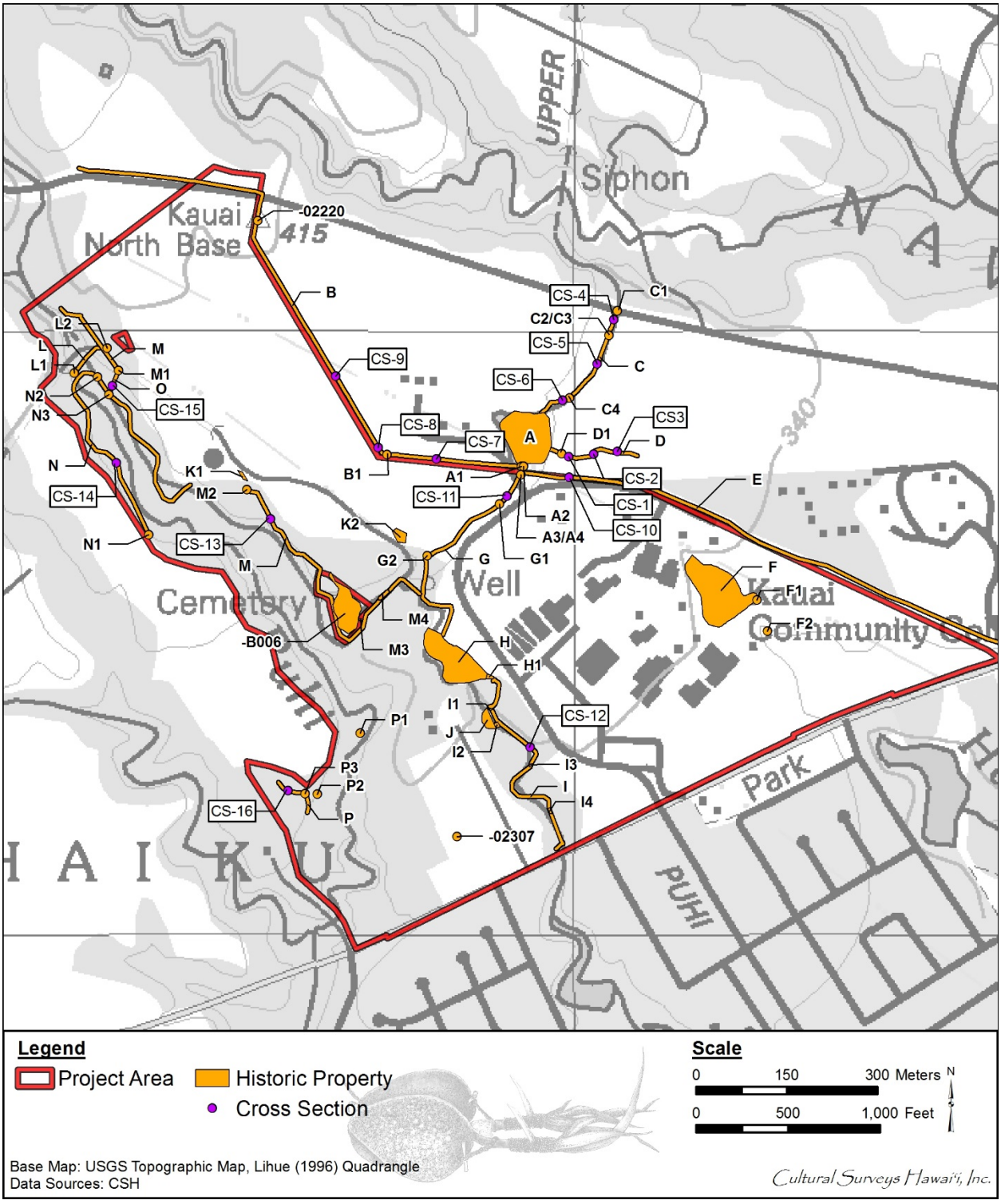

Figure 97. Portion of 1996 Lihue USGS topographic quadrangle showing the locations of historic properties within the project area

6.1 SIHP # 50-30-11-B006

FORMAL TYPE:	Puhi Camp Cemetery
FUNCTION:	Human interment
NUMBER OF FEATURES:	1
AGE:	Plantation
TEST EXCAVATIONS:	None
TAX MAP KEY:	[4] 3-4-007:005
LAND JURISDICTION:	Grove Farm
PREVIOUS DOCUMENTATION:	Palama 1973; Kikuchi and Remoaldo 1992

SIHP # -B006 is a cemetery that extends 104.08 m long by 47.33 m wide, and is located north of Pūnana Leo Pre-School and northwest of a reservoir (SIHP # -2179 Feature H). Cemetery headstones are incised with Filipino, Japanese, and Chinese names with Filipino appearing to be the most common (Figure 98). Headstone material varies from marble to stone to concrete blocks (Figure 99); marble and wooden crosses (Figure 100) are also present. The cemetery is situated on a flat to gently sloping area with a short dirt road that runs in the center of the cemetery. SIHP # -2179:Feature M, ditch, flows along the north, west, and south sides of the cemetery.

The Puhi Camp Cemetery is the Japanese Cemetery that Palama (1973) found during his 1973 archaeological reconnaissance. Palama (1973) recommended no further work and a state site number was not assigned at the time. The cemetery is within a separate parcel, surrounded by the current proposed project area, and is identified as a cemetery on the 1963 Lihue USGS quadrangle (see Figure 21). Cemeteries of Kaua‘i (Kikuchi and Remoaldo 1992:134) lists the historic property as the Puhi Camp Cemetery, SIHP # 50-30-11-B006, with 172 graves (Figure 101).

Kikuchi and Remoaldo’s (1992) study details information from individual grave markers. The names associated with graves 1 through 97 are listed, and all but seven show a year of death. Dates of death range from 1920 to 1977 with the majority of dates in the 1960s, followed by dates in the 1920s. The majority of the names (graves 1–97) are Filipino, with some Japanese and Chinese names. Graves 98 through 119 are “written in Japanese characters which could not be translated at this time” (Kikuchi and Remoaldo 1992:140), and therefore these graves lack information regarding date of death.

These Japanese graves are situated in the southern portion of the cemetery. Graves that lack information as well as markers were later interred amongst the Japanese graves. They include graves 120 through 127, identified as “unknown graves from Kaipu Camp, March 16, 1967” (Kikuchi and Remoaldo 1992:141); and graves 128 through 153, listed as “Unknown.” Many of the unknown burials lack markers but have a “concrete base” or a cross. Graves 154 through 172 “were earthen mounds or depressed areas where a grave may exist or was exhumed” (Kikuchi and Remoaldo 1992:142). The locations of graves 154 through 172 are not noted on the Puhi Camp Cemetery map (Figure 101).

Figure 98. General photograph of Puhi Camp Cemetery (SIHP # -B006) showing Buddhist grave markers on the right and Christian grave markers on the left, view to west

Figure 99. SIHP # -B006, Puhi Camp Cemetery, showing primarily Japanese headstones, view to southwest

Figure 100. SIHP # -B006, Puhi Camp Cemetery, showing various crosses, view to southeast

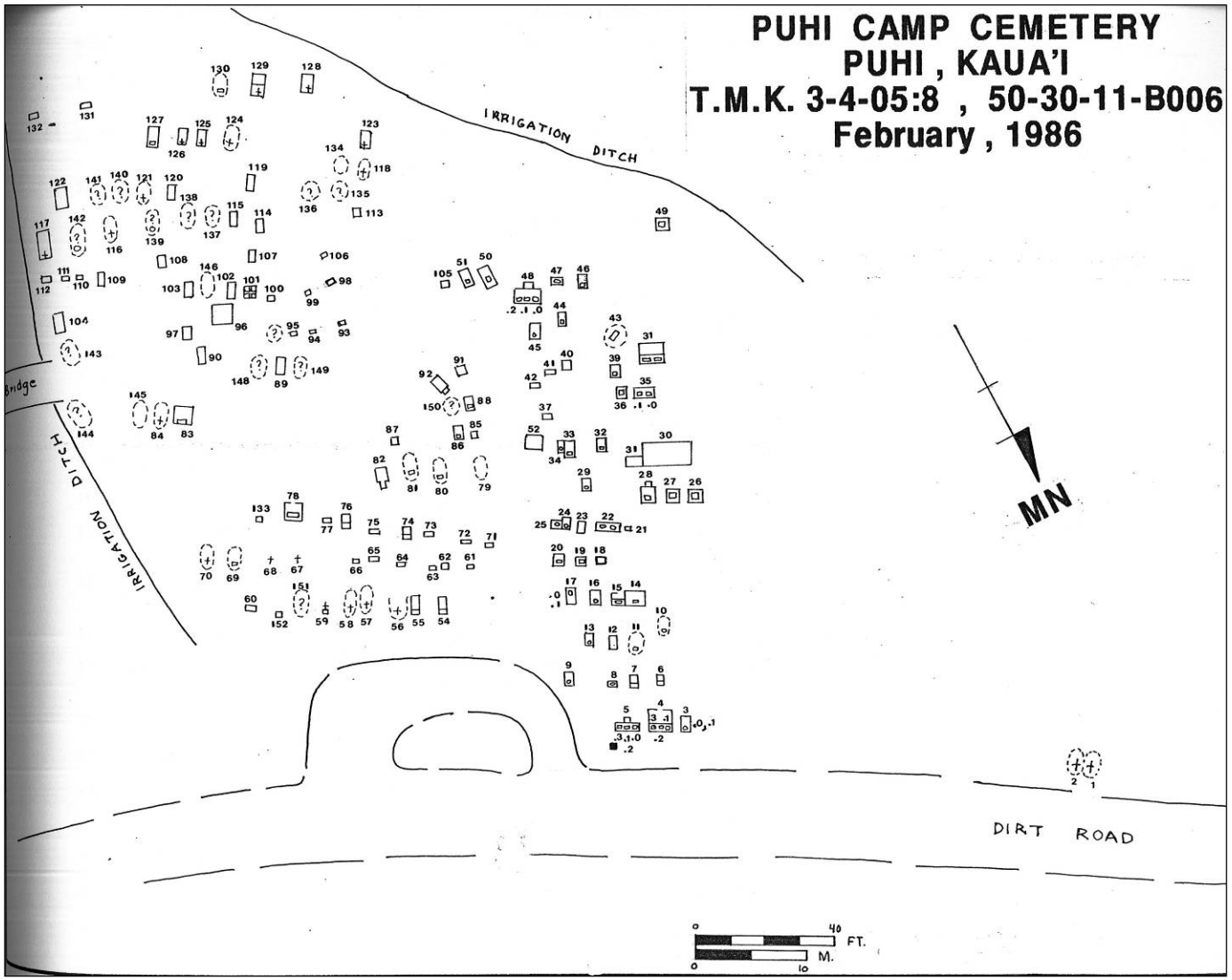

Figure 101. Puhi Camp Cemetery plan, SIHP # -B006 (Kikuchi and Remoaldo 1992:134)

The cemetery currently has the appearance of being maintained with a clear path running roughly north/south in the middle of the cemetery. In 2015, faculty and staff of Kaua‘i Community College volunteered to do a cleanup of the cemetery and placed fresh flowers at the graves (Matsumoto 2015). Upon further investigation of the graves in the cemetery, it appears the west portion of the cemetery is comprised primarily of Asian graves and the east portion is comprised primarily of Filipino graves, contrary to the observations made by Kikuchi and Renaldo (1992).

SIHP # -B006, Puhi Camp Cemetery, is located outside of, but encompassed by, the project area. SIHP # -B006 is evaluated as significant pursuant to HAR §13-284-6, under Criteria “d” (have yielded, or is likely to yield, information important for research on prehistory or history) and “e” (have an important value to the native Hawaiian people or to another ethnic group of the state due to associations with cultural practices once carried out, or still carried out, at the property or due to associations with traditional beliefs, events or oral accounts—these associations being important to the group’s history and cultural identity). This assessment is based on the historic property’s potential to provide information regarding the history of the Puhi Camp as well as burial practices of plantation workers, and its value to the current community.

6.2 SIHP # 50-30-11-2179

FORMAL TYPE:	Irrigation complex
FUNCTION:	Water control
NUMBER OF FEATURES:	16 features and 33 sub-features
AGE:	Plantation
TEST EXCAVATIONS:	None
TAX MAP KEY:	[4] 3-4-007:001, 002, 003, and 006
LAND JURISDICTION:	State of Hawai‘i
PREVIOUS DOCUMENTATION:	Palama 1973; Hunkin et al. 2014

SIHP # -2179 consists of an irrigation complex associated with Grove Farm and former Puhi Camp. Portions of the historic property were previously documented by Palama (1973) and Hunkin et al. (2014). The historic property was observed throughout the project area, primarily near roadways, along property boundaries, and within the large gulch associated with Puhi Stream. The complex extends beyond the current property area boundary on all sides. SIHP # -2179 is associated with the plantation era and includes water control features constructed during multiple chapters of the Grove Farm and Puhi Camp history.

Warren Goodale established Grove Farm in 1850 and the property was sold to James F.B. Marshall and then to Judge Widemann. At the end of 1863, George Wilcox was hired to supervise irrigation for the Grove Farm Plantation. The following year, Wilcox leased Grove Farm Plantation from Widemann and rapidly expanded development of the irrigation infrastructure. In 1870, Wilcox bought Grove Farm from Widemann and, within four years, he had 200 acres under cultivation. Wilcox continued to expand the plantation, eventually increasing the plantation lands ten-fold (Krauss and Alexander 1984:206).

At the beginning of the twentieth century, Grove Farm secured sufficient water resources and sold any surplus. A right-of-way with Koloa Plantation was secured in 1906 that provided water from Kuia Stream. Grove Farm's "Upper Ditch" was constructed between 1914 and 1917 and by the 1920s "Grove Farm had 16 miles of ditches delivering 26 mgd" (Wilcox 1998:74).

> About 1920 George Wilcox began construction of a completely modern camp at Puhi in the heart of the expanding plantation. Instead of building houses haphazardly as new families moved in, a complete village was laid out with streets, a playground, room for gardens, and lawns. The houses had proper kitchens equipped with running water and enough bedrooms for each family depending upon the number of children. [Krauss and Alexander 1984:310]

In the mid-1930s, Grove Farm further expanded its administrative operations into Puhi. Wilcox (1998:76) reports that despite almost 100 years of irrigation ditch construction, "Grove Farm's ditch system was a modest one not known for any outstanding technical or physical achievements. This may reflect the limited watershed available to Grove Farm, the small size of the plantation's acreage, or G.N.'s [Wilcox] personal sense of scale."

In the mid-1960s, Sam Wilcox of Grove Farm donated 200 acres of former sugar land to the state for KCC (Kamins and Potter 1998:275). Grove Farm ended its sugar business in 1974, setting aside lands for development and also for the continuation of sugar cultivation by leasing its Līhue lands to Lihue Plantation, and its Koloa lands to McBryde Sugar (Wilcox 1998:76).

A total of 16 features and 33 sub-features were documented as associated with SIHP # -2179 including 12 culverts, ten irrigation ditches, 11 sluice gates, nine associated with earthen tunnels, four reservoirs, two flumes, and one stream ford. The 16 features, designated alphabetically, include the primary features including ditches, reservoirs, flumes, etc. The 33 sub-features, designated numerically include the culverts, sluice gates, flumes and other features associated with a primary feature (ditch, reservoir, etc.). Features with evidence of construction dates associated with SIHP # -2179 range from 1905 to 1969. All features and sub-features are summarized in Table 22 and described by primary feature in the following paragraphs.

6.2.1 Feature A

SIHP # -2179 Feature A was previously documented by Hunkin et al. (2014). The feature is not located within the current project area. The feature consists of one primary feature consisting of a large reservoir (Feature A) located in the southeast corner of the Island School property, and four sub-features consisting of three sluice gates (Sub-features A1–A3) and a culvert (Sub-feature A4) (Figure 102 through Figure 112). The following is the description of the feature as documented by Hunkin et al. (2014):

> **Feature A** is a reservoir located adjacent to and northeast of the gate at the Island School campus road entrance. The reservoir is not part of Island School property and is located outside of the project area, but is almost completely surrounded by the project area. A 1941 map of Lihue Plantation Co. shows the Feature A reservoir between the boundaries of fields 39A and 39B (see Figure 19). The 1963 U.S. Geological Survey map (see Figure 21) shows a portion of the ‘Upper Lihue Ditch’ that corresponds with the separation between field 39A and 39B; indicating that Feature A was likely associated with the Upper Lihue Ditch system. The reservoir also appears on the 1910 U.S. Geological Survey (see Figure 10) although its associated ditches are not evident. No modification to Feature A is planned as part of the proposed development project.
>
> The reservoir measures 88.5 m by 82.3 m with a constructed berm on the east and south sides. A wooden catwalk extends from the east bank over the water for 2 m, at the end of which is a metal, mechanical device for opening and closing an underground drain pipe. Sub-features A1 through A4 are part of an overflow area at the southern end of the reservoir. Descriptions of the sub-features follow.
>
> **Sub-feature A1** . . . designates an active vertical rising sluice gate at the northern edge of the Feature A reservoir overflow area contains two pre-cast concrete wing walls and a gate composed of three wooden boards (see Figure 105 and Figure 106). The sluice gate opening measures 1.8 m wide, with a maximum height of 1.18 m. Two 2 in x 7 in pieces of lumber straddle the sluice gate (see Figure 105).

Table 22. Summary of All Features and Sub-features Associated with SIHP # -2719

Feature #	Type	Earliest Known Age	Condition	Previous Documentation*
A	Reservoir	Pre-1910	In-use	Hunkin et al. 2014
A1	Sluice gate	Unknown	Abandoned	Hunkin et al. 2014
A2	Sluice gate	Unknown	In-use	Hunkin et al. 2014
A3	Sluice gate	Unknown	In-use	Hunkin et al. 2014
A4	Culvert	10/29/1969	In-use	Hunkin et al. 2014
B	Irrigation ditch	Pre-1941	Repurposed	Hunkin et al. 2014
B1	Culvert	Unknown	In-use	Hunkin et al. 2014
C	Irrigation ditch	1917	In-use	Hunkin et al. 2014
C1	Culvert	Unknown	In-use	Hunkin et al. 2014
C2	Sluice gate	Unknown	In-use	Hunkin et al. 2014
C3	Culvert	Unknown	Abandoned	Hunkin et al. 2014
C4	Sluice gate	Unknown	In-use	Hunkin et al. 2014
D	Irrigation ditch	Pre-1941	Abandoned	Hunkin et al. 2014
D1	Culvert	Pre-1941	Abandoned	Hunkin et al. 2014
E	Irrigation ditch	Pre-1941	Abandoned	None
E1	Flume	Unknown	Abandoned	None
F	Reservoir	Pre-1910	Repurposed	None
F1	Gate	Unknown	Abandoned	None
F2	Culvert	Unknown	Abandoned	None
G	Irrigation ditch	Pre-1933	In-use	None
G1	Sluice gate	Unknown	Abandoned	None
G2	Culvert	Unknown	In-use	None
H	Reservoir	Pre-1910	In-use	None
H1	Culvert	Pre-1910 and 1938	In-use	None
I	Irrigation ditch	Pre-1930	In-use	None
I1	Sluice gate	Pre-1930	In-use	None
I2	Stream ford	Pre-1930	In-use	None
I3	Culvert	Pre-1930	In-use	None

Feature #	Type	Earliest Known Age	Condition	Previous Documentation*
I4	Culvert	1938	In-use	None
J	Reservoir/former ditch	Pre-1930 (Ditch)	Repurposed	None
K	Culverts	Unknown	In-use	None
K1	Culvert	Unknown	In-use	None
K2	Culvert	Unknown	In-use	None
L	Flume	1960	Abandoned	None
L1	Earthen tunnel	1960	Abandoned	None
L2	Earthen tunnel	1960	Abandoned	None
M	Irrigation ditch	Pre-1933	In-use	None
M1	Earthen tunnel	Unknown	In-use	None
M2	Earthen tunnel	Unknown	In-use	None
M3	Sluice gate	Unknown (gate)/ 1967 (wing walls)	In-use	None
M4	Earthen tunnel	Pre-1933	In-use	None
N	Irrigation ditch	1905	Abandoned	None
N1	Earthen tunnel	1905	Abandoned	None
N2	Sluice gate	1905	Abandoned	None
N3	Sluice gate	1905	Abandoned	None
O	Irrigation ditch	Unknown	Abandoned	None
P	Irrigation ditch	Unknown	Abandoned	None
P1	Earthen tunnel	Unknown	Abandoned	None
P2	Earthen tunnel	Unknown	Abandoned	None
P3	Earthen tunnel	Unknown	Abandoned	None

*Palama (1973) briefly discussed the features as a whole and did not provide substantive documentation; therefore, the study is not listed in this table.

Figure 102. Photo of SIHP # -2179 Feature A, reservoir adjacent to (but outside of) the project area, view to south (Hunkin et al. 2014)

Figure 103. Photo of the overflow area of SIHP # -2179 Feature A, including the four sub-features (Features A1–A4) (Hunkin et al. 2014)

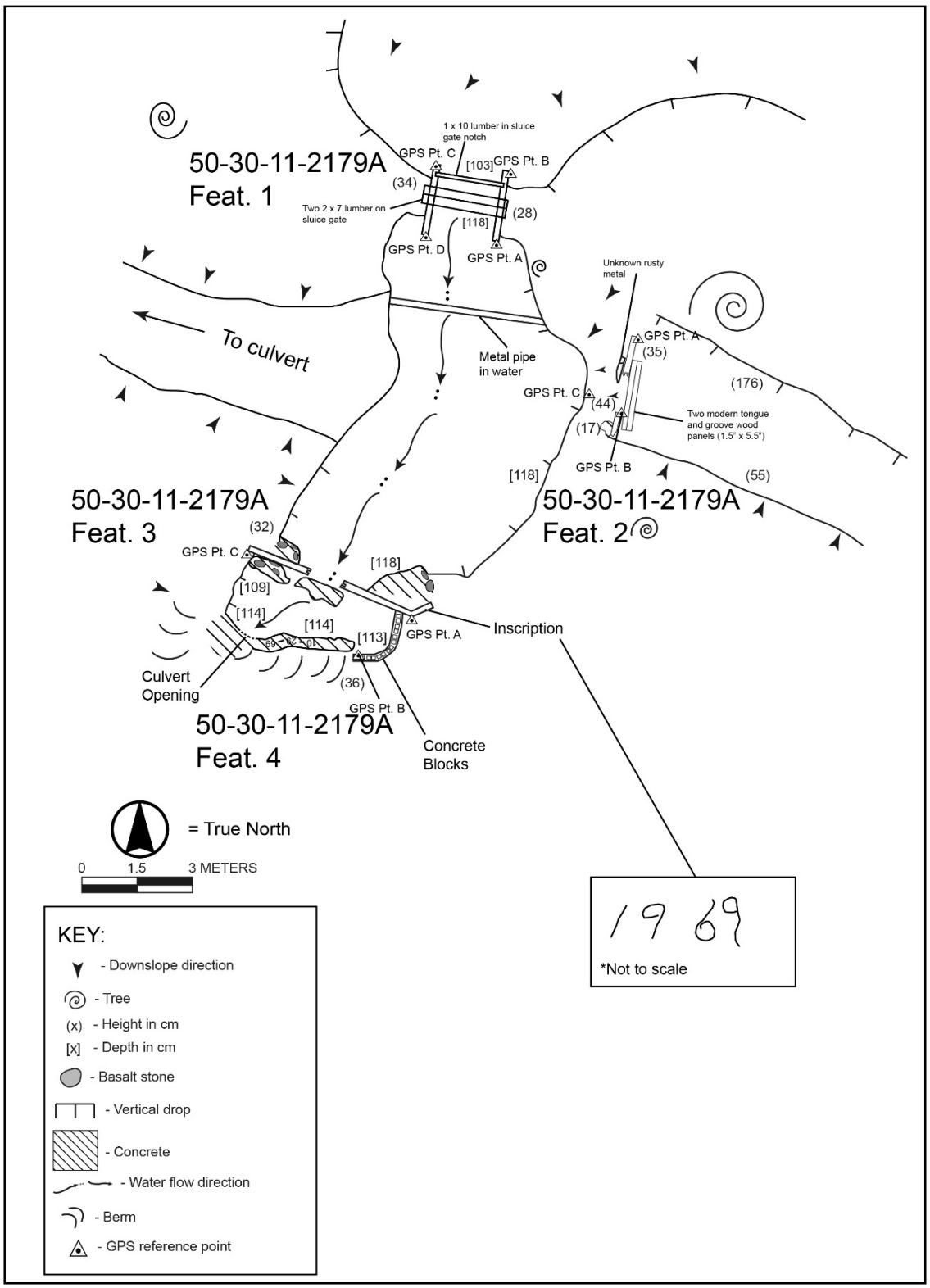

Figure 104. Plan view of SIHP # -2179 Feature A, including the four sub-features (Features A1–A4, labeled in this figure as Feat. 1–4) (Hunkin et al. 2014)

Figure 105. Photo of SIHP # -2179 Feature A1, sluice gate at the northern end of the overflow area, view to northwest (Hunkin et al. 2014)

Figure 106. Photo of SIHP # -2179 Feature A1, sluice gate at the northern end of the overflow area, view to north (Hunkin et al. 2014)

> **Feature A2** is an abandoned vertical rising sluice gate with two pre-cast concrete wing walls lies 0.70 m from the edge of the water on the easternmost edge of the Feature A overflow area (see Figure 104 for location) and is approximately 0.15 m higher that the water in elevation (see Figure 107 and Figure 108). The opening of the sluice gate measures 0.90 m wide, with a maximum height of 0.44 m. Two tongue and groove wooden panels are one the east side of the gate.
>
> **Feature A3** is a formed, slotted concrete sluice gate frame constructed of two pre-cast concrete wing walls is at the southwest side of the Feature A overflow area (see Figure 104 for location and Figure 109 and Figure 110). The wooden gate is missing. Water flows from the reservoir through the gate frame to the west to an area outside of the project area and within the Kaua‘i Community College campus. This is the reservoir’s only outlet.
>
> **Feature A4** is a modern culvert enters the reservoir at the south side of the Feature A overflow area running NE/SW and is composed of a large metal pipe with an opening approximately 0.65 m in diameter, and head and wing walls constructed of basalt boulders and cobbles with mortar fill, which have been partially capped with concrete (see Figure 111). Feature A4 has a maximum height of 1.14 m. An inscription reading ‘10-29-69’ was observed on the east wing wall (see Figure 112). [Hunkin et al. 2014:93–101]

Although outside the project area, the feature is adjacent to the current project area. During the current AIS, this feature was observed in similar condition. All features and sub-features are still in use, with the exception of Sub-feature A2, as described by Hunkin et al. (2014). Sub-feature A2 is associated with an abandoned irrigation ditch (Feature E) documented during the current AIS (see Section 6.2.5 for documentation of Feature E).

6.2.2 Feature B

SIHP # -2179 Feature B was previously documented by Hunkin et al. (2014). The feature is located within the current project area and extends along a roadway in the north portion of the project area, and turns at the KCC property boundary with Island School, ultimately terminating at Feature A. The feature consists of one primary feature consisting of an irrigation ditch (Feature B), and one sub-feature consisting of a culvert (Sub-feature B1). The following is the description of the feature as documented by Hunkin et al. (2014):

> **Feature B** is an irrigation ditch (Figure 113 and Figure 114) forming the west, southwest, and a portion of the south boundary of the project area (see Figure 104 for location). The earthen ditch is 703 m long, 0.9 m deep with a maximum width of 2.0 m . . . The ditch walls are sloped resulting in a bottom width of 1.0 m. The ditch is not currently used for irrigation but collects storm drainage and surface run-off from the Island School campus and its athletic fields.
>
> A 1941 map of Lihue Plantation Co. (see Figure 19) shows Feature B forming the western boundary of field 39B, separating Lihue Plantation and Grove Farm. Although the ditch does not currently extend to Feature A, the Lihue Plantation Co. map shows a connection . . .

Figure 107. Photo of SIHP # -2179 Feature A2, sluice gate at the easternmost edge of the Feature A overflow area, view to south (Hunkin et al. 2014)

Figure 108. Photo of SIHP # -2179 Feature A2, sluice gate at the easternmost edge of the Feature A overflow area, view to east (Hunkin et al. 2014)

Figure 109. Photo of SIHP # -2179 Feature A3, sluice gate at the southwest side of the Feature A overflow area, water flows through the pipe in background, under the Island School road, into Feature F, irrigation ditch, view to southwest (Hunkin et al. 2014)

Figure 110. Photo of SIHP # -2179 Feature A3, sluice gate at the southwest side of the Feature A overflow area, view to south (Hunkin et al. 2014)

Figure 111. Photo of SIHP # -2179 Feature A4, modern culvert at the south end of the Feature A overflow area, view to southwest (Hunkin et al. 2014)

Figure 112. Photo of SIHP # -2179 Feature A4, modern culvert, showing the inscription reading “10-29-69,” view down (Hunkin et al. 2014)

Figure 113. Photo of SIHP # -2179 Feature B, earthen irrigation ditch, view to east (Hunkin et al. 2014)

Figure 114. Photo of SIHP # -2179 Feature B, earthen irrigation ditch, view to west (Hunkin et al. 2014)

> Three cross section profiles of Feature B (CS7 through CS9) were recorded. CS7 was documented to show existing conditions of Feature B in its southernmost section (Figure 115 and Figure 116). CS8 was documented in the southwest corner of Feature B (Figure 117 and Figure 118). CS9 was documented along the western alignment of Feature B (Figure 119 and Figure 120).
>
> **Feature B1** is comprised of two abandoned culverts, both of which contain a large corrugated metal pipe with a diameter of 0.70 m and are oriented east/west (see Figure 123).
>
> The eastern culvert has only a head wall constructed of stacked small to large sub-angular and angular basalt boulders and cobbles filled with mortar. The head wall is capped with concrete. The eastern culvert is approximately 3.10 m long and 0.70 m wide, with a total height of 1.84 m (Figure 121 and Figure 124).
>
> The western culvert was not visible due to tree branch pilings in the ditch. A small strip of a concrete cap was visible through the branches (Figure 122). [Hunkin et al. 2014:101–106]

During the current AIS, this feature was observed in similar condition. All features and sub-features have been repurposed for storm and surface runoff drainage as described by Hunkin et al. (2014). The northern extent, along the unimproved roadway, could not be located during the current AIS. It is possible this portion has been disturbed. Feature B extends along the edge of SIHP # -2220, a Hawaii Territory survey marker and transit station (see Section 6.3 for documentation of SIHP # -2220).

6.2.3 Feature C

SIHP # -2179 Feature C was previously documented by Hunkin et al. (2014). The feature is not located within the current project area. The feature consists of one primary feature consisting of an irrigation ditch (Feature C), extending through the southeast corner of the Island School property ultimately terminating at Feature A, and four sub-features consisting of two sluice gates (Sub-features C2 and C4) and two culverts (Sub-features C1 and C3). The following is the description of the feature as documented by Hunkin et al. (2014):

> **Feature C** is a section of an irrigation ditch that enters the project area from the north, near the parcel’s northeast corner. The portion of the ditch within the project area is 209 m long. Water flowing through the ditch originating from a siphon north of the project area feeds SIHP # -2179 Feature A (reservoir adjacent to the project area). The irrigation ditch has mounded earthen berms on each side that measure 2.0 m wide and are from 0.5 to 0.7 m high. The water channel is 2.5 m wide and approximately 1.2 m deep. The current condition of Feature C is good.
>
> Three cross section profiles (CS4 through CS6) were recorded to represent physical characteristics of Feature C. CS4 was documented to show Feature C at its northernmost section (Figure 125 and Figure 126). CS5 was documented at the central section of Feature C (Figure 127 and Figure 128). CS6 was documented in the southern portion of Feature C (Figure 129 and Figure 130).

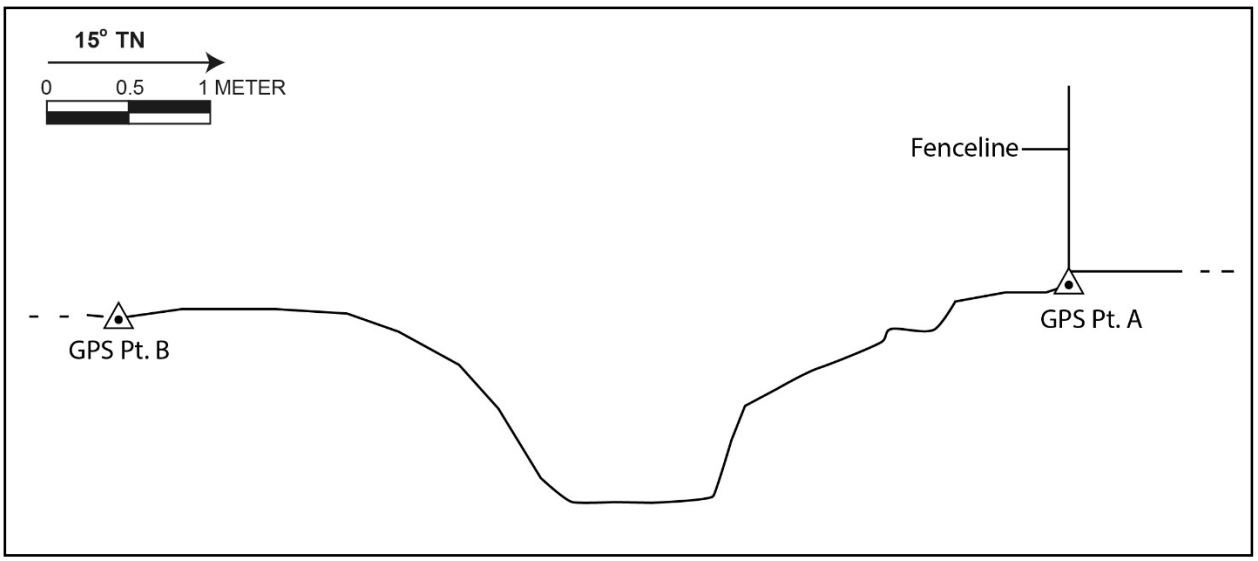

Figure 115. SIHP # -2179 Feature B, Cross Section 7 (Hunkin et al. 2014)

Figure 116. Photo of SIHP # -2179 Feature B, Cross Section 7 (Hunkin et al. 2014)

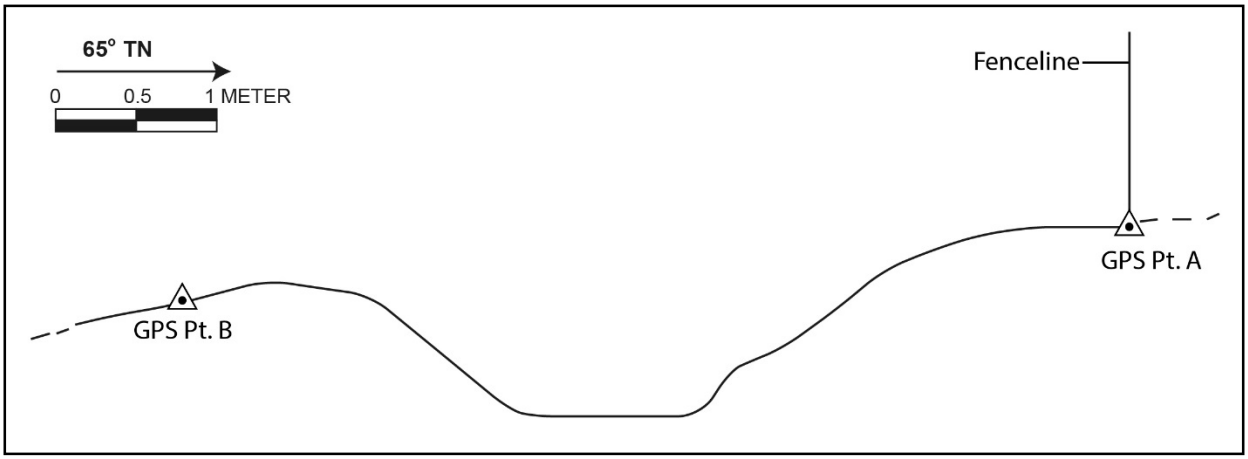

Figure 117. SIHP # -2179 Feature B, Cross Section 8 (Hunkin et al. 2014)

Figure 118. Photo of SIHP # -2179 Feature B, Cross Section 8 (Hunkin et al. 2014)

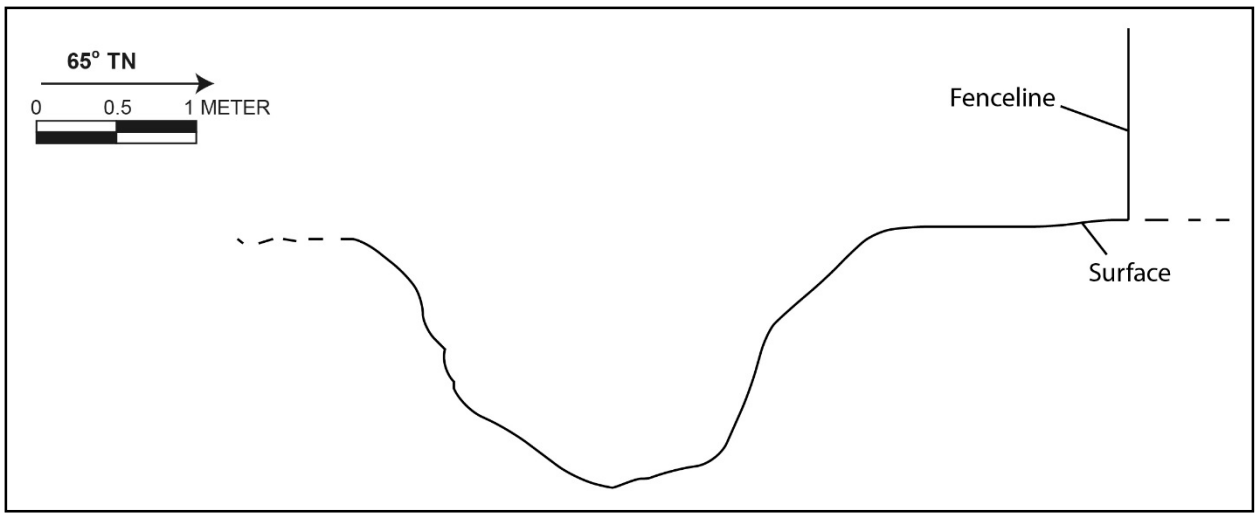

Figure 119. SIHP # -2179 Feature B, Cross Section 9 (Hunkin et al. 2014)

Figure 120. Photo of SIHP # -2179 Feature B, Cross Section 9 (Hunkin et al. 2014)

Figure 121. Photo of SIHP # -2179 Feature B1, eastern culvert, view to west (Hunkin et al. 2014)

Figure 122. Photo of SIHP # -2179 Feature B1, western culvert, view to east (Hunkin et al. 2014)

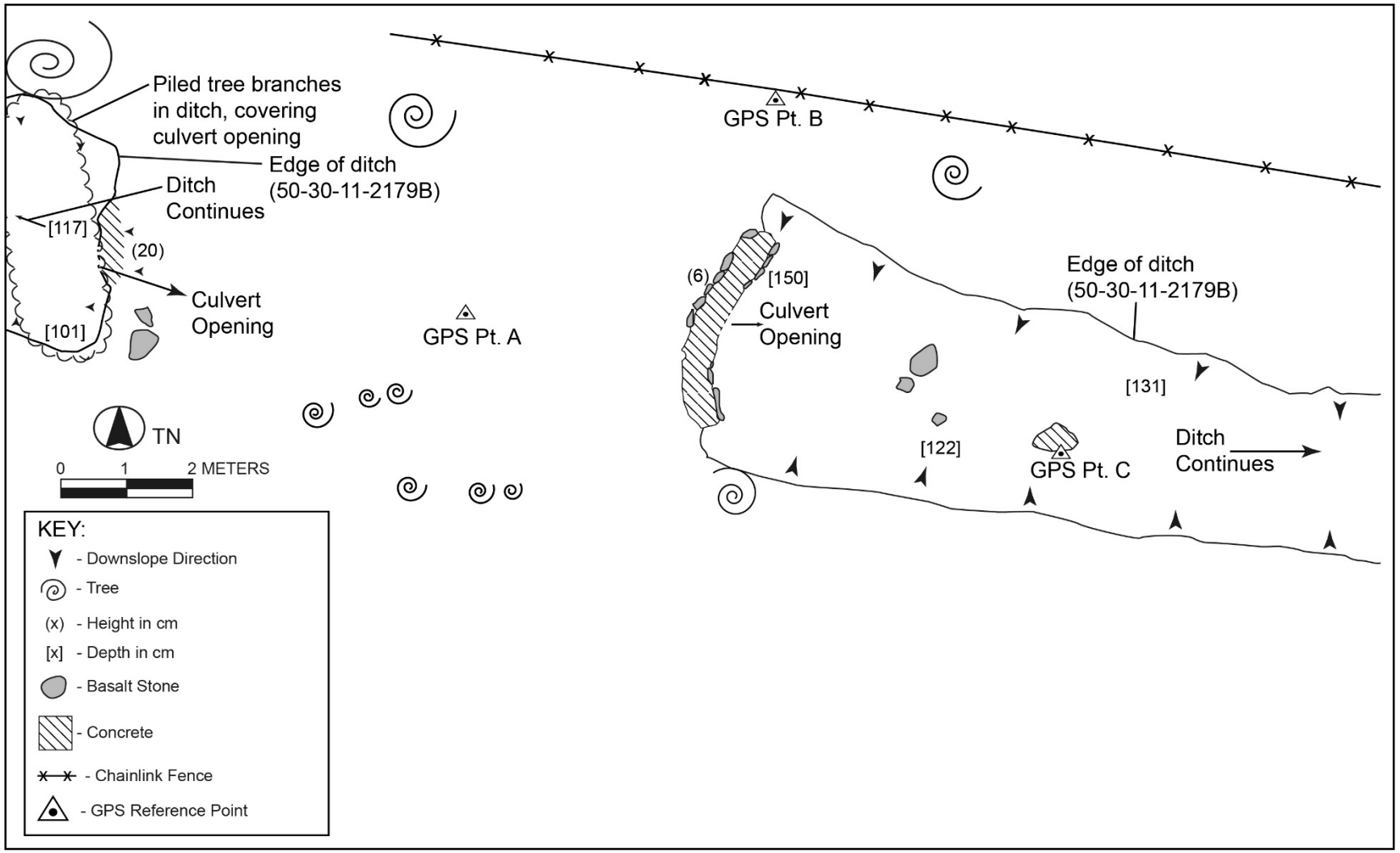

Figure 123. Plan view of SIHP # -2179 Feature B1, including east and west culverts (Hunkin et al. 2014)

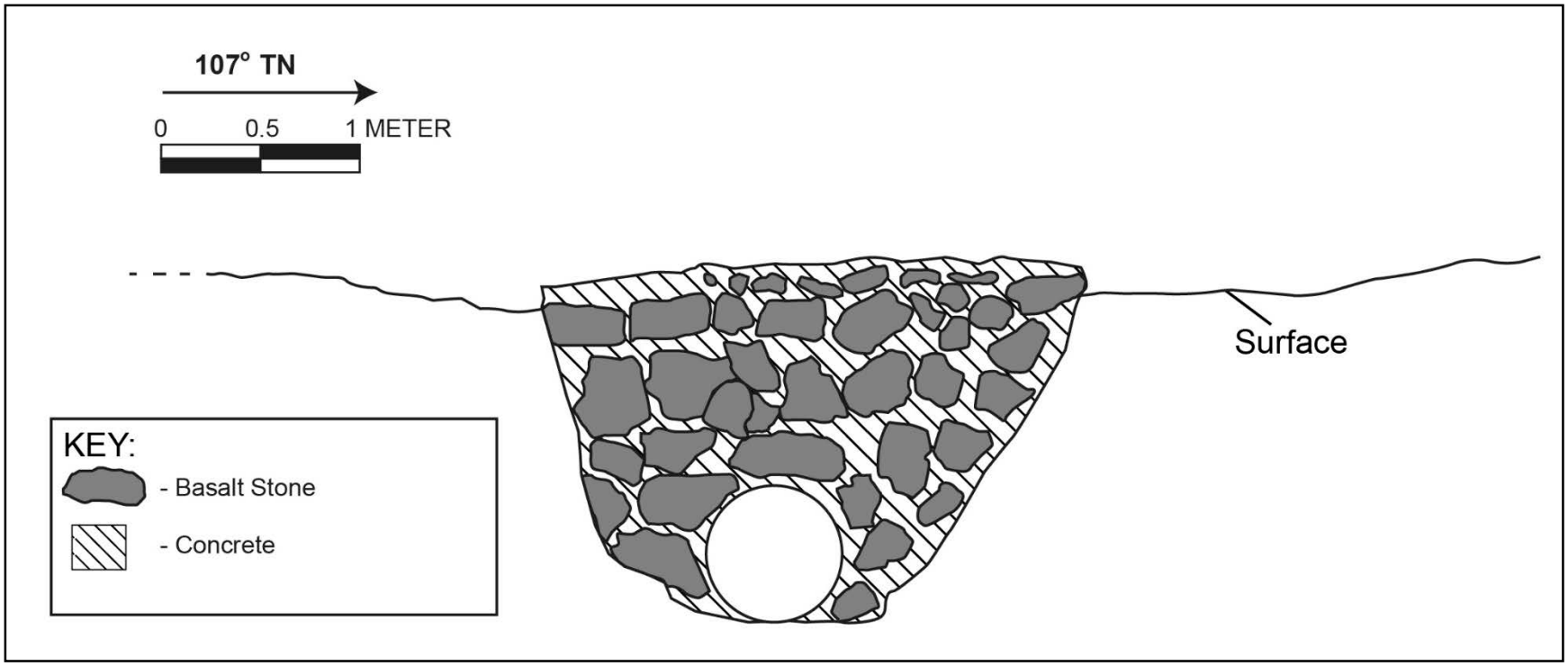

Figure 124. Elevation drawing of SIHP # 2179 Feature B1, eastern culvert (Hunkin et al. 2014)

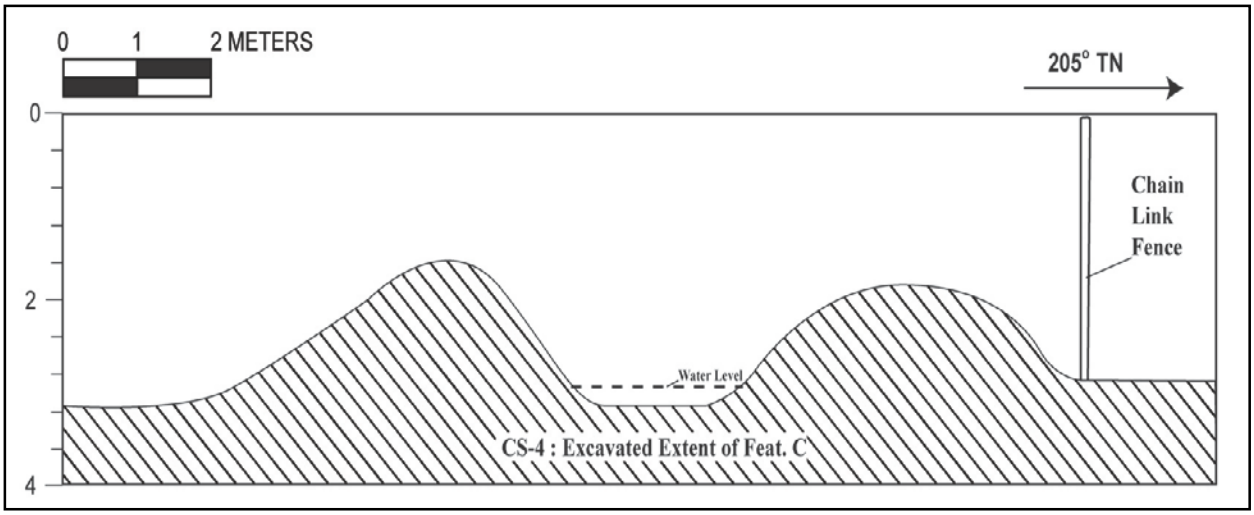

Figure 125. SIHP # -2179 Feature C, Cross Section 4 (Hunkin et al. 2014)

Figure 126. Photo of SIHP # -2179 Feature C, Cross Section 4, view to southeast (Hunkin et al. 2014)

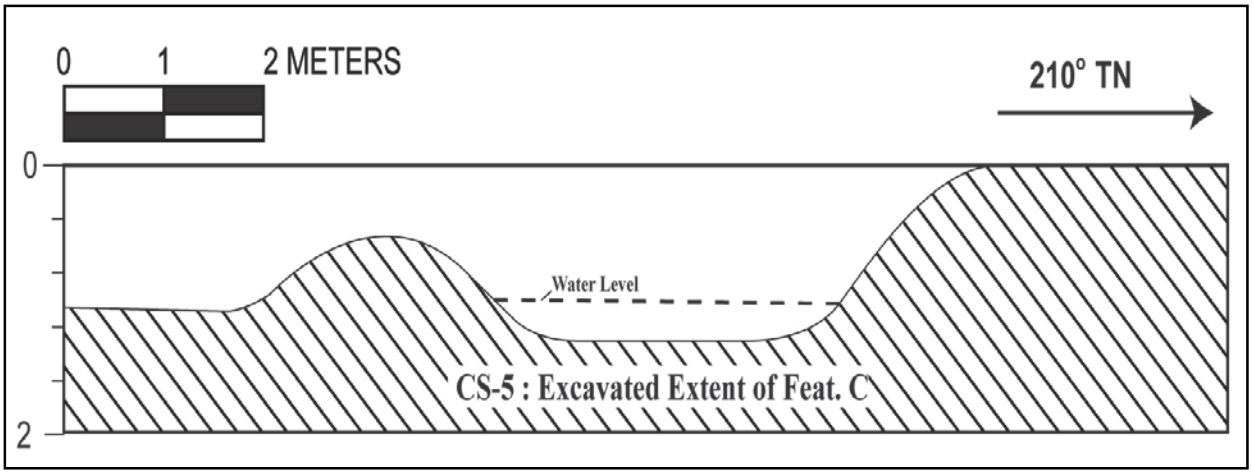

Figure 127. SIHP # -2179 Feature C, Cross Section 5 (Hunkin et al. 2014)

Figure 128. Photo of SIHP # -2179 Feature C, Cross Section 5, view to southeast (Hunkin et al. 2014)

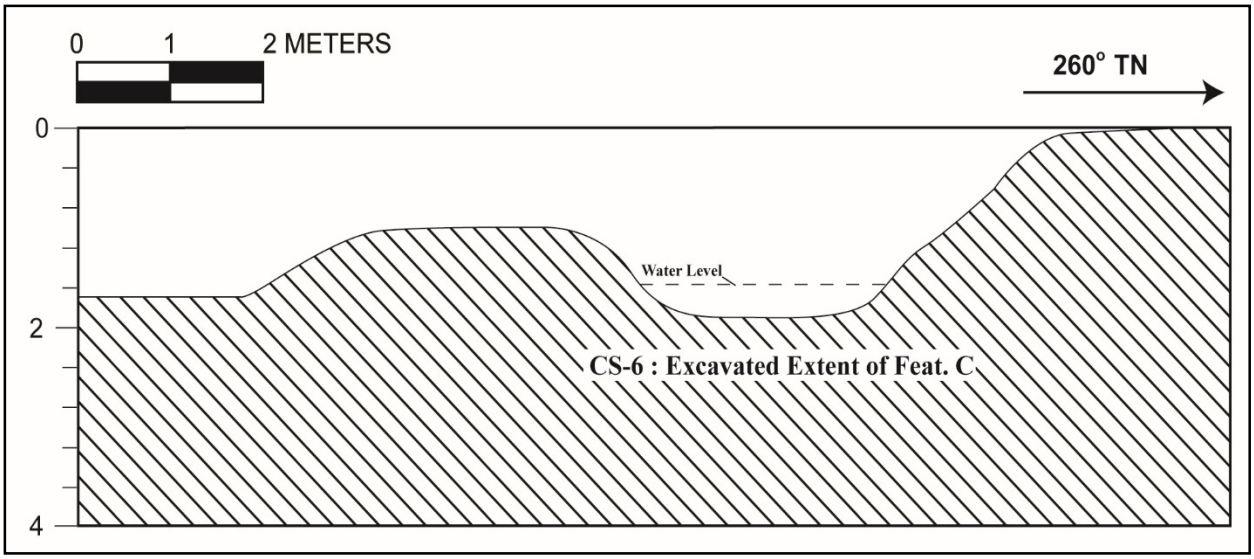

Figure 129. SIHP # -2179 Feature C, Cross Section 6 (Hunkin et al. 2014)

Figure 130. Photo of SIHP # -2179 Feature C, Cross Section 6, view to south (Hunkin et al. 2014)

A 1941 map of Lihue Plantation Co. (see Figure 19) shows that Feature C is the boundary between fields 39A and 39B. Irrigation ditches frequently formed the boundaries of fields. The 1963 U.S. Geological Survey map (see Figure 21) depicts a portion of the "Upper Lihue Ditch." Its location corresponds with the separation between field 39A and 39B, indicating SIHP # -2179 Feature C is part of the Upper Lihue Ditch system. Feature C has four sub-features, as detailed below.

Feature C1. The northernmost end of SIHP # -2179 Feature C is a slightly curved culvert (Figure 131). At this end, its height averages approximately 0.90 m. The base of the culvert is constructed of concrete and small to medium angular and sub-angular basalt boulders. The culvert itself is a large deteriorating steel pipe approximately 0.60 m wide at the opening. The upper portion of the culvert is constructed of concrete-filled hollow blocks with an average height of 0.40 m on the south (ditch) side and 0.10 m on the north (surface) side (Figure 132 and Figure 133). No definite date of construction can be determined, but the difference in construction materials suggests that the culvert is historic but later modified, although the time span between original construction and later modification is indeterminate.

Feature C2. Feature C2 consists of one active and one abandoned vertical rising sluice gate, somewhat perpendicular to each other (see Figure 134, Figure 135, and Figure 136).

The active sluice gate lies across Site # -2179 Feature C (the ditch) in a roughly NW/SE direction. The wing walls are constructed of concrete. No rising gate was present. The gate opening measures 0.97 m wide and 1.05 m high. Adjacent to the northern side of the eastern half of the sluice gate is a small retaining wall about 0.70 m along the side of the ditch and constructed of stacked sub-angular basalt cobbles up to two courses high, with a height of approximately 0.30 m from the top of the water. Abutting the southern side of both halves of the gate are small basalt and mortar walls, likely constructed at a later date to stabilize the gate and prevent erosion. On the upper portion of the eastern half of the gate, an inscription of "6-22-76" was observed, which suggests a construction date of June 22, 1976.

The abandoned sluice gate is located on the eastern bank of Site # -2179 Feature C. The wing walls are of the same material as the active gate and appear to have been constructed at approximately the same time as those of the active gate, although the gate is cracked and broken in some places. No rising gate was present. The gate opening measures 0.70 m wide and 0.85 m high from the concrete base.

Feature C3. Feature C3 is an abandoned culvert located approximately 0.80 m north of Feature C2 (see Figure 136 and Figure 137). The culvert includes a large corrugated metal pipe measuring approximately 0.65 m wide at the opening. Around the sides and on top of the pipe are stacked angular and sub-angular basalt boulders and cobbles with concrete fill. The culvert is capped with concrete. The whole structure is approximately 0.67 m high and 1.59 m wide (Figure 138 and Figure 139).

Figure 131. Photo of SIHP # -2179 Feature C1, culvert at northernmost section, view to north (Hunkin et al. 2014)

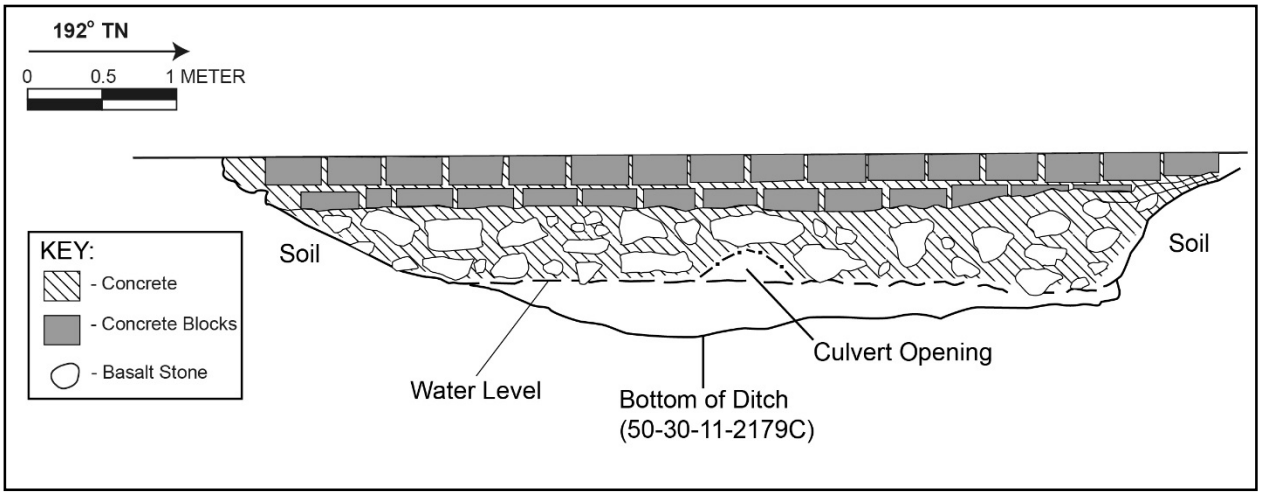

Figure 132. Elevation drawing of SIHP # -2179 Feature C1, culvert at northernmost section (Hunkin et al. 2014)

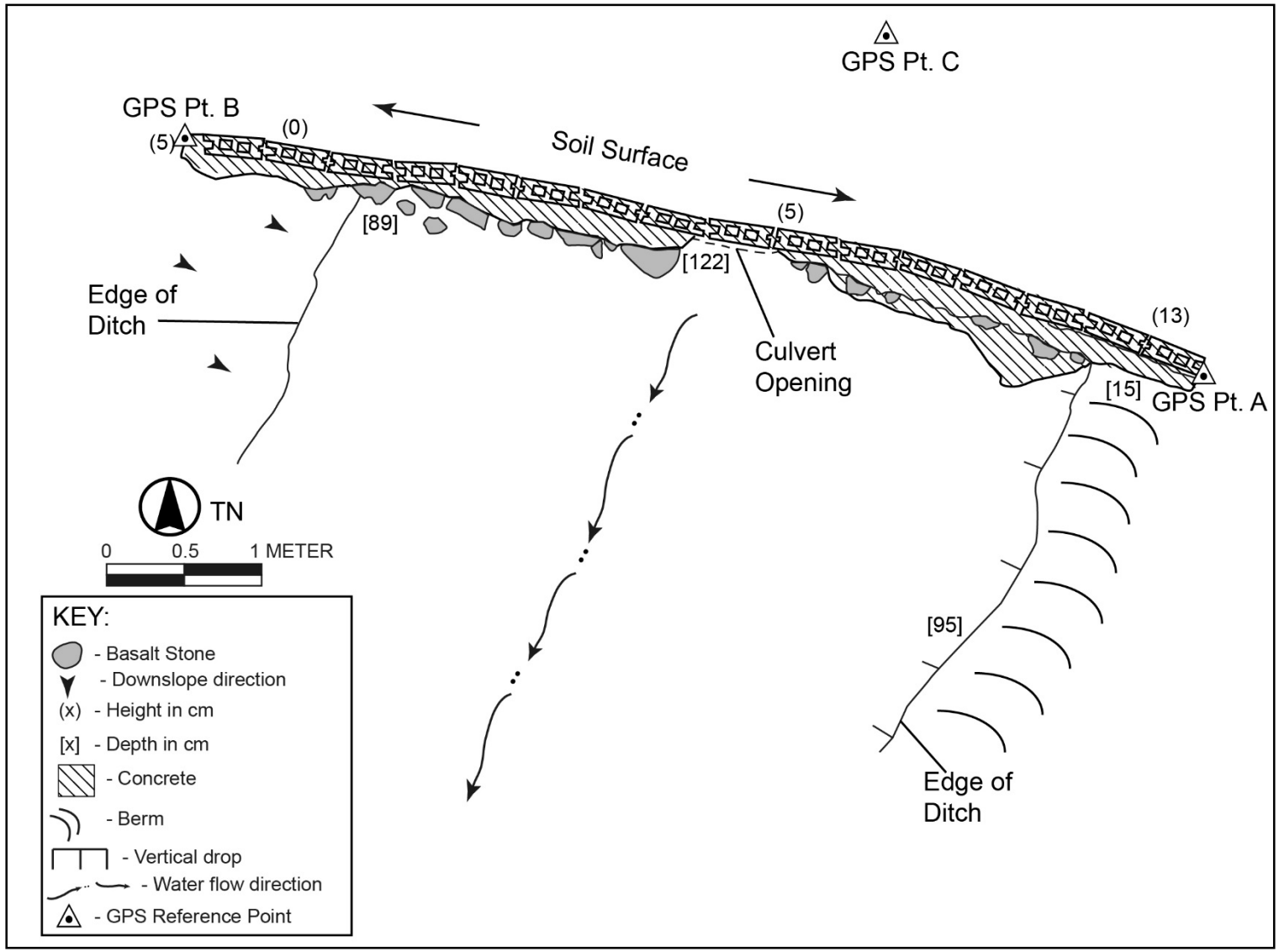

Figure 133. Plan view of SIHP # -2179 Feature C1, culvert at northernmost section (Hunkin et al. 2014)

Figure 134. Photo of SIHP # -2179 Feature C2, consisting of one active and one abandoned vertical rising sluice gate, somewhat perpendicular to each other, view to east (Hunkin et al. 2014)

Figure 135. Photo of SIHP # -2179 Feature C2, view to southeast (Hunkin et al. 2014)

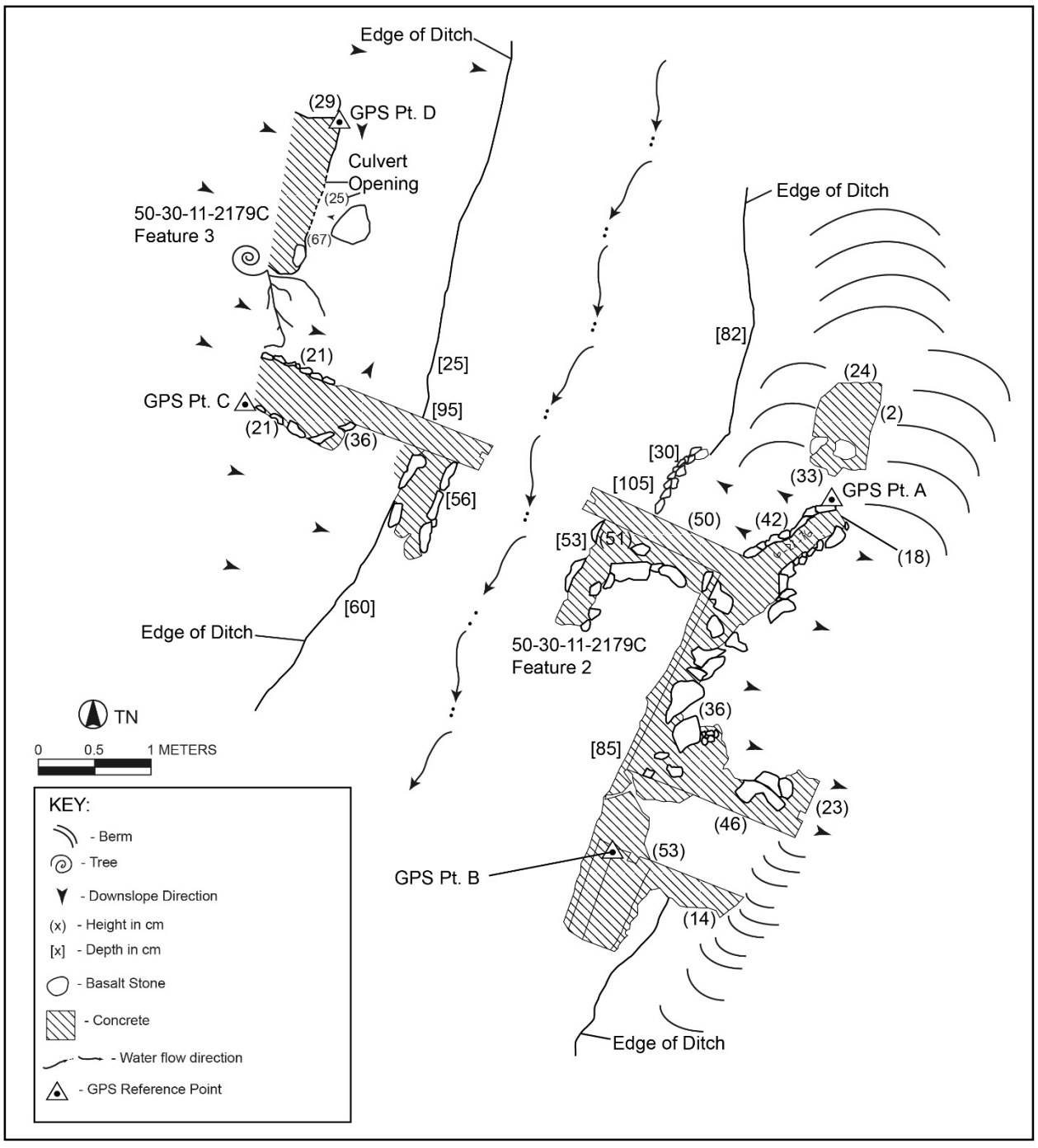

Figure 136. Plan view of SIHP # -2179 Feature C2 (two sluice gates) and Feature C3 (culvert) (Hunkin et al. 2014)

Figure 137. Photo of SIHP # -2179 Feature C3, an abandoned culvert located approximately 0.80 m north of Feature C2, view to southwest (Hunkin et al. 2014)

Figure 138. Photo of SIHP # -2179 Feature C3, an abandoned culvert, view to northwest (Hunkin et al. 2014)

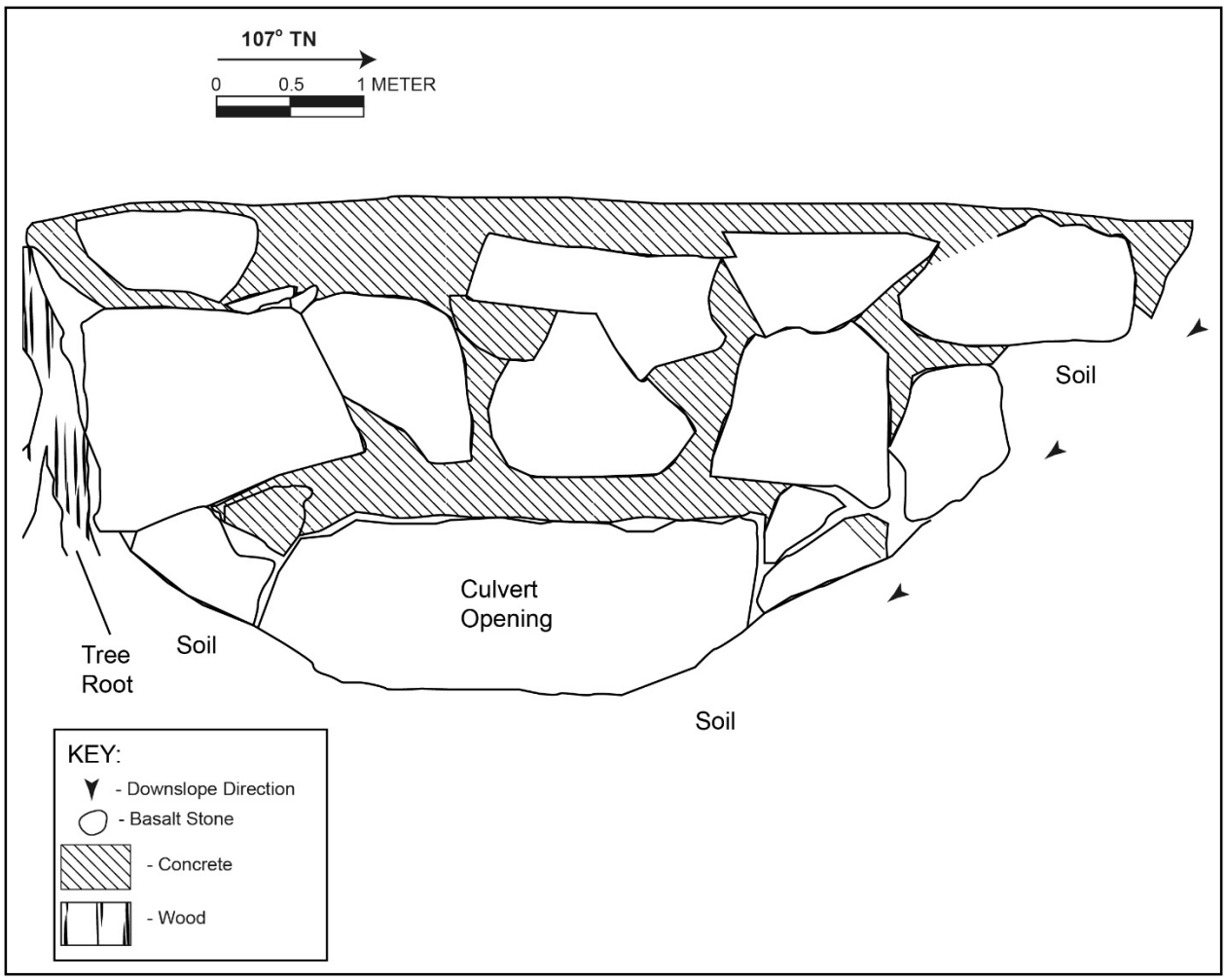

Figure 139. Elevation drawing of SIHP # -2179 Feature C3, an abandoned culvert (Hunkin et al. 2014)

> The time of the Feature C3's construction could not be determined.
>
> **Feature C4**. Two vertical rising sluice gates, one active and one abandoned, constitute Feature C4 (Figure 140 and Figure 142).
>
> The active sluice gate is aligned in a roughly NW/SE direction across SIHP # -2179 Feature C (the ditch). The gate has two pre-cast concrete wing walls and a vertical rising gate composed of two wooden boards. The gate opening measures approximately 0.80 wide and 1.20 m high. A large 4 in x 12 in board of treated wood straddles the ditch just southwest of (nearly atop) the active gate (Figure 141).
>
> The abandoned sluice gate is located on the northeast bank of the ditch, perpendicular to the active sluice gate, abutting the eastern half. No vertical rising gate was present. The gate opening is approximately 0.80 m wide and 1.20 m high. The abandoned gate is made of the same pre-cast concrete as the active gate and appears to have been constructed at the same time.
>
> Feature C4's construction could not be dated. [Hunkin et al. 2014:107–116]

Feature C is well outside the current project area. The feature was not observed during the current AIS. Hunkin et al. (2014) documented that the features and sub-features are still in use. Based on background research (see Section 3.1.5), the ditch is likely "Upper Ditch" which was built between 1914 and 1917. It is likely the associated culverts and sluice gates were constructed at the same time, however, they may be later modifications.

6.2.4 Feature D

SIHP # -2179 Feature D was previously documented by Hunkin et al. (2014). The feature is located outside the current project area and extends southwest from Feature A. The feature consists of one primary feature consisting of an irrigation ditch (Feature D), and one sub-feature consisting of a culvert (Sub-feature D1). The following is the description of the feature as documented by Hunkin et al. (2014):

> **Feature D** is a portion of an irrigation ditch that bordered the southwest portion of field 39A, as shown on a 1941 map of Lihue Plantation Co map (see Figure 19). Feature D is also evident on the 1965 aerial and 1977-1978 USGS aerial (see Figure 24 and Figure 25). Feature D, like Features B and C, was part of the Upper Lihue Ditch system, and also like those ditches, it fed into the Feature A reservoir. Three cross section profiles (CS1 through CS3) were recorded of Feature D prior to possible partial destruction during planned construction activities.
>
> CS1 was documented at Feature D's westernmost portion (Figure 143 and Figure 144). CS2 was documented at the central portion of Feature D (Figure 145 and Figure 146). CS3 represents the easternmost portion of Feature D (Figure 147 and Figure 148).
>
> A 1941 map of the Lihue Plantation Company's cane field system indicates that Feature D is located in what was once the upslope portion of Field 39A. The function of Feature D was to distribute water originating from Feature A

Figure 140. Photo of SIHP # -2179 Feature C4, one active and one abandoned vertical rising sluice gate, view to northwest (Hunkin et al. 2014)

Figure 141. Photo of SIHP # -2179 Feature C4, showing the 4-inch by 12-inch board of treated wood just southwest of (nearly atop) the active gate, view to west (Hunkin et al. 2014)

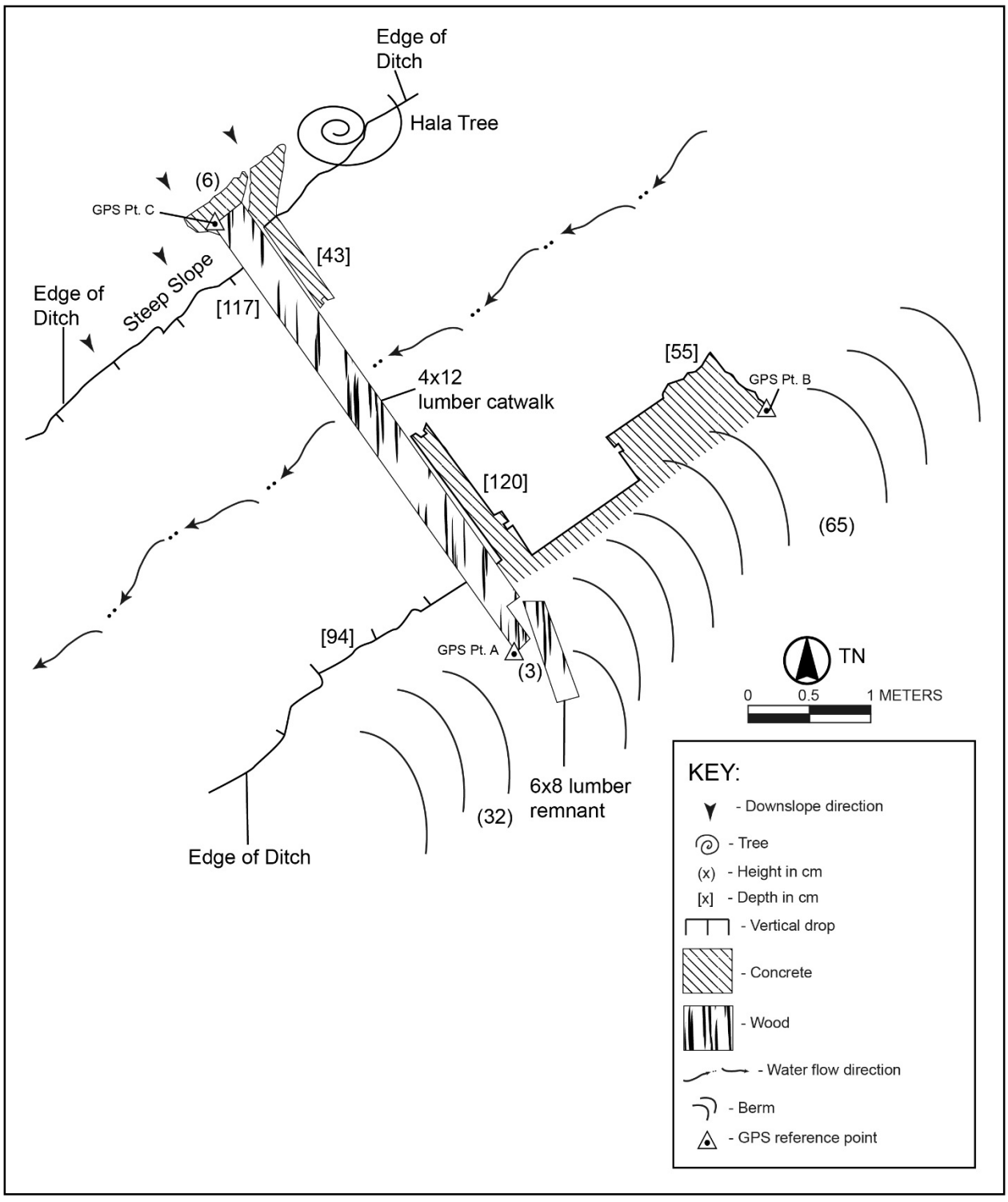

Figure 142. Plan view of SIHP # -2179 Feature C4, two vertical rising sluice gates (Hunkin et al. 2014)

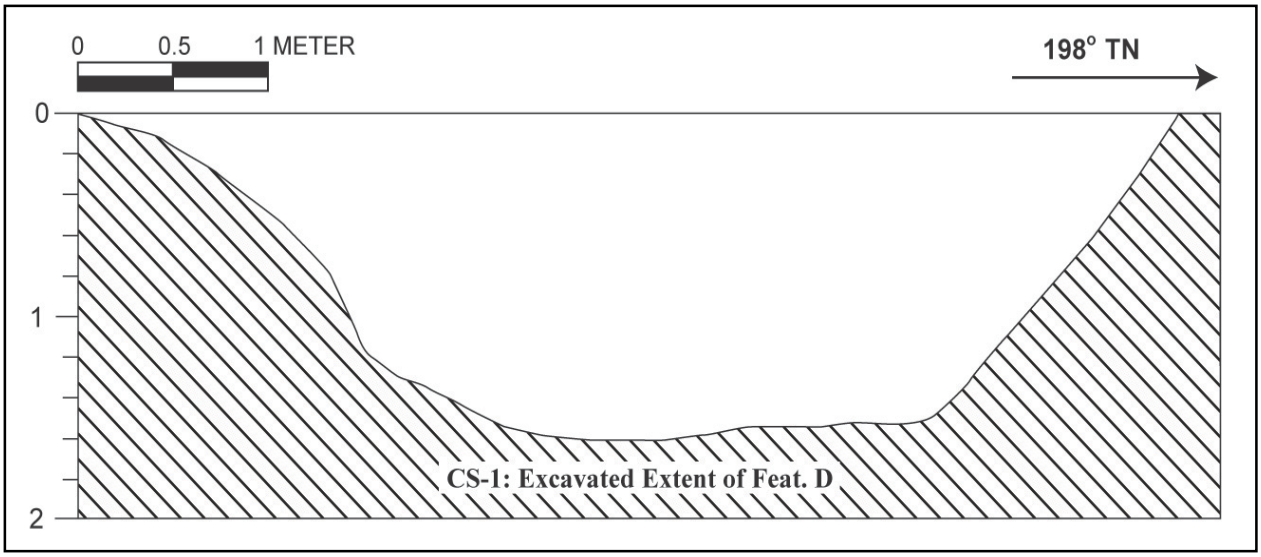

Figure 143. SIHP # -2179 Feature D, Cross Section 1 (Hunkin et al. 2014)

Figure 144. Photo of SIHP # -2179 Feature D, Cross Section 1, view to east (Hunkin et al. 2014)

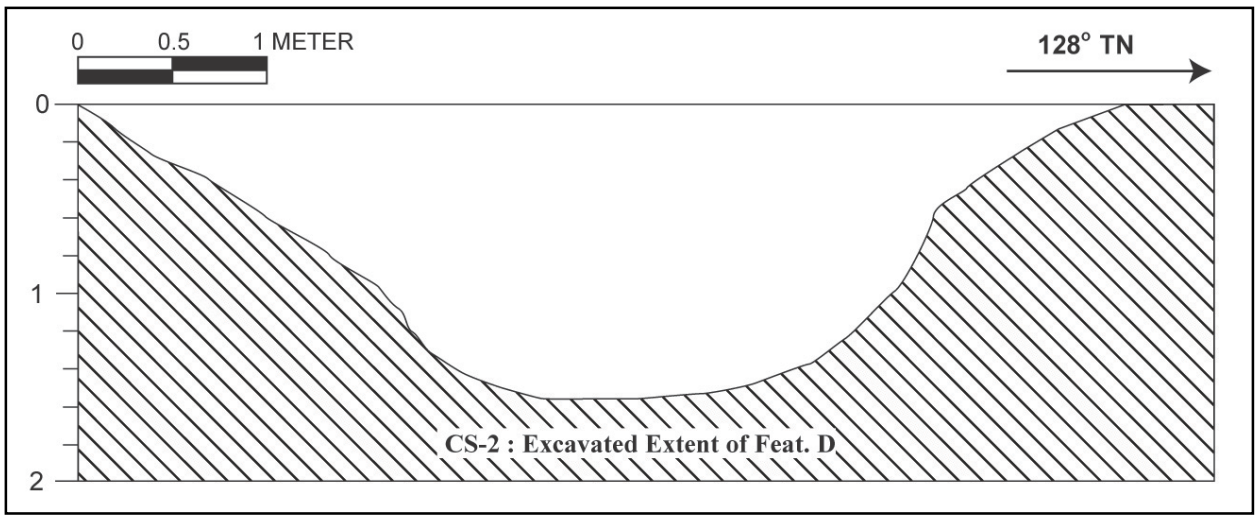

Figure 145. SIHP # -2179 Feature D, Cross Section 2 (Hunkin et al. 2014)

Figure 146. Photo of SIHP # -2179 Feature D, Cross Section 2, view to northeast (Hunkin et al. 2014)

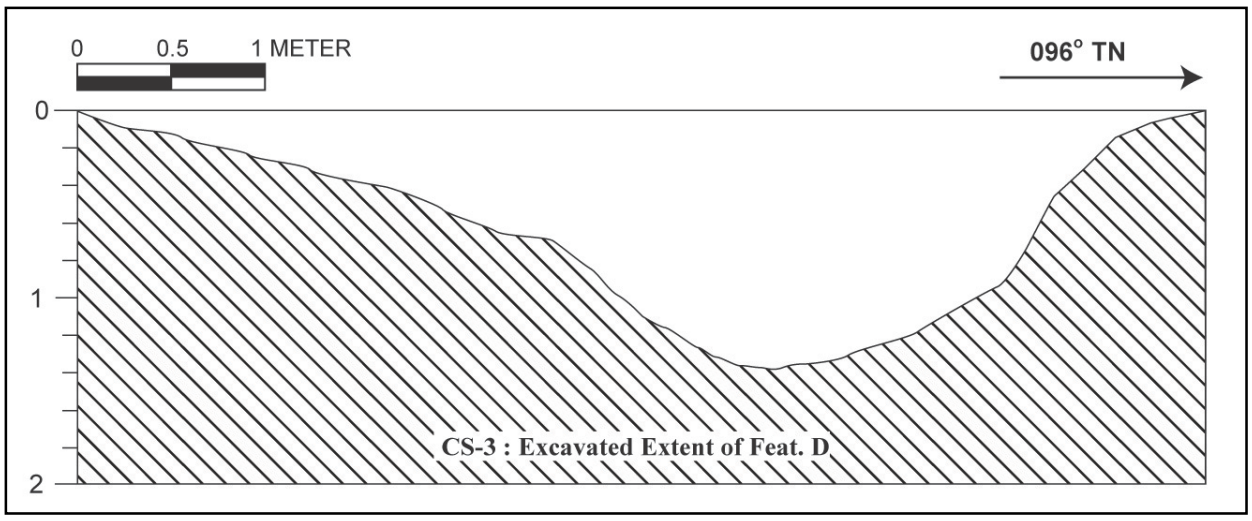

Figure 147. SIHP # -2179 Feature D, Cross Section 3 (Hunkin et al. 2014)

Figure 148. Photo of SIHP # -2179 Feature D, view to north (Hunkin et al. 2014)

> (reservoir) to flood cane fields to the east (down slope). The current condition of Feature D is poor, and is attributable to continuous modification due to subsequent agriculture-related land use and lack of maintenance.
>
> An outlet at the westernmost end of Feature D, designated as Feature D1 allowed water to flow from the Feature A reservoir into the Feature D ditch channel (Figure 149, Figure 151, and Figure 150). [Hunkin et al. 2014:123]

Feature D is well outside the current project area. The feature was not observed during the current AIS. Hunkin et al. (2014) documented that the features and sub-features have been abandoned and are in poor condition. The ditch is illustrated on a 1941 map, and it is likely the associated culvert would have been also present, unless the culvert is a later modification.

6.2.5 Feature E

SIHP # -2179 Feature E is a newly identified feature of the irrigation complex. The feature is located within the current project area and extends along the east boundary of the project area, from Feature A2 to the highway, where no remnant of the feature could any longer be observed. The feature consists of one primary feature consisting of an irrigation ditch (Feature E) and one sub-feature consisting of a concrete flume (Sub-feature E1).

Feature E is an abandoned plantation era earthen irrigation ditch (Figure 152 through Figure 156) measuring 852.3 m long by 1.6 m wide and 0.8 m deep (see Figure 96) that bordered the southwest portion of field 39A, as shown on a 1941 map of Lihue Plantation Company (see Figure 19). The southern portion of SIHP # -2179 Feature E does not appear to correspond to the plantation boundary. The ditch began at a berm at the southwest side of a reservoir adjacent to and northeast of the project area. It is likely the berm is a more modern feature to not allow water to flow into Feature E. The abandoned ditch continues in a southeasterly direction forming the southeastern boundary of the proposed project area.

Sub-feature E1 is a formed concrete flume that extends along an 82-m section on the north side of the ditch (Figure 158 through Figure 161). A portion of the flume and a cross-section was documented (see Figure 160 and Figure 161). The flume is 0.6 m wide by 0.7 m high and rests on intermittent concrete footings that are from 0.1 to 0.6 m high (see Figure 158). Water was apparently diverted into the flume at one time with remnants of the ditch extant near the flume.

Feature E is located in an area used primarily for illegal dumping between the KCC campus and Kilohana Plantation, the former estate of Wilcox. Debris and trash were observed throughout the feature. Several areas of the feature were disturbed, eliminating distinguishing elements in those areas. The feature has been abandoned; however, it appears the ditch has been repurposed for storm and surface runoff drainage.

6.2.6 Feature F

SIHP # -2179 Feature F is an abandoned plantation-era reservoir that measures 196 m by 123 m and is between 5 and 6 m deep (see Figure 96). The feature consists of one primary feature consisting of a former reservoir (Feature F), and two sub-features consisting of a sluice gate (Sub-feature F1) and a culvert (Sub-feature F2). The former reservoir is located in the southeast portion of the proposed project area adjacent to existing buildings. The former reservoir is currently used as a flood control basin for the KCC campus.

Figure 149. Photo of SIHP # -2179 Feature D1, outlet at the westernmost end of Feature D, which indicates water from Feature A was diverted and fed into Feature D to be transported to feed cane fields to the east (slightly down slope from Features C and A), the original Lihue Plantation Company’s cane field 39A, view to west (Hunkin et al. 2014)

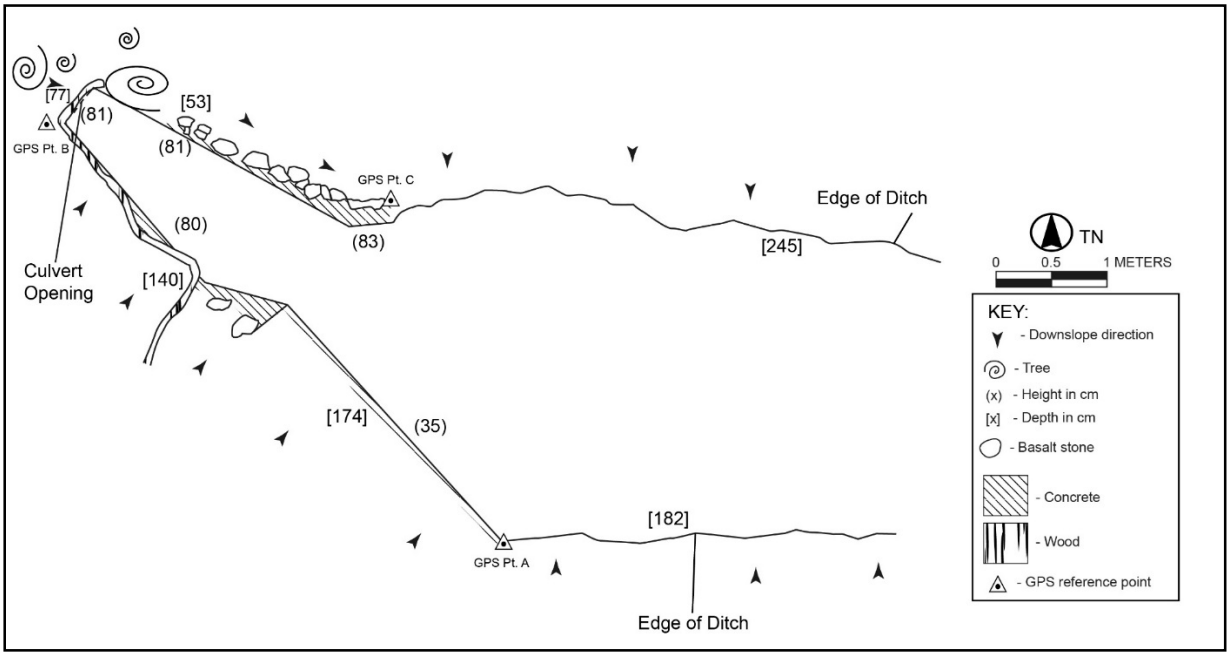

Figure 150. Plan view of SIHP # -2179 Feature D1, portion of an irrigation ditch SIHP # -2179 Feature D (Hunkin et al. 2014)

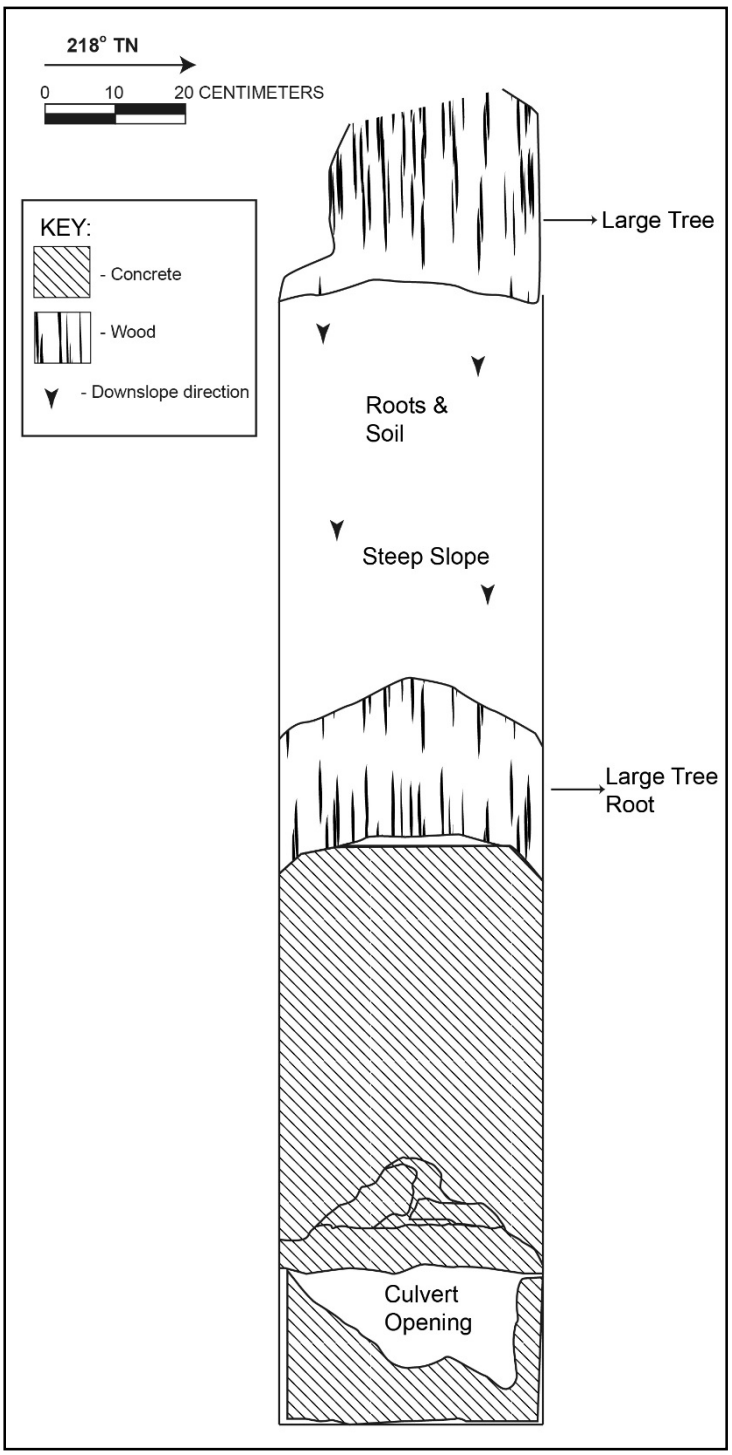

Figure 151. Elevation drawing of SIHP # -2179 Feature D1 at culvert opening in the northwest corner (Hunkin et al. 2014)

Figure 152. SIHP # -2719 Feature E, abandoned irrigation ditch, view to north

Figure 153. SIHP # -2179 Feature E, abandoned irrigation ditch, view to east

Figure 154. Small berm separating SIHP # 2179, Feature A (foreground) from SIHP # -2179 Feature E (background), view to southwest

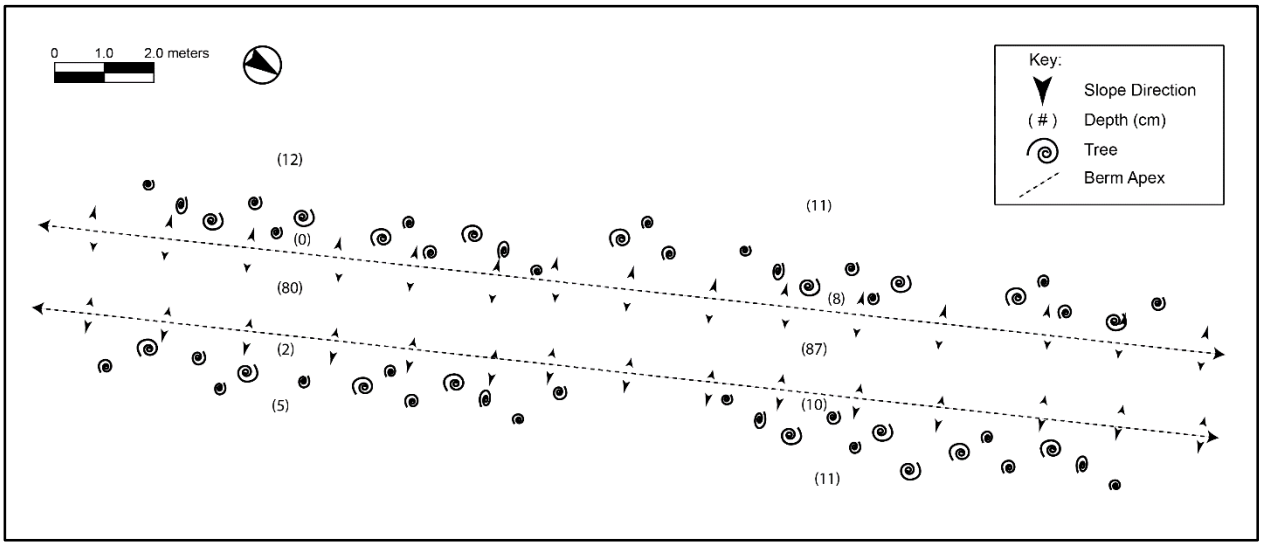

Figure 155. Plan map of a portion of SIHP # -2179 Feature E, abandoned irrigation ditch

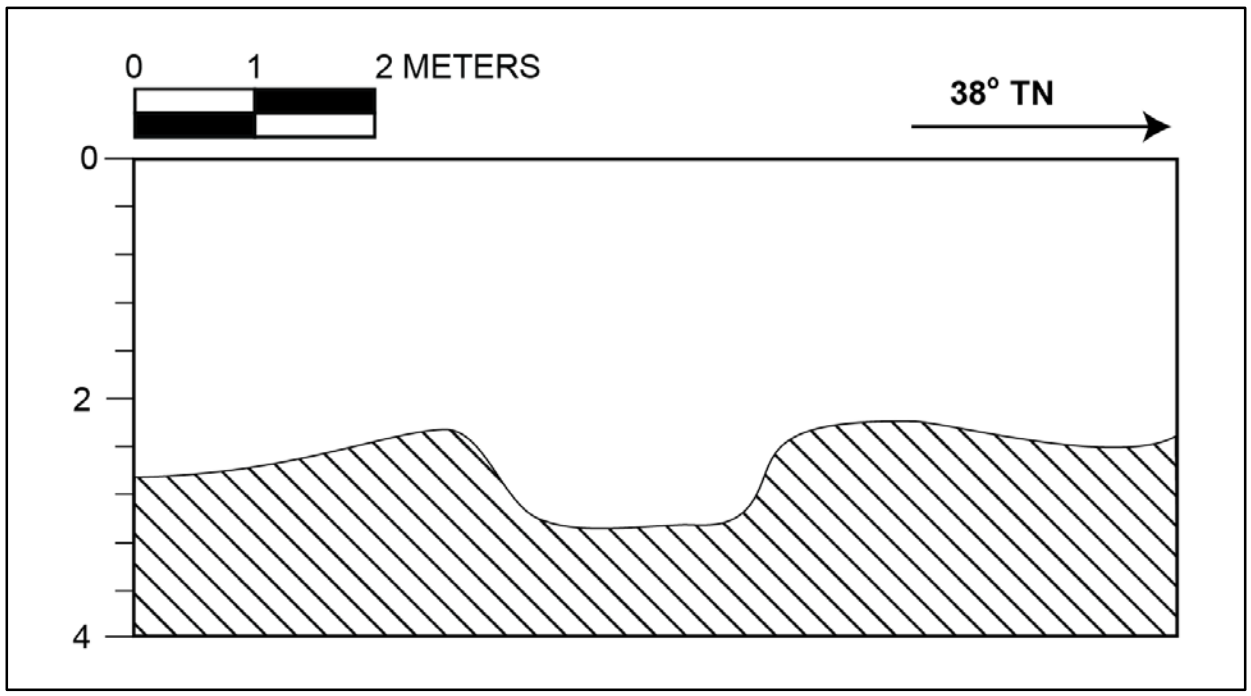

Figure 156. CS-10, cross-section of Feature E, abandoned irrigation ditch

Figure 157. SIHP # -2179 Feature E1, flume, showing concrete footings, view to northwest

Figure 158. Portion of flume, SIHP # -2179 Feature E1, view to northwest

Figure 159. Portion of SIHP # -2179 Feature E1, view to east

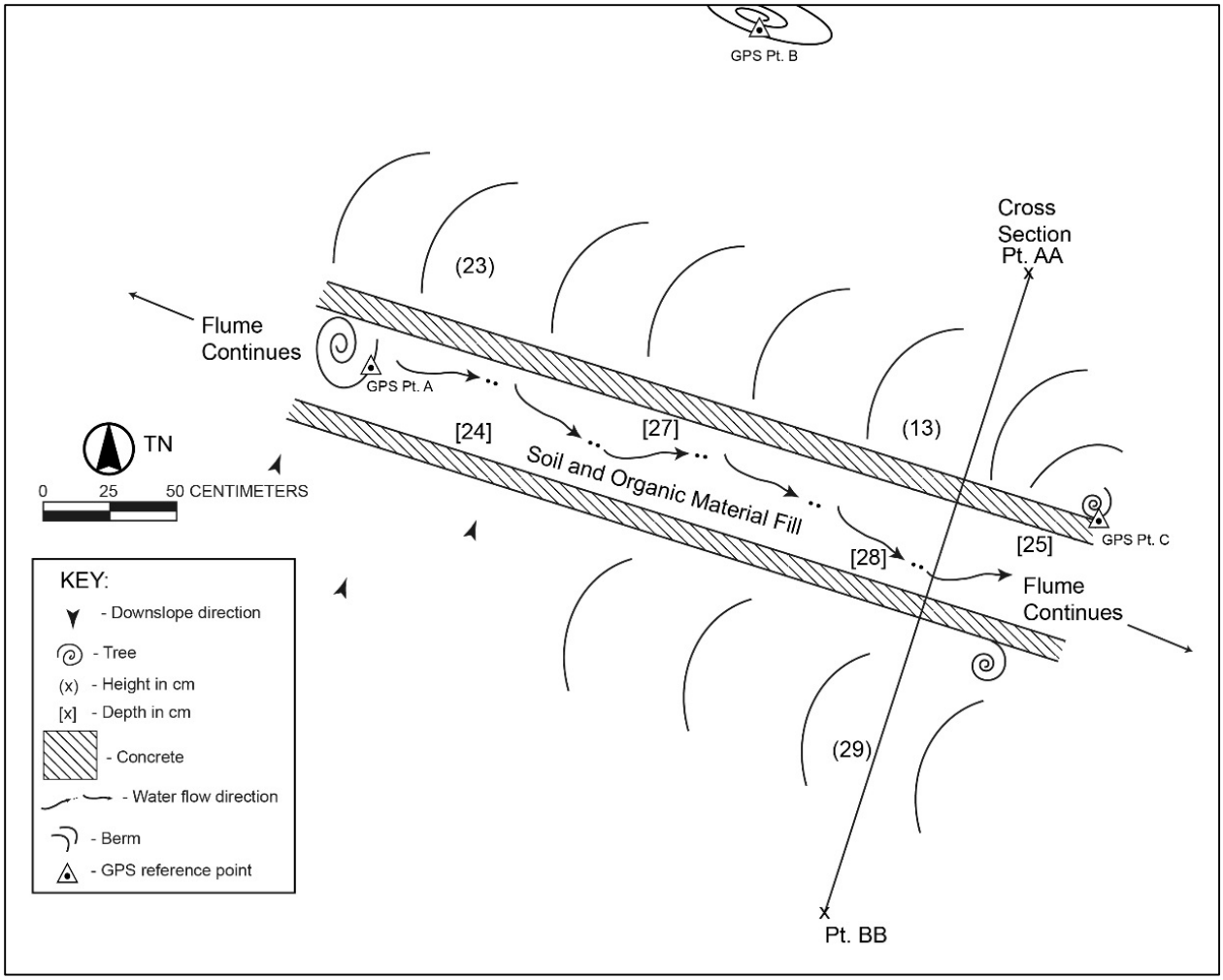

Figure 160. Plan map of a portion of the concrete flume SIHP # -2179 Feature E1

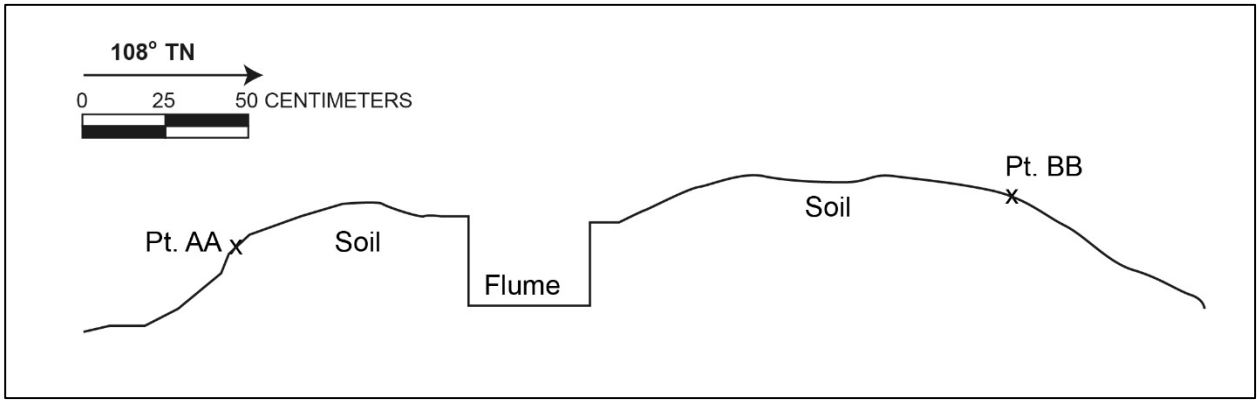

Figure 161. Cross-section of concrete flume (Feature E1), showing the elevation of area

Feature F has been terraced except for the area near the old gate and the north side (Figure 162). A depression that enters the former reservoir from the north side may have marked the alignment of the original feeder ditch, but is now a modern flood control feature dug into the reservoir floor. Other modern modifications include several storm drain outlets that flow into the reservoir, and a concrete overflow drain on the southwest side. Feature F is shown as an intermittent lake/pond on the 1996 Lihue USGS quadrangle (see Figure 1). The reservoir is also shown on the 1910 and 1963 Lihue USGS quadrangles (see Figure 10 and Figure 21).

Sub-feature F1 is a sluice gate at the southeast side of Feature F (Figure 163 through Figure 166). The sluice gate is associated with a square-shaped basalt and mortar retaining wall that is approximately 3 m in length by 0.15 m wide and 4.2 m tall. The sluice gate is not directly on the retaining wall but is rather on a wooden structure attached to the retaining wall. Wooden posts and crossbeams make up the structure that holds the sluice gate. The sluice gate is composed of a metal plate that currently seals the inflow tunnel, and grooved metal rod that extends to a wheel approximately 82 cm above the top of the mortared basalt retaining wall.

Sub-feature F2 is the culvert that is likely the outflow of Sub-feature F1 (Figure 167 through Figure 169). Sub-feature F2 is located south of Feature F and connects to a modern flood-control channel that extends toward the highway. The concrete-capped mortared basalt culvert is of similar materials and style as Sub-feature F2 and consists of a center portion and two angled and sloped sidewalls that extend outward in a V-shape from the center portion. The center portion is 1.2 m long and 0.3 m wide. The angled and sloped sidewalls are approximately 2.7 m in length and 0.3 m wide. The use of a concrete pipe and the general design characteristics suggests this culvert is more modern than Sub-feature F2 and likely was constructed when the reservoir was reconstructed into a flood control basin.

Feature F and associated sub-features have been repurposed and are no longer used for irrigation purposes. Their function is flood control purposes; the associated irrigation ditches that were associated with the former reservoir have been destroyed. Modified channels follow the former ditch alignments to allow for floodwaters to flow safely through the KCC campus.

6.2.7 Feature G

Feature G is a plantation-era irrigation ditch measuring approximately 400 m long that courses from a reservoir (Feature A) adjacent to the east boundary of KCC and terminates at a reservoir (Feature H) (Figure 170 and Figure 171). From Feature A, the ditch flows west along the north side of the road that encompasses the presently developed KCC campus. The ditch then continues south, where it meets up with Feature M (Figure 172), then terminates at Feature H (see Figure 96). The feature consists of one primary feature consisting of an irrigation ditch (Feature G), and two sub-features consisting of a sluice gate remnant (Sub-feature G1) and a culvert (Sub-feature G2).

Feature G originates at SIHP # -2179 Sub-feature A4. The irrigation ditch is an earthen ditch, 85 m deep with a surface width of 2.0 m. The ditch walls are sloped, resulting in a bottom width of 1.0 m. The ditch is currently active and is the only in-use outflow of the reservoir (Feature A). The 1963 USGS map (see Figure 21) shows a portion of the “Upper Ditch” that appears to include the reservoir adjacent to the east boundary of KCC. Based on the association of Feature G and the adjacent reservoir (Feature A), Feature G may have also been associated with the “Upper Ditch.” Feature G is seen on a 1933 LCA 1087 Map 1 (see Figure 16), connecting two reservoirs (Features H and F); however, in no longer continues to Feature F.

Figure 162. SIHP # -2179 Feature F former reservoir, view to northeast

Figure 163. Sluice gate (Sub-feature F1) associated with Feature F, view to north

Figure 164. SIHP # -2179 Sub-feature F1 showing mortared basalt retaining wall and wooden beam structure holding sluice gate, view to southeast

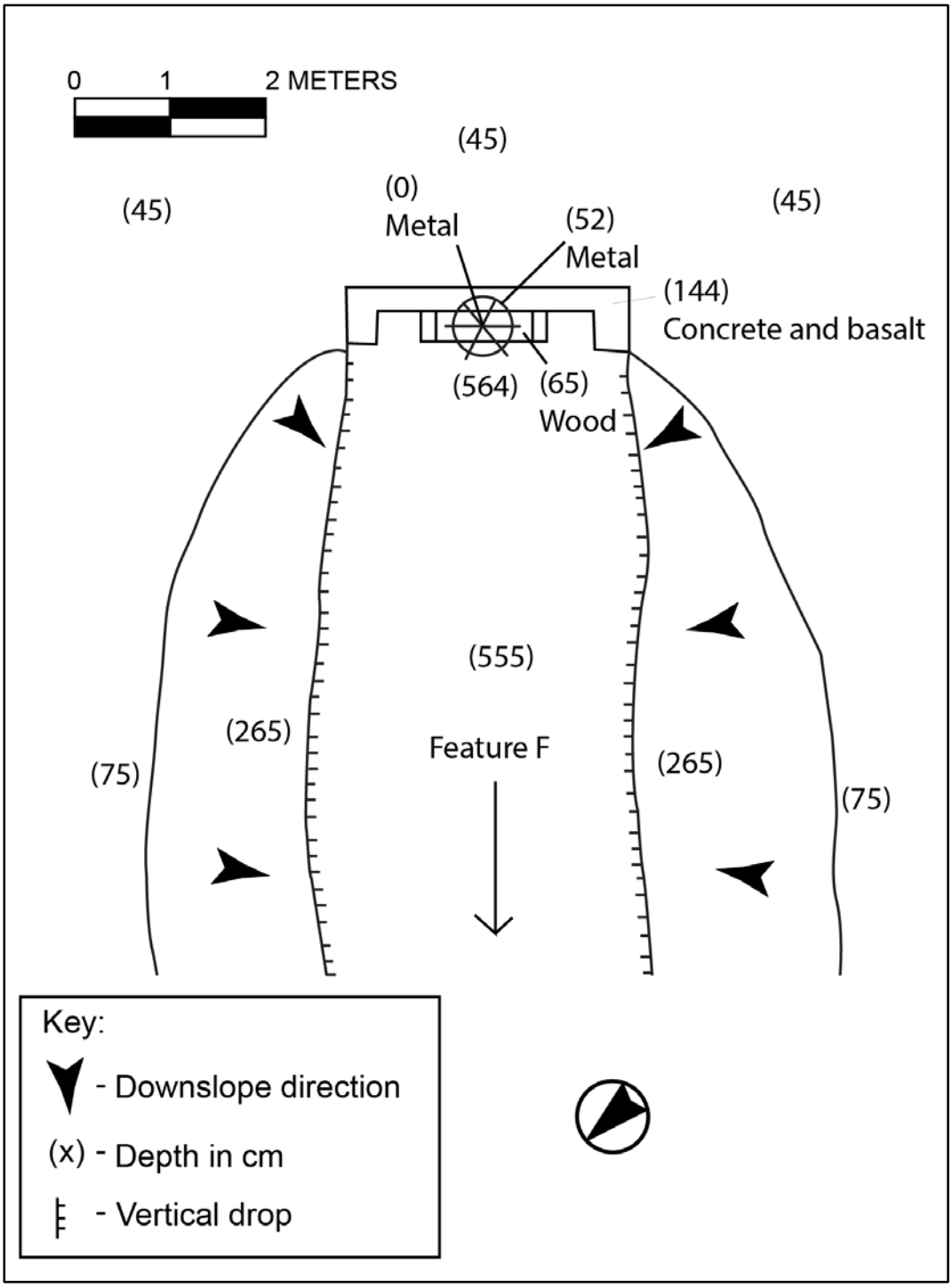

Figure 165. Plan map of SIHP # -2179 Sub-feature F1

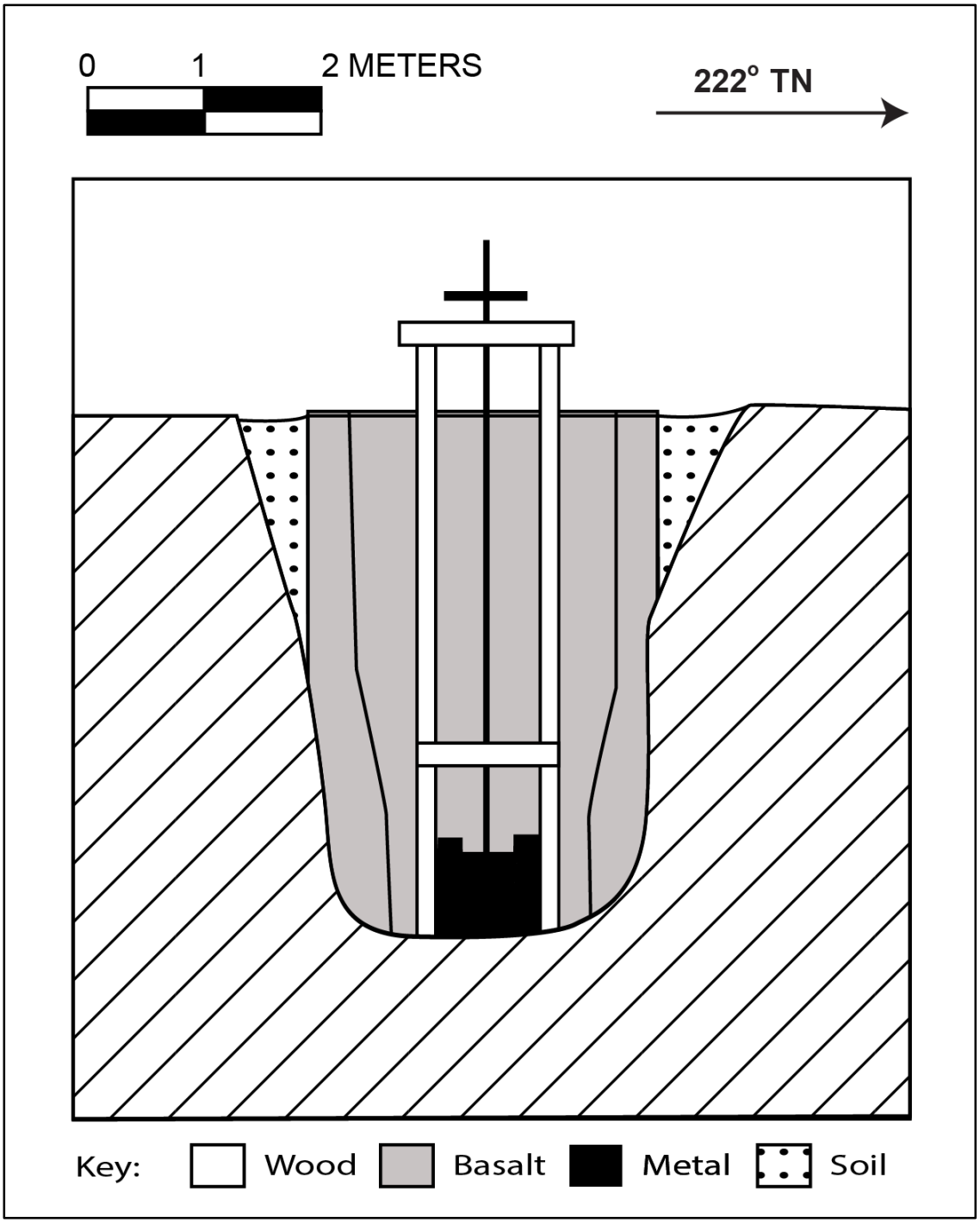

Figure 166. Profile map of SIHP # -2179 Sub-feature F1

Figure 167. SIHP # -2179 Sub-feature F2, view to northwest

Figure 168. SIHP # -2179 Sub-feature F2, showing channel for floodwaters, view to southeast

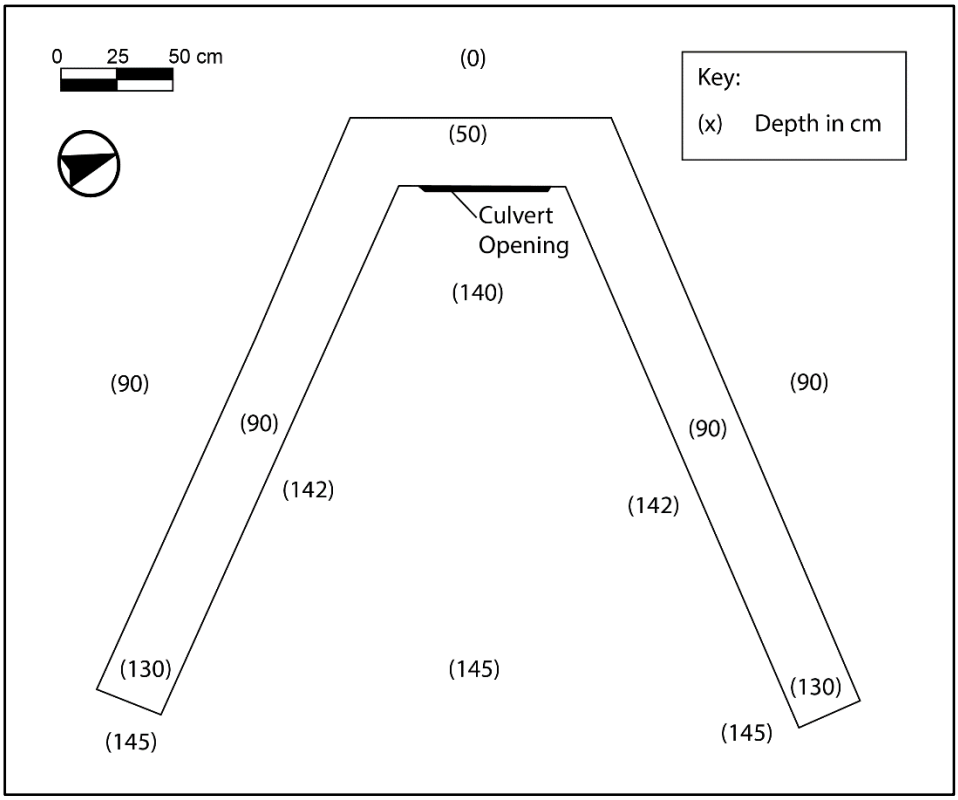

Figure 169. Plan map of SIHP # -2179 Sub-feature F2

Figure 170. SIHP # 2179 Feature G, irrigation ditch, view to northwest

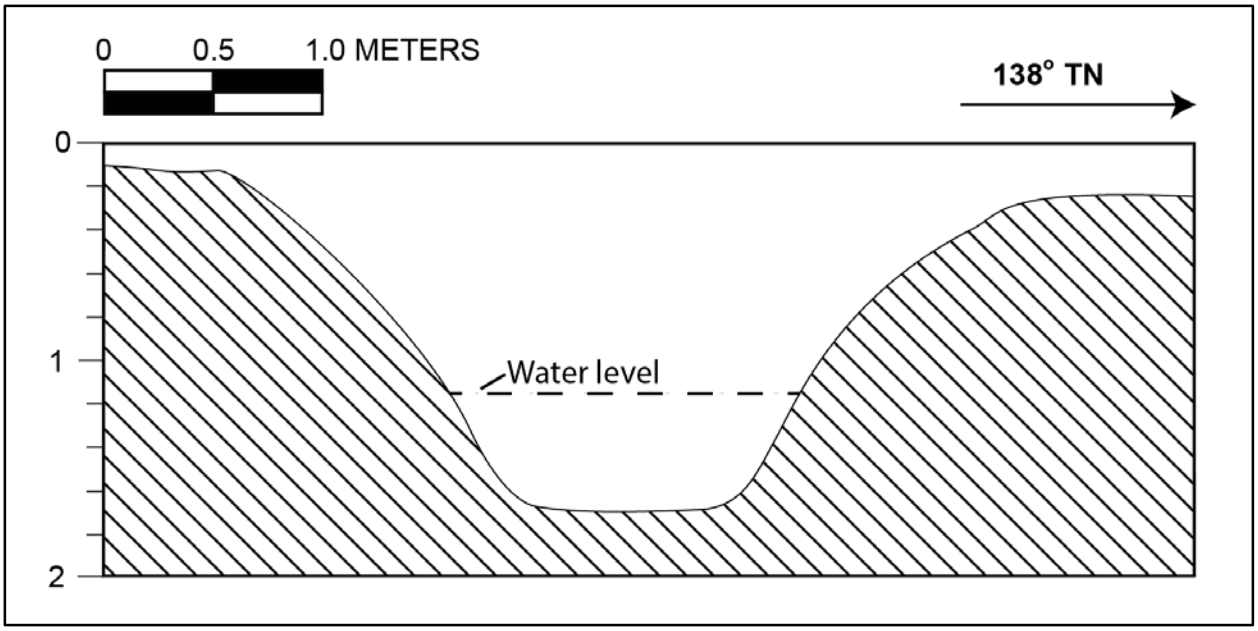

Figure 171. CS-11, cross-section of SIHP # -2179 Feature G

Figure 172. View of the confluence of SIHP # -2179 Features G and M, view to southwest

Sub-feature G1 is an abandoned sluice gate remnant observed in the ditch's westward flowing portion. The remnants consist of three individual portions: a large concrete wall bisecting a portion of the ditch, and two former sluice gate structures that run parallel to the ditch (Figure 173 and Figure 175). The concrete wall portions consist of a wall with a notch for a sluice gate. The wall is 105 cm long by 15 cm wide and 128 cm tall at its maximum extents. The concrete wall drops at the south end, where a lower 15-cm wide concrete wall was observed. It is likely the sluice gate was located on this short wall. The wall is broken and likely met up with a wall on the south side similar to the northern wall. Along the south berm of Feature G are two buried sluice gate features. The features are broken and buried in the current berm. The two concrete 50-cm long by 15-cm wide features have sluice gate notches which suggests the two concrete features are former concrete housing for a sluice gate. These two concrete structures were likely a water diversion for irrigation of the southern fields (now the developed portion of the KCC campus).

Sub-feature G2 is a culvert located where the former cane haul road extends north from the previously discussed paved road (Figure 176 and Figure 178). The feature consists of a U-shaped basalt retaining wall that channels the water into a metal pipe which carries the water to a second U-shaped basalt retaining wall. A modified cinder block connected to a plastic pipe diverts a portion of the water through a pipe to an unknown location. The majority of the water that flows through the culvert continues to the confluence with Feature M, until it meets with Feature H. The sub-feature is not shown on any maps or photographs; however, the road that passes over the culvert is shown crossing the ditch on a 1933 Land Court Application 1087 Map 1. It is possible Sub-feature G2 was extant at the time the map was created. The feature is still in use.

Feature G is one of the two main in-use irrigation ditches in the current project area. Based on background research (see Section 3.1.5), the ditch is likely "Upper Ditch," which was built between 1914 and 1917. It is likely the associated culverts and sluice gates (Sub-features G1 and G2) were constructed at the same time, however, they may be later modifications.

6.2.8 Feature H

Feature H is a plantation-era reservoir located just to the east of Pūnana Leo Pre-School and Kawaikini Charter School within the project area (Figure 179 and Figure 180). The active reservoir is situated in the center of the project area (see Figure 96). The feature consists of one primary feature consisting of an in-use reservoir (Feature H), and one sub-feature consisting of a concrete and metal water control gate and flume (Sub-feature H1).

Feature H measures approximately 126 m by 56 m. The water level fluctuates drastically on a regular basis, with water levels during the course of fieldwork ranging from full to approximately 2 m below the highest water level. Drastic variations were observed within days. A symbol for a reservoir is shown in the location of Feature H on the 1910 (see Figure 10), the 1963 (see Figure 21), and the 1996 (see Figure 1) Lihue USGS maps. The reservoir may be associated with the "Mauka Ditch" as illustrated on an undated Grove Farm map (see Figure 20).

Sub-feature H1 consists of a mortared basalt, concrete and metal water control sluice gate and concrete flume (Figure 181 through Figure 187). The structure is located along the south side of the reservoir (see Figure 96). Water from the reservoir flows out through the gate under the road that leads to Pūnana Leo Pre-School and exits in a concrete flume to flow down into Feature I, an in-use earthen ditch (see Figure 186 and Figure 187). The sluice gate and the intake for the flume are located at a retaining wall structure constructed of mortared basalt that measures 10.5 m by

Figure 173. SIHP # -2179 Sub-feature G1, sluice gate remnant, view to west

Figure 174. SIHP # -2179 Sub-feature G1, sluice gate remnants, view to east

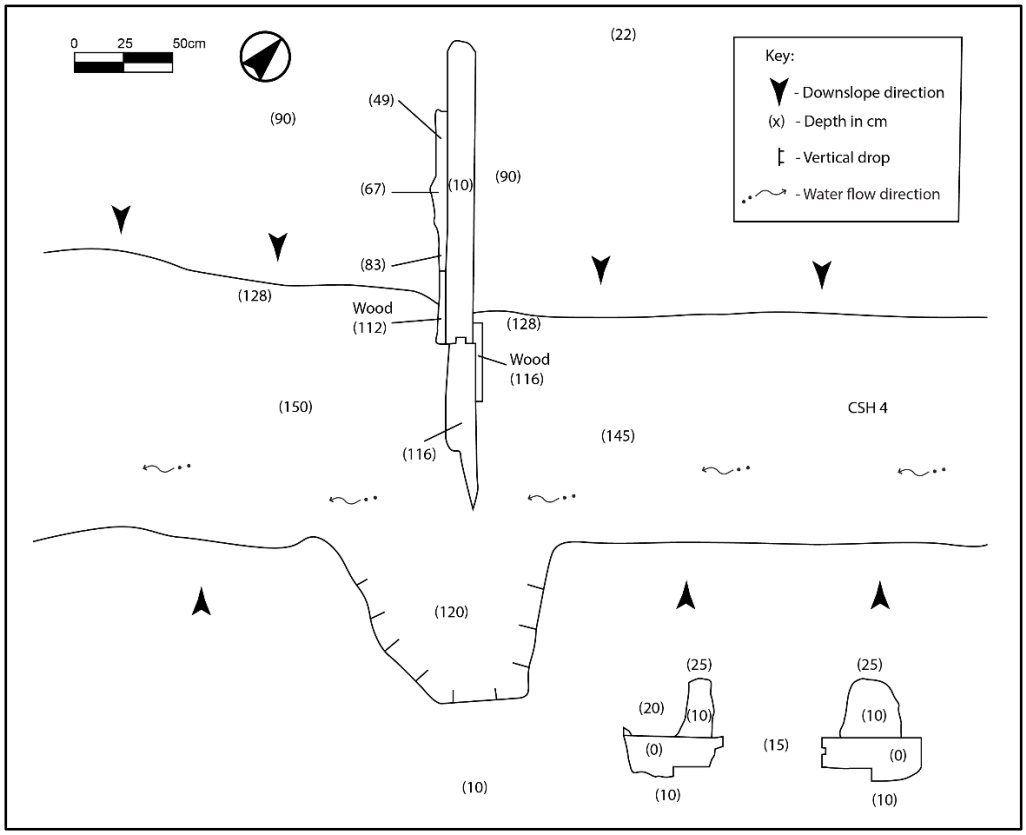

Figure 175. Plan map of SIHP # -2179 Feature G1

Figure 176. SIHP # -2179 Feature G2, west end of culvert showing modern pipe for diverting and transporting water, view to northwest

Figure 177. SIHP # -2179 Feature G2, east end of culvert, view to west

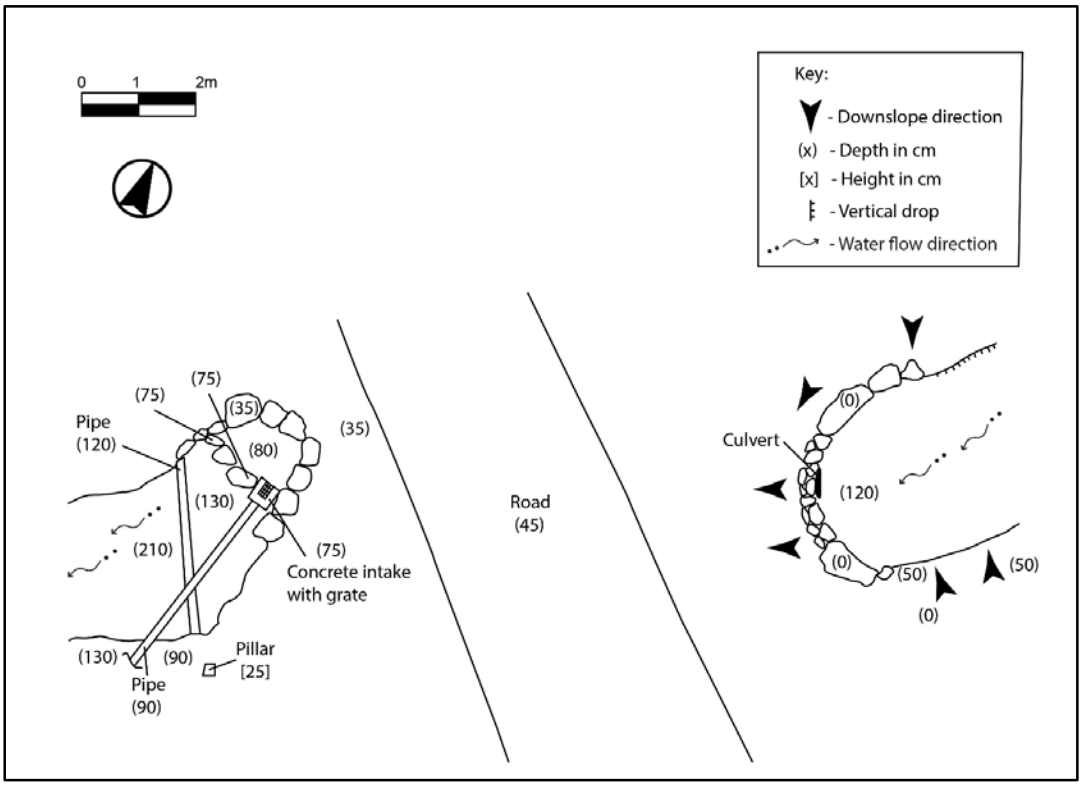

Figure 178. Plan map of SIHP # -2179 Feature G2

Figure 179. SIHP # -2179 Feature H, reservoir in center of project area at fullest extent, view to north

Figure 180. SIHP # -2179 Feature H, reservoir in center of project area, showing Sub-feature H1 in background, view to southeast

Figure 181. SIHP # -2179 Sub-feature H1, retaining wall, view to south

Figure 182. SIHP # -2179 Sub-feature H1, showing retaining wall, sluice gate (right), and flume (left) with lower water level in Feature H, view to northeast

Figure 183. SIHP # -2179 Sub-feature H1, showing retaining wall, sluice gate (right), and flume (left) with lower water level in Feature H, view to southeast

Figure 184. Date engraved in flume associated with SIHP # -2179 Sub-feature H1

Figure 185. SIHP # -2179 Sub-feature H1, flume on west end of road, view to southeast

Figure 186. Profile view of sluice gate outtake and flume at the origin of Feature I, irrigation ditch, view to west

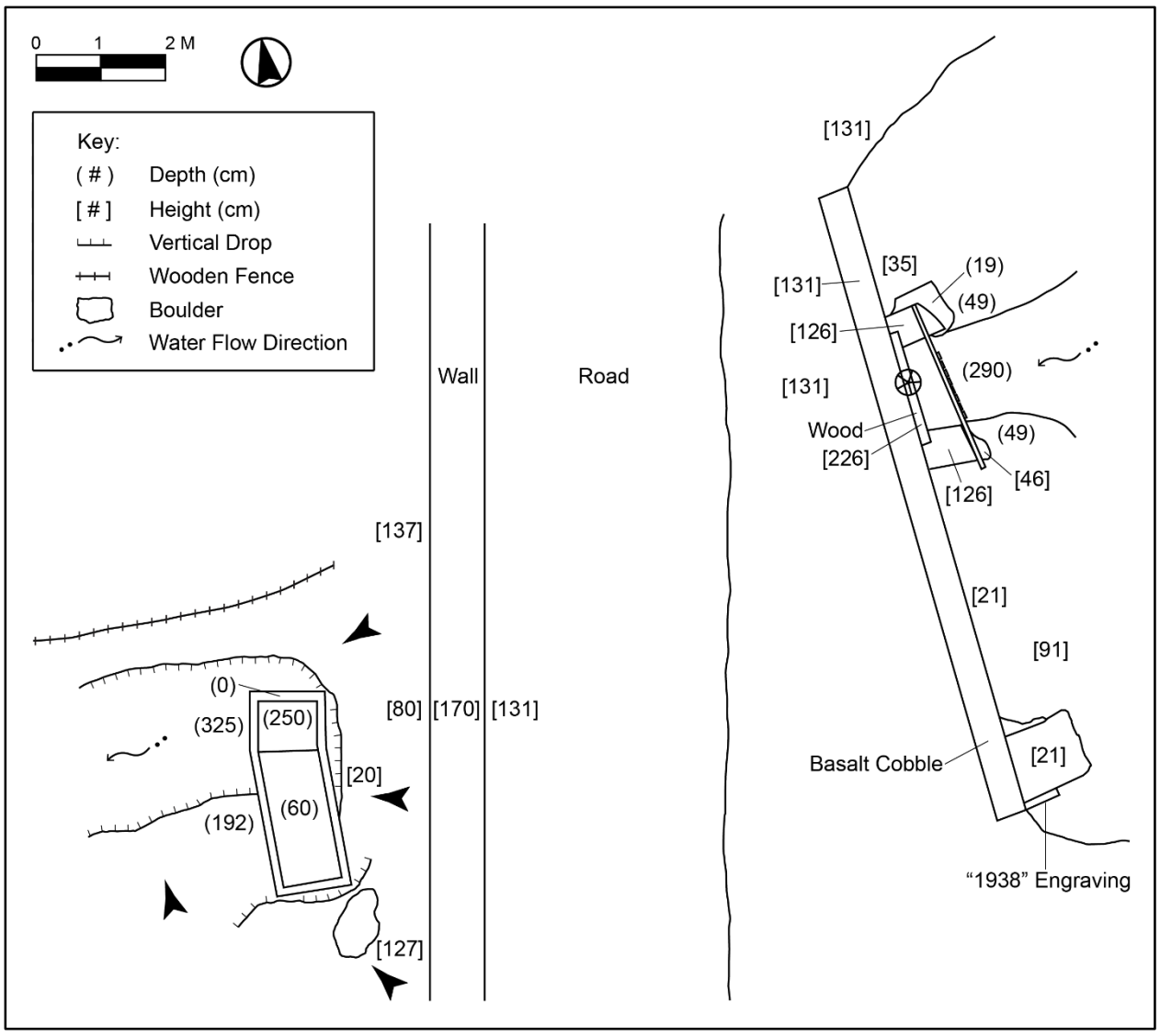

Figure 187. Plan map of SIHP # -2179 Sub-feature H1, water control infrastructure, depicting Feature H (right) and Feature I (left)

0.7 m and has a maximum height of 4.2 m. The water control sluice gate is located on the north portion of the wall. The sluice gate is constructed of metal, including a gate, grooved pole, and wheel that is housed on atop wooden beams secured to the retaining wall. There are 12 steel rails resting against a horizontal rail, with the probable function of preventing debris from clogging the pipe that extends under the road. The rails are likely reused from the plantation railroads. Two short mortared basalt walls extend into the reservoir on either side of the gate feature, likely installed to help channel the water. A modern concrete retaining wall was observed adjacent to the roadway on the west side, however, this wall is not associated with the sub-feature.

The flume associated with Sub-feature H1 is located on the south end of the retaining wall and extends under the paved road, and meets up with Feature I. The intake for the flume is located substantially higher than the gate, likely a flood control feature, to prevent the reservoir from overflowing its banks. The flume measures about 26 m long by 1 m wide with a maximum height of 3.9 m where it drops down into Feature I. The flume appears to post-date the retaining wall and sluice gate structure and abuts the retaining wall. The flume is constructed of basalt gravel and mortar. The stones are substantially smaller than the adjacent structure. The intake is approximately 1 m wide by 0.7 m tall. The date “1938” is engraved on the concrete sidewall of the intake (see Figure 184). On the west side of the road the flume is an open trough that extends in a north-south direction for approximately 2 m, before dropping into Feature I. The water from the previously described sluice gate flows through the base of the flume at this location as well.

Feature H and the associated sub-feature are still in-use. The reservoir acts as the central reservoir for all in-use irrigation ditches that flow through the project area. The reservoir was likely constructed prior to 1910. The mortared basalt retaining wall and sluice gate feature was likely constructed at the same time, however, it may be a later modification and pre-dates the flume which was constructed in 1938.

6.2.9 Feature I

Feature I is a plantation-era earthen irrigation ditch that courses from a reservoir (Feature H) through the former Puhi Camp and beyond the project area (see Figure 96). The feature is still in use, functioning as the main ditch flowing through the project area. The feature consists of one primary feature consisting of an irrigation ditch (Feature I), and four sub-features consisting of a sluice gate (Sub-feature I1), a stream ford (Sub-feature I2), and two culverts (Sub-features I3 and I4).

Feature I primarily follows a natural hollow that has been modified for use as an irrigation ditch (Figure 188 and Figure 189). The ditch follows the natural contours of the area. The length of the ditch measures 314.5 m with widths that vary from 1.0 m to 3.5 m and depths that vary from 0.7 m to 1.5 m. The ditch is observed in its current extent on the 1930 Plan of Puhi Camp by W.M. Moragne (see Figure 11) and the 1933 Land Court Application 1087 Map 1 (see Figure 16). A stream or ditch is illustrated on the 1901 Wall map of Grove Farm (see Figure 8); however, the illustrated stream is shorter and in a slightly different path from the current Feature I. It is unclear whether this stream is Feature I, or a natural intermittent stream that follows the previously described natural hollow. The ditch meanders southeast from Feature H and flows to Sub-feature I1.

Sub-feature I1 consists of two sluice gates that divert a portion of the water flow of Feature I into Feature J, a pond and former ditch (Figure 190 through Figure 193). The sluice gates are located on the north side of Feature J, approximately 55 m south of Feature H. The sub-feature is

Figure 188. SIHP # -2179 Feature I, showing bend in ditch southwest of Sub-feature H1 and northeast of Sub-feature I1, view to west

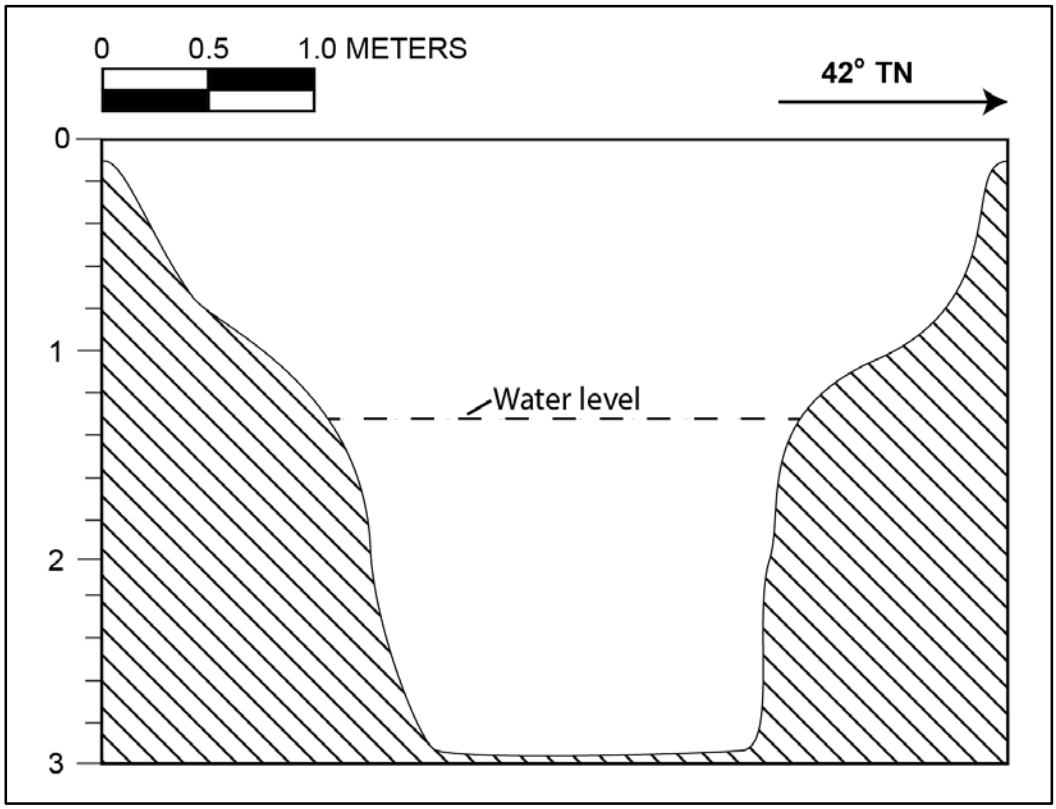

Figure 189. CS-12, cross-section of SIHP # -2179

Figure 190. SIHP # -2179 Sub-feature I1, north sluice gate, diverting water to pipe that flows under grass road to Feature J, view to east, photo adapted from Groza and Hammatt 2010 (note wooden bridge over the south sluice gate had not yet been constructed)

Figure 191. SIHP # -2179 Sub-feature I1, south sluice gate and modern wooden bridge, maintaining water flow to Feature I, view to northeast

Figure 192. SIHP # -2179 Sub-feature I1, south sluice gate, maintaining water flow through Feature I, view to north

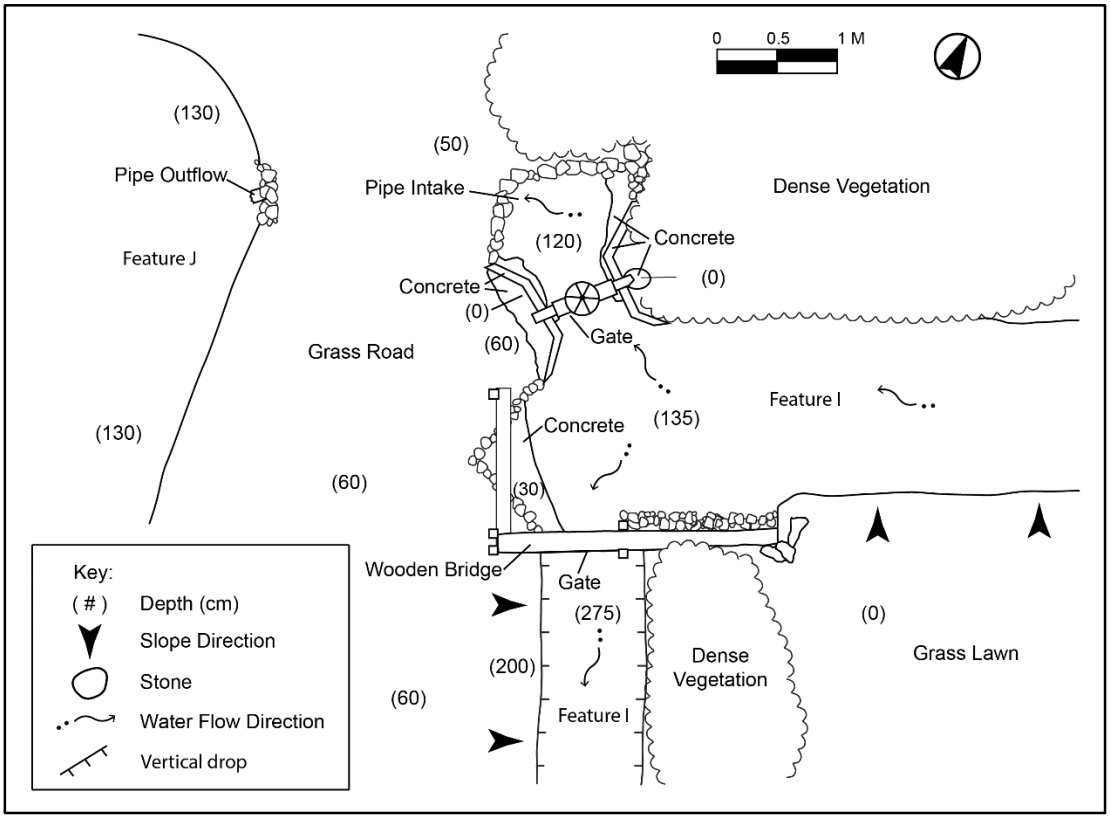

Figure 193. Plan map of Sub-feature I1, showing a portion of Features I and J

L-shaped measuring approximately 2.85 m long by 1.0 m wide on the north end and 2.0 m wide on the south end. The walls of the feature are approximately 60 cm above the grass road surface to the west. The north sluice gate allows water flow to Feature J, and the south sluice gate allows water flow to continue within Feature I.

The north vertical rising sluice gates are intact, constructed of wood and metal and comprised of a metal plate, screw and hand-cranked wheel, housed on a wooden frame. The frame is mounted atop a concrete foundation structure. The metal screw rises 2.0 m above the concrete foundation with the gate opened. The water flows from Feature I, through the north sluice gate into a small basalt cobble-lined reservoir where the water flows through a metal pipe under the grass road and into Feature J. The south sluice gate is comprised of a wooden gate that currently acts as a weir, held in place by an in-channel recessed groove within the approximately 2.0-m long by 0.15-m wide and 2.75-m tall concrete foundation and retaining wall. The water that continues to flow within Feature I flows over the gate and drops approximately 1.4 m into a deep channel. The concrete foundation of the sluice gate also functions as a retaining wall. A basalt cobble wall with concrete infill comprises the west wall connecting the two sluice gate foundations. A modern wooden bridge was constructed atop the south wall to allow for pedestrian traffic over the sub-feature. On the 1930 map, the diversion of Feature I is illustrated which shows the continuation of Feature I, as well as a ditch that follows a similar path as Feature J, a third ditch which flowed from Feature H, a ditch which flowed west from Sub-feature I1 to the gulch edge and then south to the highway, and a ditch that went east from Feature H, likely terminating at Feature F. No remnants of the latter three ditches were observed during the current AIS. Sub-feature I1 was likely constructed at the time this ditch complex was constructed, suggesting the sub-feature pre-dates 1930; however, it may be a more modern modification.

Sub-feature I2 consists of a mortared basalt stone stream ford and associated retaining wall (Figure 194 through Figure 197). The stream ford is located on the south side of Feature J, approximately 22 m southwest of Sub-feature I1 on the west side of Feature I. The stream ford structure is rectangular, 9.2 m long by 7.7 m wide with a maximum height of 2.0 m. The central portion of the sub-feature is even with the grass road and slopes to a maximum depth at the center of the structure of 25 cm below the grass road. The water diverted into Feature J and Sub-feature I1 flows across the structure in this area perpendicular to the grass road to reunite with Feature I. Two square short pillar-like structures were observed on the southwest side, and act to divert the water into the center of the structure. A short ramp was observed between the two short pillars rising approximately 25 cm from the bottom of the pond to also facilitate in water flow. The water, after passing across the roadway, is then diverted into two openings in the retaining wall on the northeast side. The retaining wall has a maximum height of 45 cm from the road surface (southwest side) and 155 cm on the northeast side. The two openings that allow water to flow to Feature I are created by three mortared basalt stone pillars. The pillars have a maximum height of 85 cm on the southwest side and 200 cm on the northeast side and are approximately 0.6 m long by 0.8 m wide. In between each of the pillars is a step, 60 cm below the road surface. The water flows over the step and into a mortared, stone-lined channel that terminates perpendicular to Feature I. The confluence of Features J and I at this location is shown on the 1930 Moragne map of Puhi Camp (see Figure 11). Sub-feature I2 was likely constructed at the same time as this ditch complex, suggesting the ford pre-dates 1930; however, it may be a more modern modification.

Figure 194. SIHP # -2179 Sub-feature I2, stream ford, view to northwest

Figure 195. SIHP # -2179 Sub-feature I2, stream ford, view to southeast

Figure 196. Sub-feature I2, showing water flowing from Sub-feature I2 to Feature I, view to south

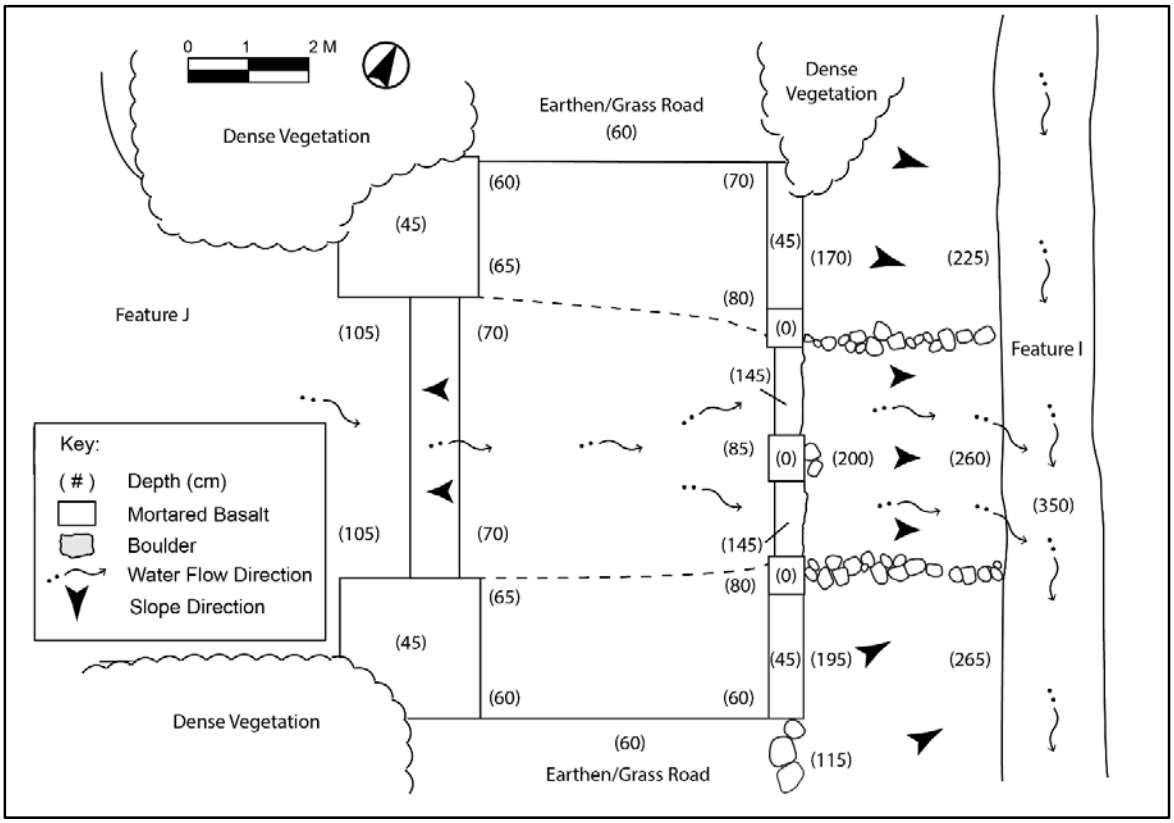

Figure 197. Plan map of Sub-feature I2, showing Feature 1 and Feature J

Sub-feature I3 consists of a mortared basalt stone culvert (Figure 198 through Figure 201). The culvert was constructed to allow vehicular traffic to cross over Feature I. The culvert is located south of two modern ponds. The culvert consists of two retaining walls approximately 8.8 m long and 0.42 cm wide that extend parallel to each other approximately 6.25 m apart. Short wing walls extending outward are located on the south end of the parallel walls. The earthen/grass covered roadway, which extends between the two walls of the culvert is large enough to allow two lanes of traffic across the culvert, and slopes upward toward the two modern ponds. The heights of the walls on the interior of the culvert range from a maximum height of 70 cm to a minimum of 40 cm. The heights of the walls of the culvert on the exterior side range from 95 cm to 340 cm. The walls are concrete capped. The culvert tunnel, which allows Feature I to pass under the road is a concrete-lined tunnel approximately 1.8 m in width. The culvert is likely associated with the former road associated with Puhi Camp shown on the 1930 Moragne map of Puhi Camp (see Figure 11). The road was likely utilized regularly until the 1980s when the camp was demolished. Three large stone boulders now block the south entrance to the culvert.

Sub-feature I4 consists of a mortared basalt stone and concrete culvert (Figure 202 through Figure 206). The culvert was constructed to allow vehicular traffic to cross over Feature I. The culvert is located approximately 80 m southeast of Sub-feature I3, south of a natural meander of Feature I. The culvert consists of two retaining walls approximately 6.4 m long and 0.20 cm wide that extend parallel to each other approximately 8.0 m apart. The primarily earthen/grass-covered roadway, which extends between the two walls of the culvert, is large enough to allow two lanes of traffic across the culvert and slopes upward toward the KCC campus. A small patch of asphalt was observed in the center of the roadway, but appears to be fragmented and highly disturbed. The heights of the walls on the interior of the culvert are even with the ground surface, with the wing walls sloping 50 cm below the main height of the wall. The heights of the walls of the culvert on the exterior side range from 80 cm to 330 cm. The walls are concrete capped. The culvert tunnel, which allows Feature I to pass under the road, is constructed of concrete approximately 0.8 to 1.0 m thick with a tunnel approximately 2 m in width. The culvert is likely associated with the former road associated with Puhi Camp first shown on a 1950 aerial photograph (see Figure 22). The road was not illustrated on any of the earlier maps and photographs. The road was likely utilized regularly until the 1980s when the camp was demolished. Multiple large stone boulder, concrete blocks, and chained gates now block the east entrance to the culvert.

Feature I is the only remaining in-use irrigation ditch in the current project area that transports water beyond the project area. The features and sub-features are in good to fair condition. Based on background research (see Section 3.1.5), the ditch is likely a modified natural stream and was likely constructed between 1901 and 1933. It is likely the associated culverts and sluice gates (Sub-features I1 through I3) were constructed at the same time, however, they may be later modifications. Sub-feature I4 is a later modification, constructed in 1938.

6.2.10 Feature J

Feature J is a plantation-era pond located south of Pūnana Leo Pre-School and Kawaikini Charter School within the project area (see Figure 96). The in-use pond is situated in between Sub-features I1 and I2. The earthen pond has a maximum length of 40 m and a maximum width of 16 m (Figure 207 through Figure 209). The pond is likely a modified ditch seen on the 1930 Moragne map of Puhi Camp (see Figure 11). On the Moragne map, three ditches are

Figure 198. SIHP # -2179 Sub-feature I3, showing modern pond in background, view to west

Figure 199. Sub-feature I3, retaining wall of culvert on south end, view to south

Figure 200. Sub-feature I3, view of concrete-lined culvert for Feature I, view to north

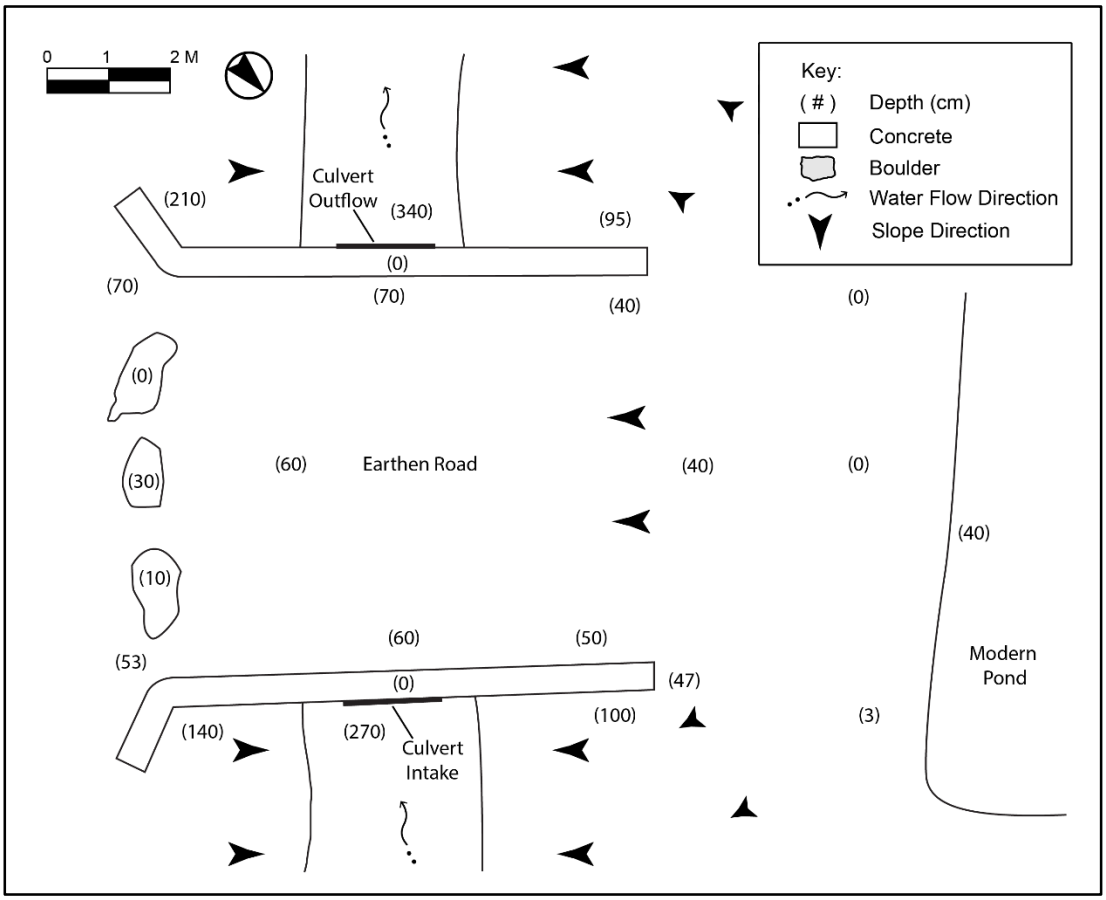

Figure 201. Plan map of Sub-feature I3, showing modern pond on right and Feature I flowing through culvert

Figure 202. SIHP # -2719 Feature I4, showing concrete culvert and mortared basalt retaining wall, photograph adapted from Groza and Hammatt 2010, view to south

Figure 203. Sub-feature I4, showing current condition of culvert, view to southeast

Figure 204. View of roadway above Sub-feature I4, showing patches of asphalt, view to east

Figure 205. Date “1938” located on Sub-feature I4, view to south

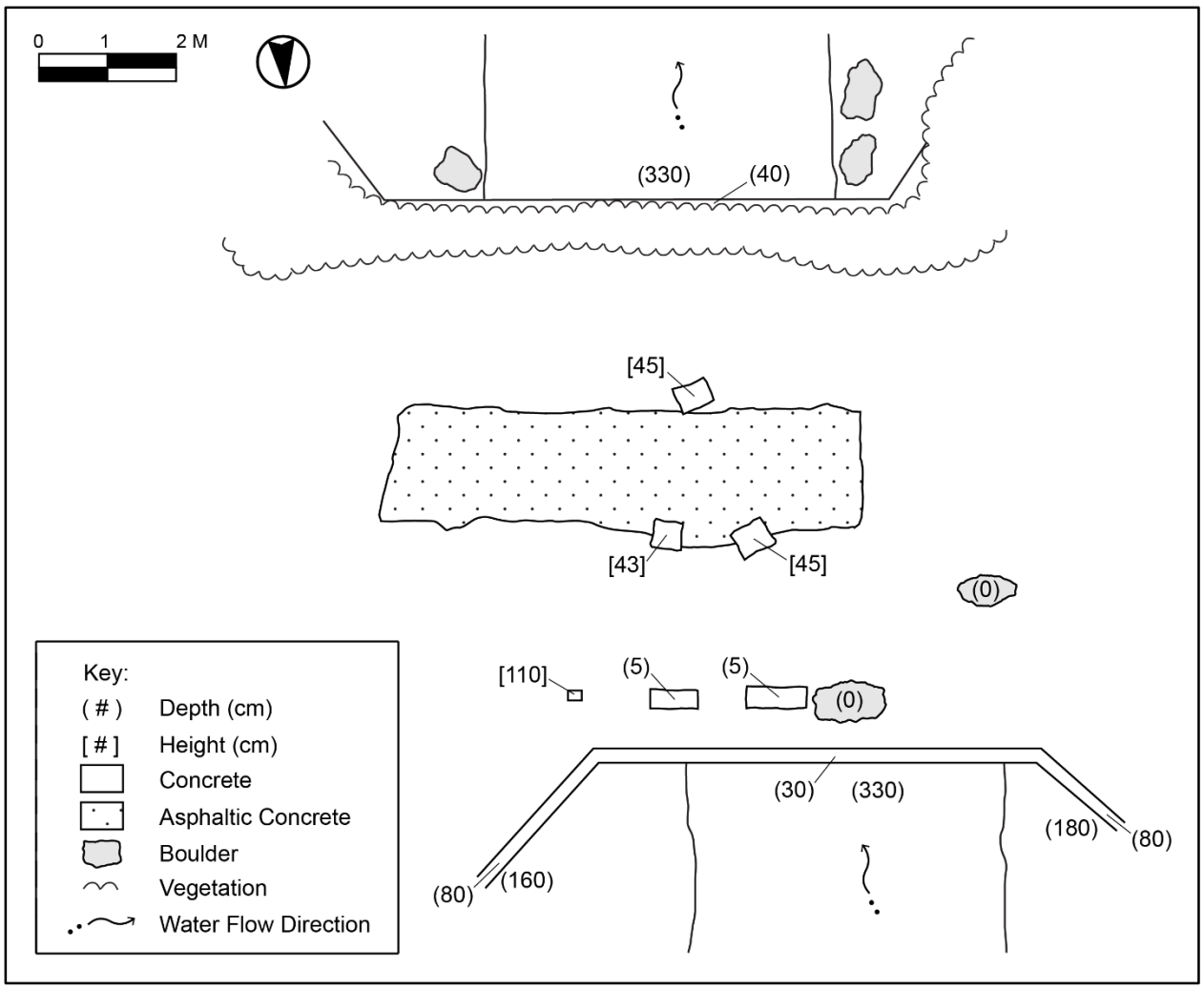

Figure 206. Plan map of Sub-feature I4, showing Feature I flowing through culvert

Figure 207. SIHP # -2179 Feature J, north section, view to south

Figure 208. Feature J, south section at Sub-feature I2, view to west

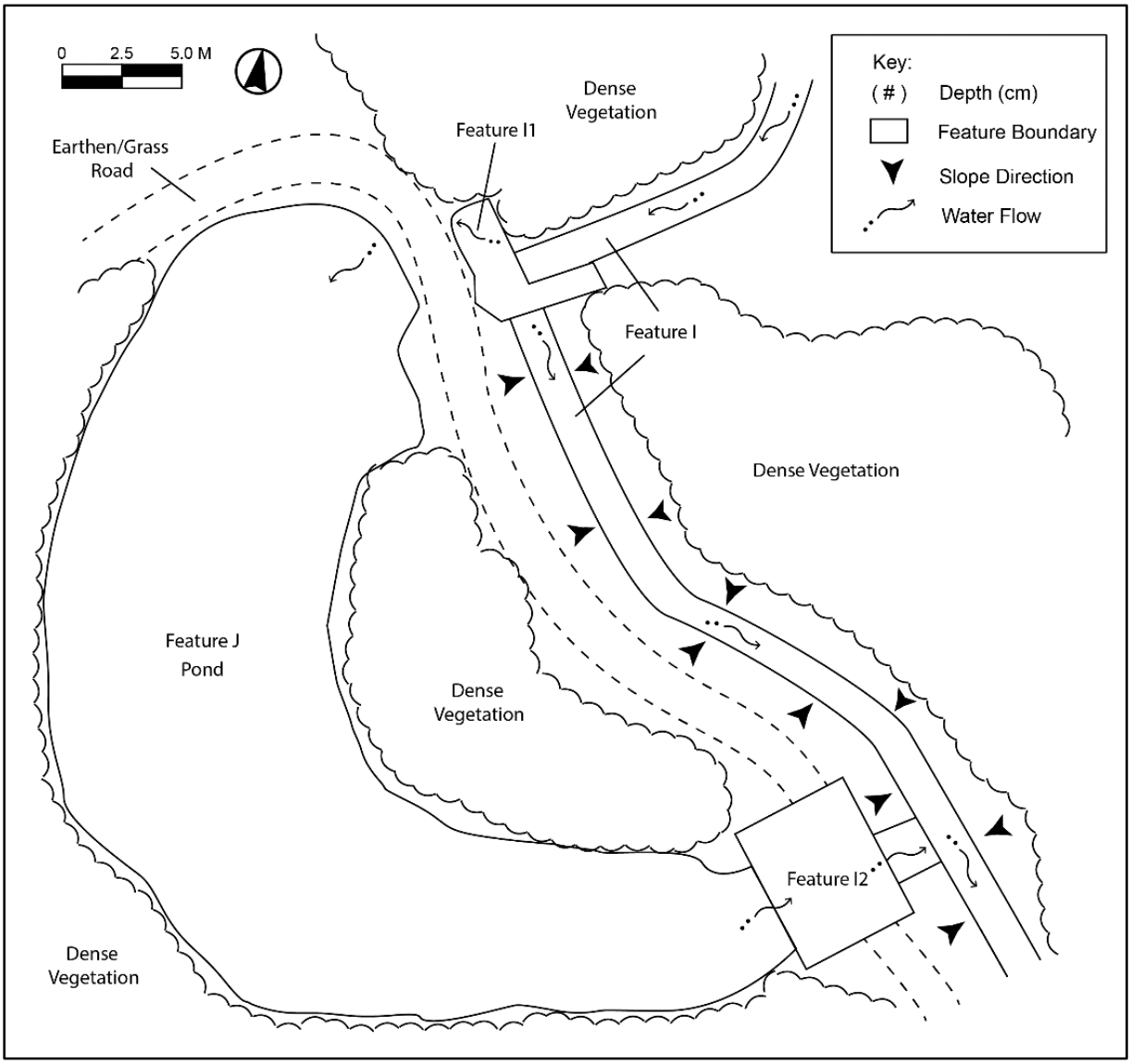

Figure 209. Plan map showing Feature J in relation to Feature I and Sub-features I1 and I2

illustrated as flowing into and out of this general area. Feature I, is observed in its current general location on the map.

Historically, a second ditch originated at the location of Sub-feature I1 and extended westward and along the rim of the gulch. A third ditch originated at Feature H (west of Sub-feature H1) and extended south, overlapping the current location of the pond and terminating at the location of Sub-feature I2. It is likely that when the two latter ditches were abandoned, the water, which originally was channeled into the westward flowing ditch, was diverted into Feature J, which was created by modifying the southernmost extent of the south-flowing ditch. The water that now flows into the pond at Sub-feature I1 exits the pond across Sub-feature I2 and returns to Feature I. It is likely the pond is a decorative feature and is not associated with irrigation of former sugarcane fields. The pond (in its current form) is not illustrated on any historic maps and is only observed in the 2013 aerial photograph (see Figure 3). The modified pond is likely modern, however, the ditch from which the pond originated was likely constructed prior to 1930.

6.2.11 Feature K

SIHP # -2179 Feature K consists of two culverts associated with a former cane haul road still in use. Feature K is not illustrated on any of the historic maps or aerial photographs associated with the project. No date of construction was observed on the sub-features, however, the construction style is consistent with other mortared basalt structures observed in the project area. The road associated with the culverts is illustrated on a 1933 LCA 1087 map 1 (see Figure 16).

Sub-feature K1, the northernmost culvert, is located along the former cane haul road, near a modern water tank (see Figure 96). The culvert is a mortared basalt with concrete capped structure, with two wing walls to channel water into two concrete pipes (Figure 210 through Figure 214). The north wall is approximately 5 m long with the west and east wing walls approximately 2 m long. The structure is 0.5 m wide with a maximum height of 1.5 m. The two concrete pipes are approximately 1.2 m in diameter. The south wall is located 12 m southeast of the north wall. The south wall is approximately 5 m long with the wing walls approximately 3 m long on the west side and 1 m long on the east side. It is possible the east wing wall continues, however, the wall is covered with dirt and a large tree is located near the wing wall obscuring the structure. The south wall is approximately 21 m northwest of a portion of Feature M, an in-use irrigation ditch. The culvert’s function is to allow runoff to travel under the road and into the irrigation ditch.

Sub-feature K2 is located 250 m southwest of Sub-feature K1 (see Figure 96). The culvert is of similar construction to Sub-feature K1 (Figure 215 through Figure 221). The mortared basalt and concrete capped culvert, however, has mortared basalt ripraps instead of wing walls. The ripraps are triangular and angled along the slope of the hill. The ripraps on the west wall were obscured by dense vegetation and dirt accumulation. Two concrete pipes approximately 2.0 m in diameter allow water to flow under the bridge, ultimately flowing into Feature M, an in-use irrigation ditch. The east wall is approximately 13 m long and 0.45 m wide. The maximum height of the wall is 1.72 cm above surface. The west wall is slightly concave and measures approximately 15.5 m long by 0.55 m wide with a maximum height of 1.77 m above surface. The ripraps on the west wall extend approximately 3 m to the west of the wall. A metal pipe, likely a drain pipe, was observed extending from the wall on the south end. No intake for the pipe was observed on the east wall. It is likely this pipe is a drain feature associated with an external drainage or irrigation system.

Figure 210. Sub-feature K1, north end of culvert, view to southeast

Figure 211. Plan view of Sub-feature K1, north end, view to west

Figure 212. Sub-feature K1, south end, view to northeast

Figure 213. Plan view of Sub-feature K1, south end, view to east

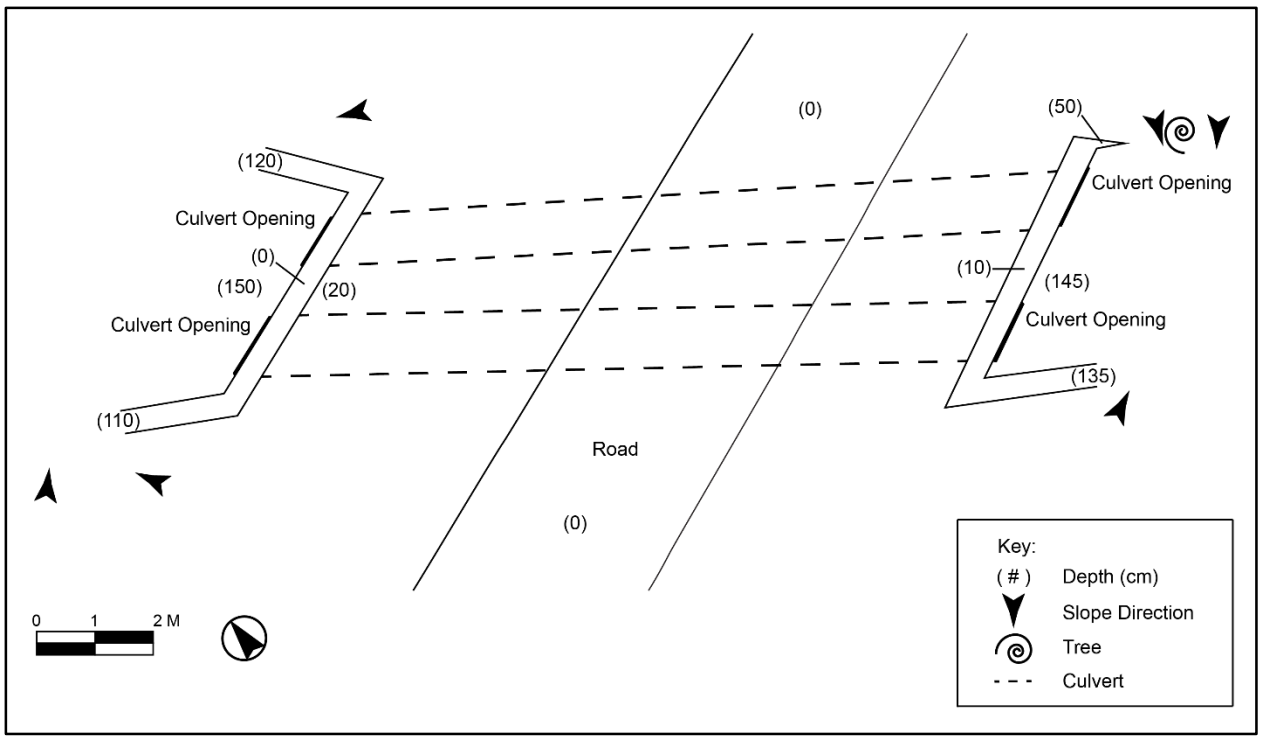

Figure 214. Plan map of Sub-feature K1

6.2.12 Feature L

Feature L originally spanned the gulch, transporting water from west to east (see Figure 96). The flume is constructed primarily of wooden beams and boards anchored by concrete foundations and mortared basalt retaining wall foundations on the steeply sloped hillsides (Figure 222 through Figure 231). Two sluice gate and wing wall features were observed on the ends of the flume to control water flow across the flume. The flume measures approximately 29.5 m long from sluice gate to sluice gate. The flume is 0.75 m across with the cross-beams extending out 1.0 m. The maximum height of the flume, from the bottom of flume to ground surface is 4.15 m. Concrete foundations measured 0.3 m by 0.3 m and ranged in height from 0.15 to 0.45 m.

The sluice gate concrete foundations on the west end of the flume are angled to channel water into the flume. The foundations were between 1.0 and 1.35 m in length and were the same height as the flume opening approximately 50 cm above the bottom of the flume. The date "1960" was stamped on the southern foundation. A retaining wall was observed on the west slope of the gulch to provide additional stability to the structure. The retaining wall was constructed of mortared basalt 0.25 m thick. The retaining wall was approximately 1.45 m in height. The sluice gate concrete foundations on the east slope are approximately 0.5 m in length and are of similar height. The foundations are also angled outward. Two retaining walls were observed on the east slope. The lower retaining wall is approximately 0.25 m thick with a maximum height of 0.8 m. The upper retaining wall is 0.3 m thick with a maximum height of 0.95 m. A rectangular foundation was observed just west of the upper retaining wall.

The west end of the flume is mostly intact. The central section, the portion that spans the gulch floor, was documented as mostly intact, with only a small portion missing during the project's associated LRFI (Groza and Hammatt 2010). During the 2016 fieldwork, it was documented that the entire portion spanning the gulch floor has collapsed. The concrete foundations were observed in place, however, wooden beams and debris were observed throughout the gulch floor in the area. It also appeared that a large amount of the debris was likely looted and removed from the area. The cause of collapse is unknown, however, it appeared as though a flooding event and collapsing trees, likely caused by a large storm, may have caused the collapse. The eastern portion had fallen but mostly remained together as several large pieces. The concrete foundations and mortared basalt retaining walls were observed in place.

Sub-feature L1 consists of an earthen ditch tunnel opening serving as the outflow for a ditch that flows across the flume (Figure 232 and Figure 233). Dirt accumulation, likely due to erosion and collapse, was observed at the opening of the tunnel. The parabolic tunnel opening was approximately 1 m in width with a maximum height of 0.8 m above the ground surface. Substantial dirt accumulation was observed at the tunnel opening. Within the tunnel the maximum height was approximately 1.3 m.

Sub-feature L2 consists of an earthen ditch tunnel opening that allows water to flow back into an earthen tunnel system after flowing across the flume (Figure 234). The tunnel was more heavily disturbed than Sub-feature L1 and substantial dirt accumulation was observed at the opening of the tunnel. The parabolic tunnel opening was approximately 1 m in width with a maximum height of 0.3 m above the ground surface. Substantial dirt accumulation was observed at the tunnel opening. It is likely the tunnel is of similar size and shape as was documented at Sub-feature L1.

Figure 215. Plan view of Sub-feature K2, north end, view to west

Figure 216. Sub-feature K2, north end, soil accumulation obscuring riprap, view to southeast

Figure 217. Sub-feature K2, north end, view to south

Figure 218. SIHP # -2179 Sub-feature K2, south end, view to east

Figure 219. Sub-feature K2, south end showing riprap on west end, view to northwest

Figure 220. Sub-feature K2, south end showing riprap at east end and metal pipe, view to east

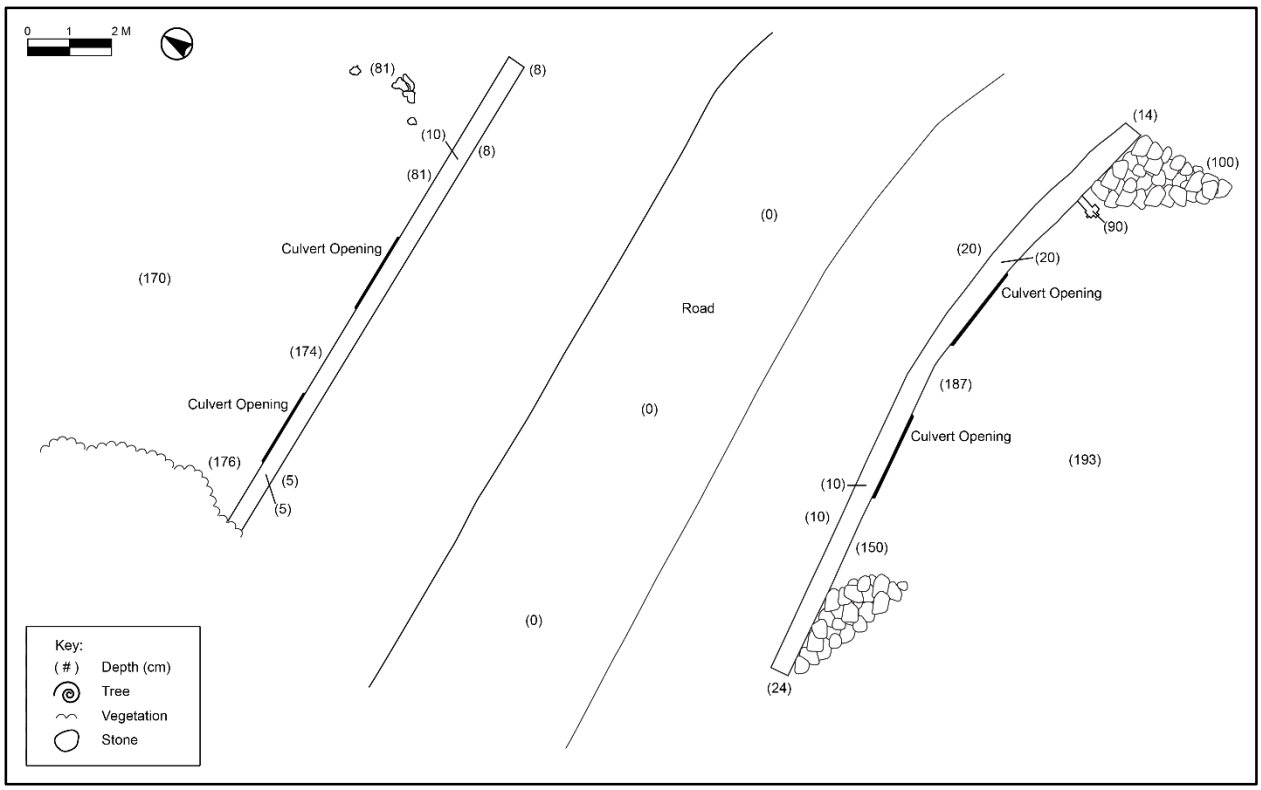

Figure 221. Plan map of SIHP # -2179 Sub-feature K2

Figure 222. SIHP # -2179 Feature L, flume, showing west portion mostly intact, view to east

Figure 223. Sluice gate foundation with date “1960,” view to west

Figure 224. West portion of Feature L, showing general construction design, view to northeast

Figure 225. West portion of Feature L, showing support structure including wooden beams, concrete foundations, and mortared basalt retaining walls, view to west

Figure 226. Debris from collapse of center portion of Feature L, view to northeast

Figure 227. Feature M crossing path of Feature L, note concrete foundations on left and right, view to east

Figure 228. Feature M crossing over central portion of Feature L, collapsed section of east portion in foreground, view to southwest

Figure 229. Intact section of east portion, showing general construction, view to west

Figure 230. Remnants of support structure of east portion of Feature L including wooden beams, concrete foundations, and mortared basalt retaining walls, view to southeast

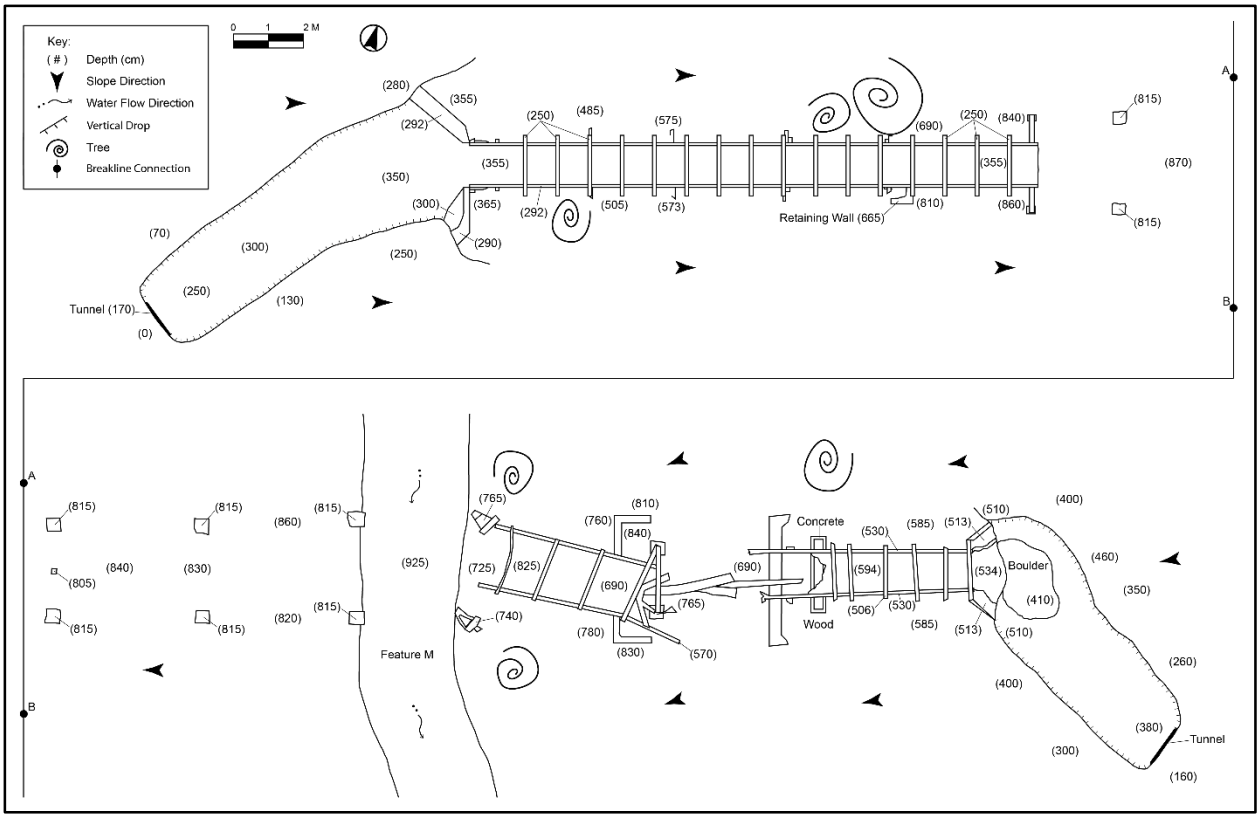

Figure 231. Plan map of Feature L, flume, showing Feature M crossing feature

Figure 232. Sub-feature L1, showing dirt accumulation at tunnel opening, view to southwest

Figure 233. View of Feature L and ditch from Sub-feature L1, view to northeast

Figure 234. Sub-feature L2, showing heavy dirt accumulation at entrance, view to east

The flume is observed on a 1963 USGS map (see Figure 21). The ditch flows eastward, across several gulches, before entering the project area, then flows across Puhi Stream Gulch, across a flume and then southeast toward Feature G. Evidence of the eastern portion of the ditch was not observed. The flume was constructed in 1960, shortly before the development of the KCC campus. A 1978 aerial photograph (see Figure 25) shows a tunnel opening at approximately the location of a tunnel opening on the 1963 map, however, the ditch appears not to follow the 1963 alignment, but rather enters a drainage canal associated with Sub-feature K1.

6.2.13 Feature M

SIHP # -2179 Feature M is an in-use earthen irrigation ditch that extends from the northern project area boundary to a confluence with Feature G (see Figure 96). The feature consists of a primary feature consisting of an earthen irrigation ditch (Feature M) and four sub-features consisting of three irrigation ditch tunnels (Sub-features M1, M2, and M4) and a sluice gate (Sub-feature M3).

Feature M enters the project area on the Puhi Stream Gulch floor. The ditch crosses under a flume (Feature L) and flows along the east side of the gulch. The ditch then enters a tunnel at Sub-feature M1. The feature was observed exiting the outflow of the tunnel (Sub-feature M2). The ditch then meanders south toward the Puhi Camp Cemetery (SIHP # -B006), wraps around the west, south, and east boundaries of the cemetery and terminates at Feature G. A sluice gate (Sub-feature M3) was observed southeast of the cemetery, and an earthen tunnel (Sub-feature M4) acting as a bridge for the cemetery road was observed just northeast of Sub-feature M3. The ditch is the only in-use irrigation ditch present within the gulch and transports water from the gulch floor to the tablelands above. The exposed portion of Feature M is approximately 148 m long within the gulch and 510 m long on the tablelands (Figure 235 through Figure 238). The ditch tunnel openings (Sub-features M1 and M2) are approximately 290 m apart to the southeast suggesting the minimum possible length of the feature within the project area is approximately 948 m. The ditch measures between 2 m and 3 m in width and 0.3 to 0.8 m in depth. The feature primarily uses the hillside to form the upslope wall of the ditch and in most areas contains a man-made berm on the downslope side of the ditch.

Sub-feature M1 consists of an earthen ditch tunnel opening that serves as the intake for the earthen ditch tunnel associated with Feature M (Figure 239 and Figure 240). The ditch tunnel is located south of Feature L on the east slope of the gulch. The ditch tunnel opening measures 1.7 m wide. The tunnel is parabolic and with a maximum height of 1.9 m at the opening. The top of the opening is approximately 2.4 m below the ground surface, which slopes drastically to the west of the feature. No evidence of the date of construction was observed.

Sub-feature M2 consists of an earthen ditch tunnel opening that serves as the outflow for the earthen ditch tunnel associated with Feature M (Figure 241 and Figure 242). The ditch tunnel is located south of Feature K1 on the tablelands to the east of the gulch. . The ditch tunnel opening measures 2.0 m wide. The tunnel is parabolic and with a maximum height of 2.1 m at the opening. The top of the opening is approximately 0.95 m below the ground surface which slopes drastically upwards. No evidence of the date of construction was observed.

Sub-feature M3 is a sluice gate which functions to control water flow of Feature M (Figure 243 through Figure 248). The sluice gate is L-shaped with two gate features on the two perpendicular sides. The gates are housed on a concrete foundation, with mortared basalt wing

Figure 235. SIHP # -2179 Feature M, southwest of Feature K2, view to east

Figure 236. Feature M near cemetery (SIHP # -B006), view to west

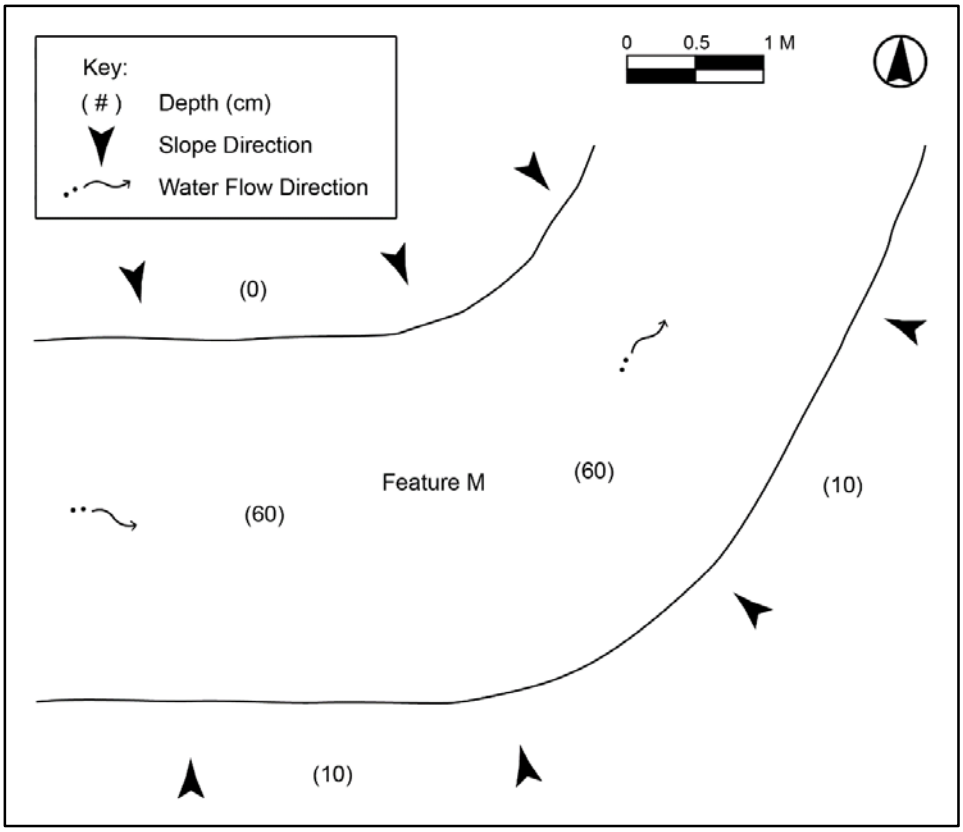

Figure 237. Plan map of SIHP # -2179 Feature M

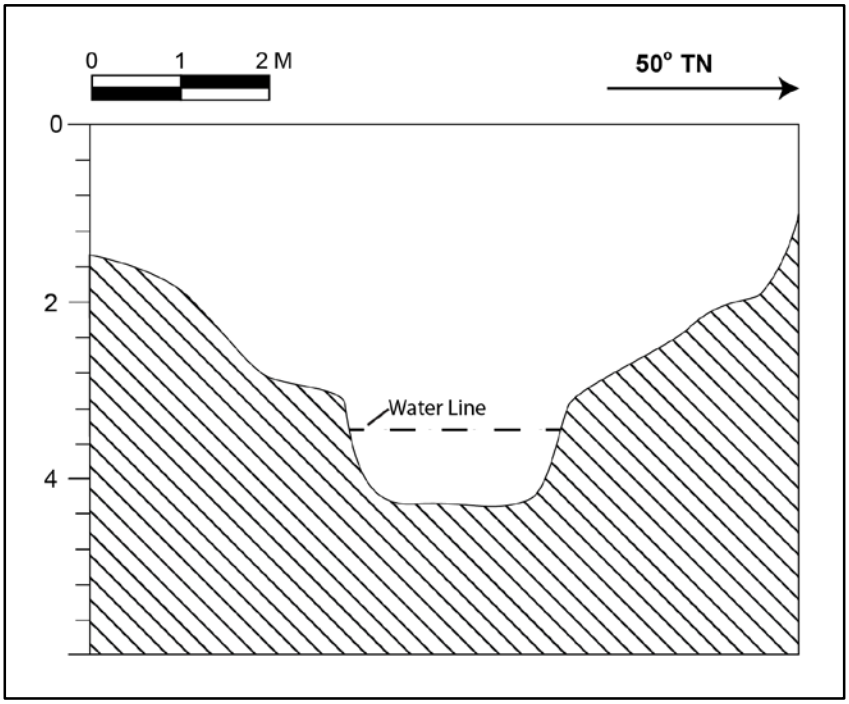

Figure 238. CS-13, cross-section of Feature M

Figure 239. Sub-feature M1, showing Feature M flowing into tunnel, view to southeast

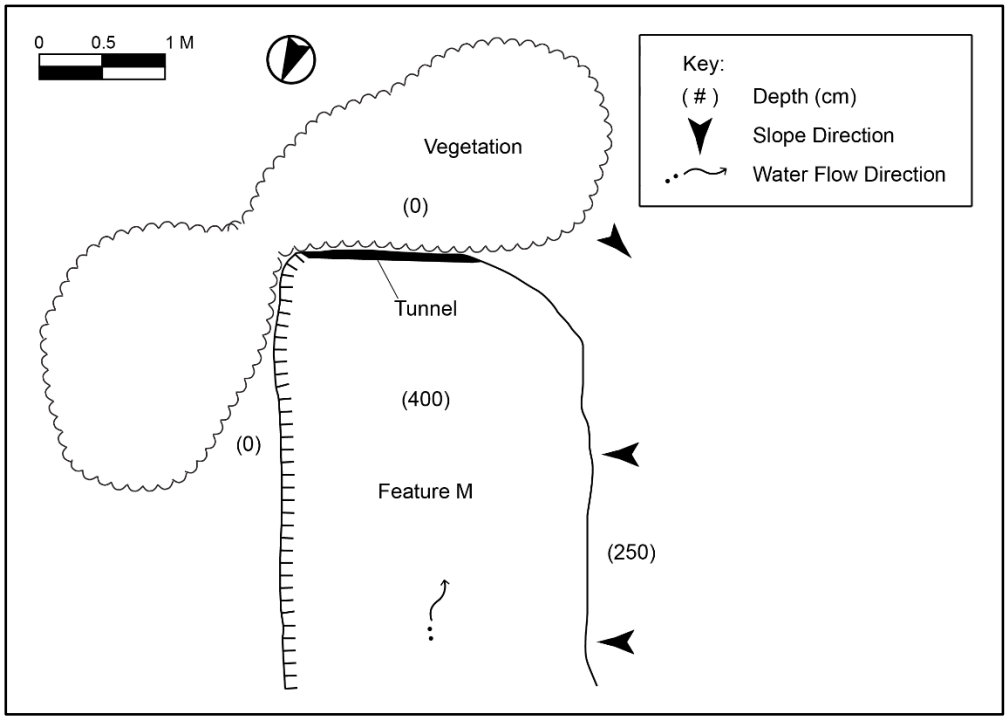

Figure 240. Plan map showing Sub-feature M1

Figure 241. Sub-feature M2, irrigation ditch tunnel outflow, view to southwest

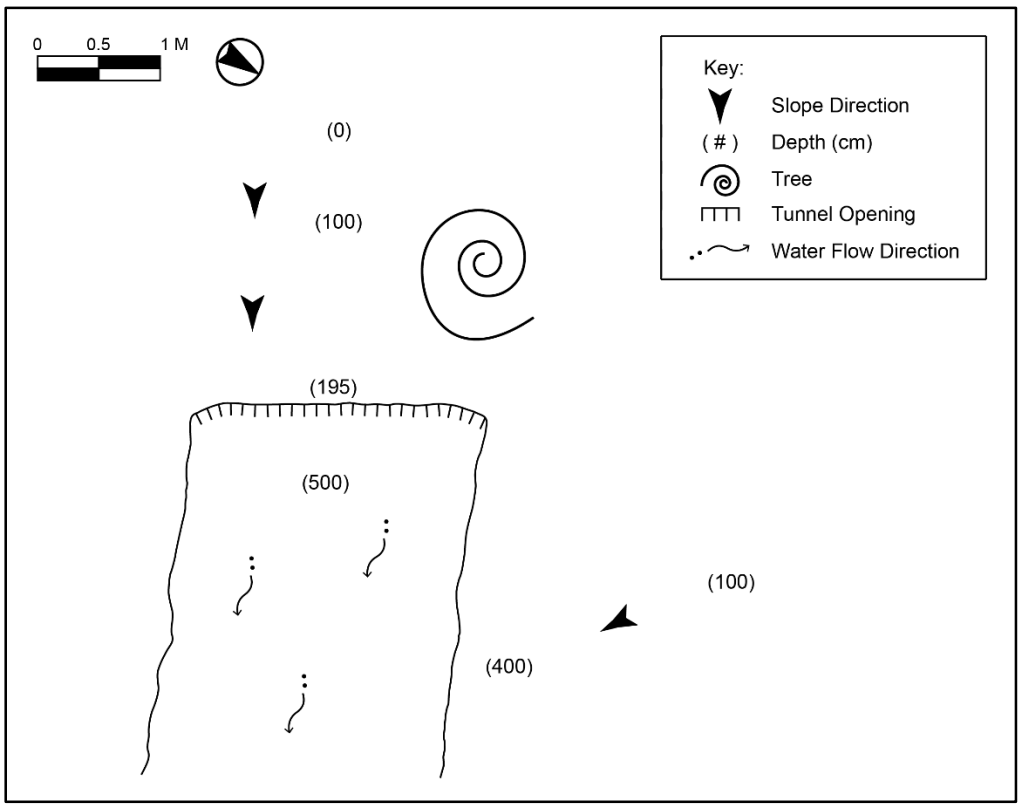

Figure 242. Plan map of Sub-feature M2, irrigation ditch tunnel outflow

Figure 243. Feature M3, sluice gate, showing close proximity to SIHP # -B006, view to northeast

Figure 244. Sub-feature M3 showing north gate (left) and east gate (right), view to northeast

Figure 245. Sub-feature M3, east gate, view to west

Figure 246. “J.Andres 4/14/67 FEB 14” inscribed on wing wall

Figure 247. “4/14/67 FEB 14” inscribed on wing wall

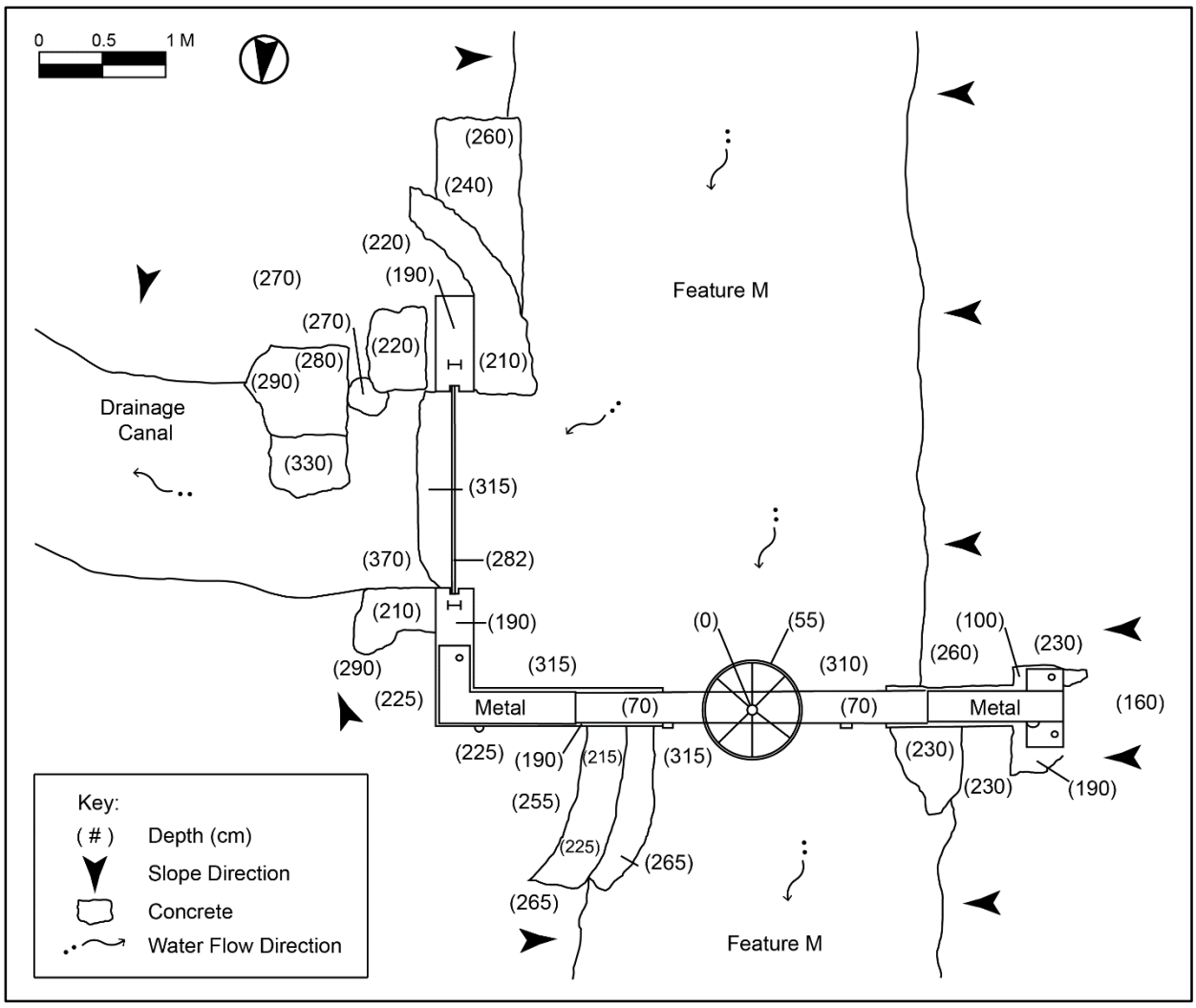

Figure 248. Plan map of SIHP # -2179 Sub-feature M3

walls. The foundations contain grooves to allow for the individual gates to be held in place. The north sluice gate is a metal vertical rising gate that is made up of a metal plate, attached to a screw and hand-crank wheel. The sluice gate is connected to the concrete foundation by two diagonal steel beams and one cross beam that extend from the outer corners of the concrete foundation. The structure that holds the gate is 4.95 m long by 0.3 m wide. The wheel is attached to the screw approximately 1.35 m above the concrete foundations. The plate fills the 1.8 m gap in the concrete foundations.

The east gate feature is disturbed, likely due to erosion. A mortared basalt wall approximately 20 cm below the concrete foundation raps around the west side of the foundation and mortared basalt wing walls were observed on the east side of the concrete foundation. The south wing wall has collapsed, portions of which are lying the drainage ditch. The gate is not as elaborate as the north gate and consists of placing wooden boards within the notches on the foundations. The concrete foundations are similar in width, but are not as long as the north gates foundations. The gap between the two foundations that allow water to pass through is approximately 1.5 m wide. Writing was observed Water flows over the boards which acts more like a weir. A drainage ditch was observed as heading downhill. It is likely the east gate was constructed to allow for the outflow of excess water, through the drainage ditch meeting up with the Puhi Stream in the gulch below.

Along the mortared basalt wing walls, inscriptions were observed on the concrete caps (see Figure 246 and Figure 247). The inscriptions were located on all the concrete capped walls and had the name “J.Andres” inscribed on them and numerous instance of the dates: “4/14/67” and “FEB 14” inscribed as well. It is likely the mortared basalt walls are a later modification of the sluice gates and the concrete foundations and metal gates were constructed prior to 1967.

Sub-feature M4 is an earthen ditch tunnel that serves as a bridge for the cemetery road (Figure 249 through Figure 253). The tunnel is approximately 45 m northeast of Sub-feature M3. Feature M flows northeast towards the tunnel through a steep canal, then flows through the tunnel for approximately 17 m. The tunnel is parabolic and measures approximately 2 m wide with a maximum height of 2.1 m. The apex of the tunnel was located approximately 2 m below the road surface. Some minor collapse of the internal structure was observed, however, water is still able to flow through the tunnel. The tunnel is illustrated on a 1933 LCA 1087 Map 1 (see Figure 16).

Feature M is one of the two main in-use irrigation ditches that flow into the project area. While the current alignment of Feature M is shown on any historic maps or aerial photographs, the current path of the ditch is likely the connection of various former ditches and tunnel systems. This may have been accomplished as former ditches became obsolete, or destroyed. Portions of the feature were constructed prior to 1933, and were likely modified several times, including in 1967, as described above.

6.2.14 Feature N

Feature N is an abandoned earthen irrigation ditch, extending from the west project area boundary, through the Puhi Stream Gulch terminating on the eastern slope of the gulch (see Figure 96). The feature consists of a primary feature consisting of an earthen irrigation ditch (Feature N) and three sub-features consisting of an irrigation ditch tunnels (Sub-features N1) and two abandoned sluice gates (Sub-features N2 and N3).

Figure 249. Sub-feature M4, from cemetery road, view to south towards Sub-feature M3

Figure 250. View of tunnel and roadway associated with Sub-feature M4, view to north

Figure 251. North end of Sub-feature M4, view to southwest

Figure 252. Sub-feature M4, showing collapse on in interior, view to south

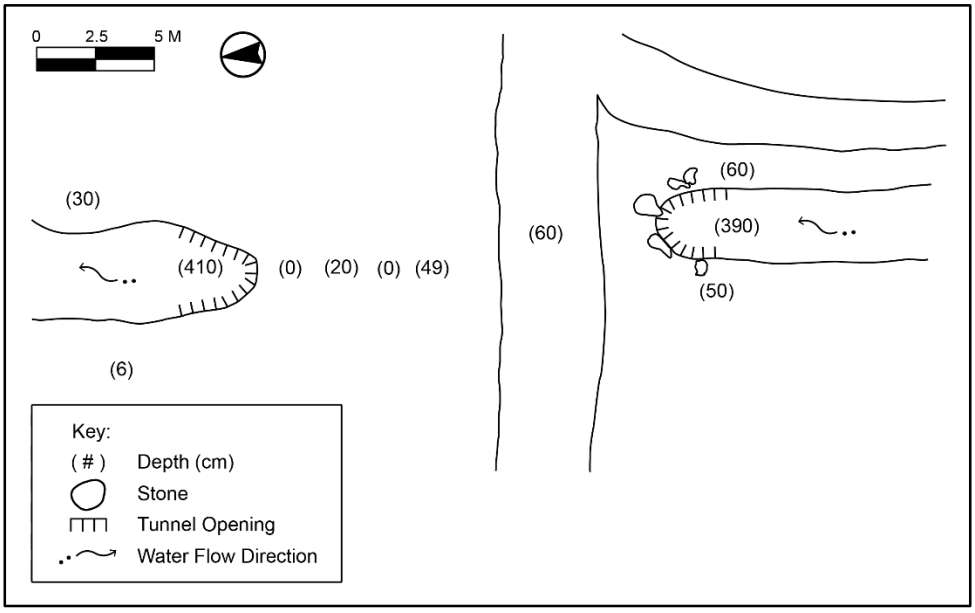

Figure 253. Plan map of Sub-feature M4

Feature N is an abandoned earthen irrigation ditch that enters the project area from the west via an earthen ditch tunnel (Sub-feature N1), extending north along the west slope of the gulch. The feature than bends east, and then south, passing through two sluice gates (Sub-features N2 and N3 on either side of the Puhi Stream, and extends southeast along the east slope of the gulch. The remnant ditch is characterized by a steep side wall on the upslope side of the ditch, and a man-made berm on the downslope side of the ditch. Erosion and dirt accumulation has created flat areas of the ditch, however, areas are more greatly defined with maximum depths of 0.6 m. The remnant ditch measures 648.5 m long and is on average 1.7 m wide. The ditch is illustrated on a 1933 LCA 1087 Map 1 (see Figure 16) as following the current known extent, then meeting with the current alignment of Feature M near the cemetery.

Sub-feature N1 is an abandoned earthen tunnel opening that functioned as the outflow for Feature N. The ditch tunnel is located on the west slope of the Puhi Stream Gulch near the gulch rim. The ditch tunnel opening measures 1.4 m wide. The tunnel is parabolic and with a maximum height of 90 m at the opening. The top of the opening is approximately 1.9 m below the ground surface which slopes slightly towards the tablelands. No evidence of the date of construction was observed.

Sub-feature N2 is an abandoned sluice gate feature. The gate is likely were associated with a flume that allowed the irrigation ditch to cross over Puhi Stream. No evidence of the flume was observed. The gates consist of two similar concrete and basalt foundations with a diagonal edge to channel water and a notch, likely for water control. The foundations are partially buried and were observed 40 cm above the current ground surface. The gates are approximately 60 cm long by 50 cm wide on the outside edges. The gates are approximately 1.4 m apart and are parallel to each other. The date “DEC. 13th 1905” was inscribed in the west foundation. It is likely this sub-feature is associated with one of the early ditches associated with Grove Farm.

Sub-feature N3 is an abandoned sluice gate feature consisting of two gates connected by a wedge shaped foundation. The gates likely were associated with a flume that allowed Feature N to cross over Puhi Stream. No evidence of the flume was observed. The gates consist of three concrete and basalt sluice gate foundations attached on a single concrete slab. The northernmost foundation is similar to those observed in Sub-feature N2. The structure measures 65 cm long by 45 cm wide and is approximately 50 cm above the concrete slab. The structure has a similar diagonal edge and notch as Sub-feature N3. The center foundation is 1.1 m southwest of the northern foundation. The center foundation is wedge shaped and constructed of concrete and basalt. The foundation measures 1.25 m long by 0.95 m wide at its greatest extent. Approximately 0.95 m to the south of the center foundation is a 1.2 m long and 0.5 m wide concrete and mortared basalt retaining wall that extends in an east to west direction. The two gates suggest a second ditch may have once joined the ditch at this location. It is likely this sub-feature is associated with one of the early ditches associated with Grove Farm.

Feature N was likely constructed in 1905, and was in-use through 1933. It was likely replaced with Feature M and the 1960 flume (Feature L). With the early date of 1905, it is likely that this ditch was one of the early ditches for the Grove Farm area, and an example of the expansion of water ditches associated with Grove Farm in the early Twentieth Century.

Figure 254. Feature N, showing berm of right side of photo, view to northwest

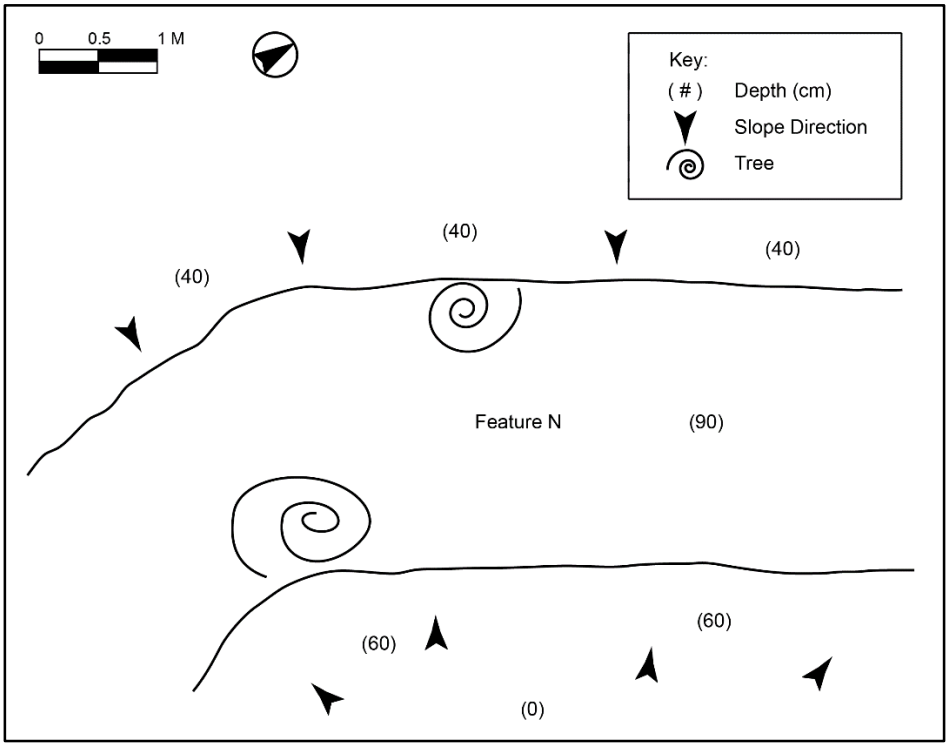

Figure 255. Plan map of a portion of Feature N

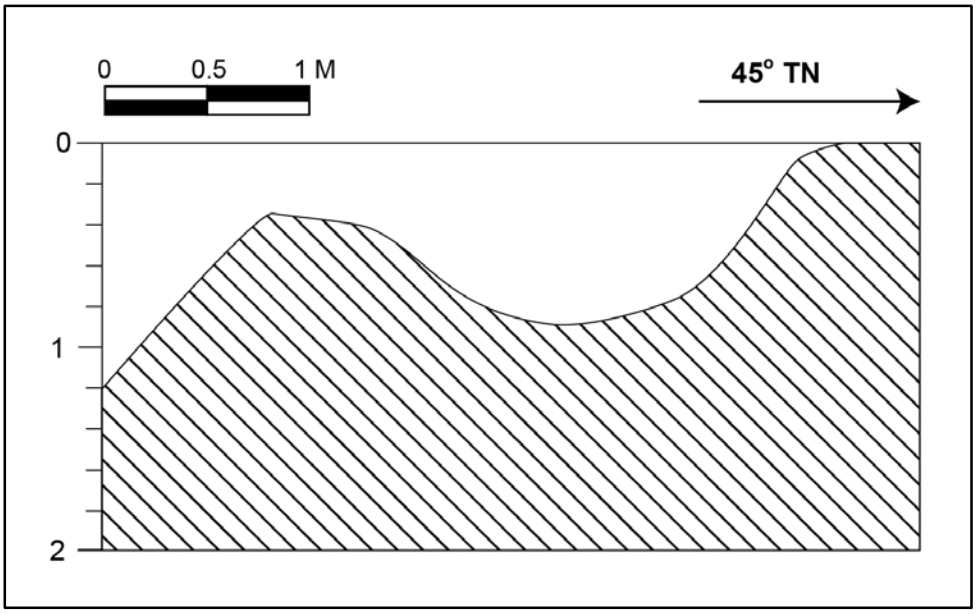

Figure 256. CS-14, cross-section of Feature N

Figure 257. Sub-feature N1, abandoned earthen tunnel, view to southwest

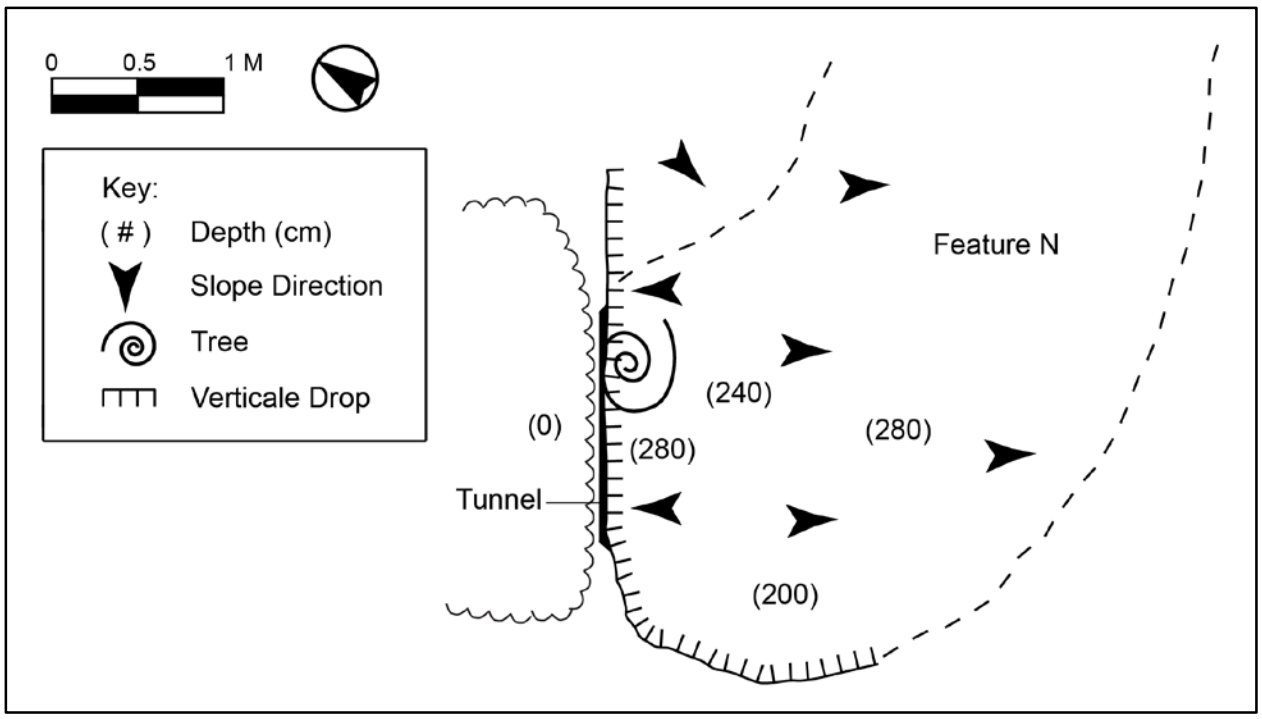

Figure 258. Plan map of Sub-feature N1

Figure 259. Sub-feature N2, abandoned sluice gate, view to northwest

Figure 260. Date “DEC. 13th 1905” inscribed on east concrete foundation of Sub-feature N2

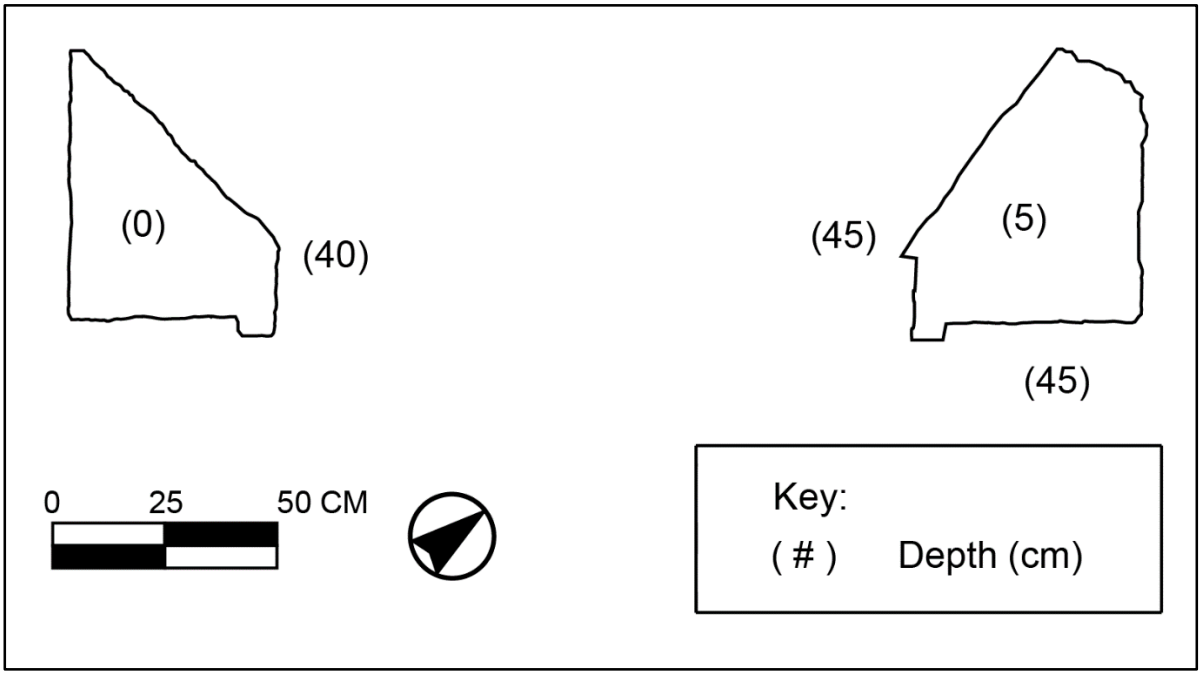

Figure 261. Plan map of Sub-feature N2

Figure 262. Sub-feature N3, showing two sluice gates, view to northwest

Figure 263. East portion of Sub-feature N3, view to southeast

Figure 264. Close-up of east portion of Sub-feature N3, view to northeast

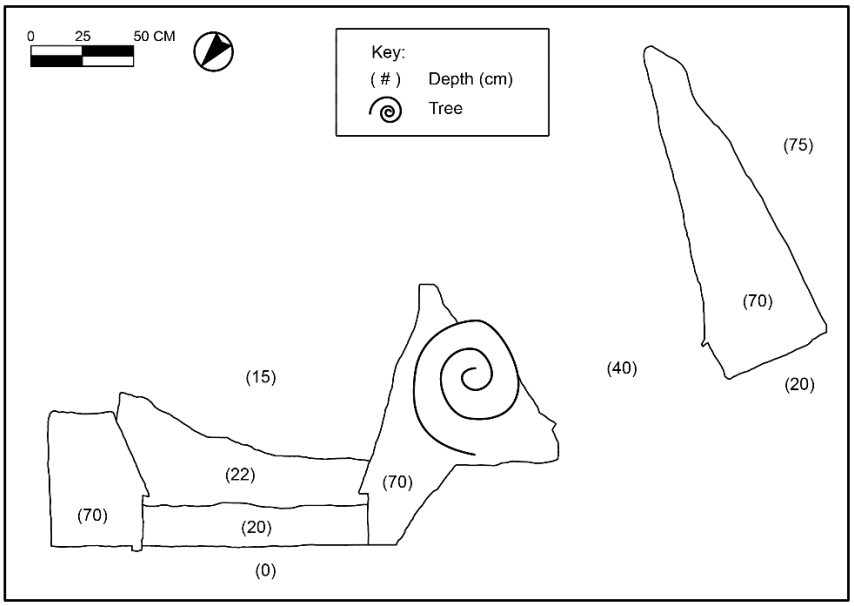

Figure 265. Plan map of Sub-feature N3

6.2.15 Feature O

Feature O is a short abandoned ditch that extends from Sub-feature M1 to Sub-feature N3 (Figure 266 through Figure 268). The ditch connects once connected Feature M with Feature N. Feature O is an earthen ditch characterized by a steep wall on the upslope side of the ditch and a man-made berm on the downslope side of the ditch. Feature O measures 42.5 m in length and is approximately 1.0 to 1.5 m wide and 0.2 to 0.5 m deep. It is likely that Feature M once fed into Feature N and later was redirected through the tunnel between Sub-features M1 and M2, when Feature N was abandoned. It is also possible that the ditch acted as a temporary channel for redirecting water during the many modifications of the Grove Farm ditch system.

6.2.16 Feature P

Feature P is an abandoned irrigation ditch and series of abandoned earthen tunnels located in the Puhi Stream Gulch in the southwest portion of the project area. The feature consists of a primary feature consisting of an earthen irrigation ditch (Feature P) and three sub-features consisting of earthen irrigation ditch tunnels (Sub-features P1–P3). The tunnels were previously interpreted by Palama (1973) as military-related; however, based on the construction and design of the features, they are rather abandoned/collapsed irrigation tunnels.

Feature P is an abandoned earthen irrigation ditch that extends approximately 83 m southwest and south on the western edge of the project area. The ditch extends southeast and is connected to an abandoned irrigation tunnel in the hillside (Sub-feature P3). The feature than bends south. The evidence of the feature beyond the documented extent could not be establish due to a modern gulch access road and erosion. The remnant ditch is characterized by a steep side wall on the upslope side of the ditch, and a man-made berm on the downslope side of the ditch. Erosion and dirt accumulation has created flat areas of the ditch, however, areas are more greatly defined with maximum depths of 0.8 m and is on average 3.0 m wide.

Sub-feature P1 is a tunnel in a cliff face along the western side of a modern access road). The tunnel measures 6 m in length and runs in a northwestern/southeastern direction. The southeast opening measures 0.90 m in height with a width of 0.60 m; the northwest opening measures 1.0 m in height and 1.0 m in width. The maximum interior height of the tunnel measures 1.3 m. The interior of the tunnel slopes downward toward the middle of the tunnel, as dirt has accumulated due to erosion and the creation of the modern access road. A hearth was observed on a thin ledge on the northern side inside the tunnel; it measures 0.40 m in width, height, and depth. Ash residue was observed in the hearth. Also observed was a glass bottle situated on the tunnel floor in front of the hearth. It is likely the hearth was constructed after the tunnel was abandoned. Residents of Puhi Camp, such as children, are documented as playing in the tunnels in the gulch. The hearth may be a result of this activity or could be more modern vagrant activities.

Sub-feature P2 consists of a collapsed irrigation ditch tunnel located approximately 300 m south of Sub-feature P1 on the west side of the modern access road. The collapsed dirt near the two ends of the feature sloped downwards, likely due to the dirt flowing outwards into the tunnel. The tunnel itself was not observed. On the east end of the bunker is a short “ditch-like” cut that slopes to the east, toward the gulch; it measures 4.2 m in length by 2.4 m in width with a depth of 0.69 m. It appears the cut is the cause of erosion during rainstorms. The collapse measures 8.5 m in length (north/south direction) and 2.3 m in width (east/west direction) with a maximum depth

of 1.55 m on the west interior. A rusty piece of a cloverleaf end cap was discovered on the north side

Figure 266. Feature O, abandoned remnant of an irrigation ditch connecting Features M and N, view to south

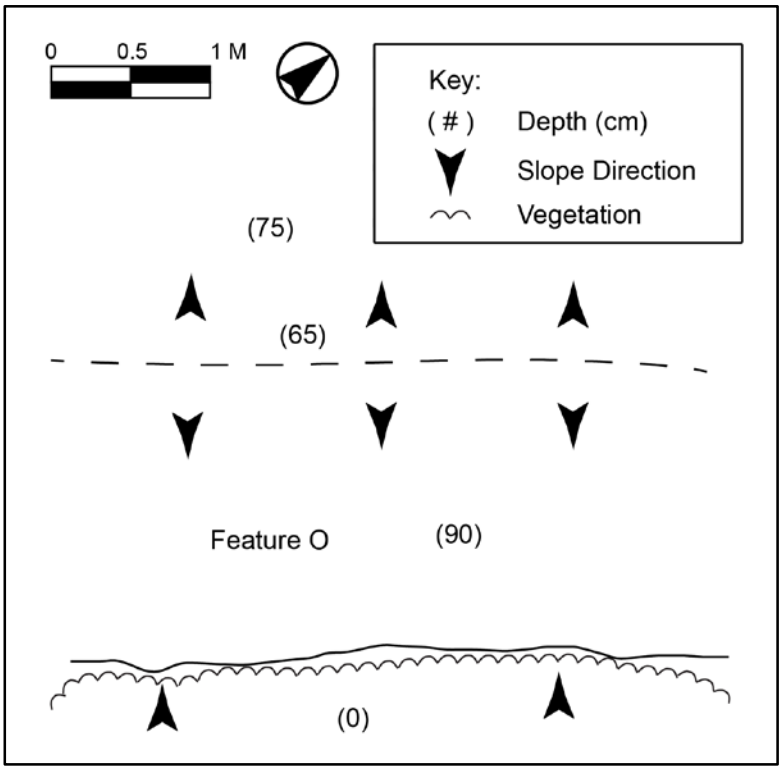

Figure 267. Plan map of Feature O

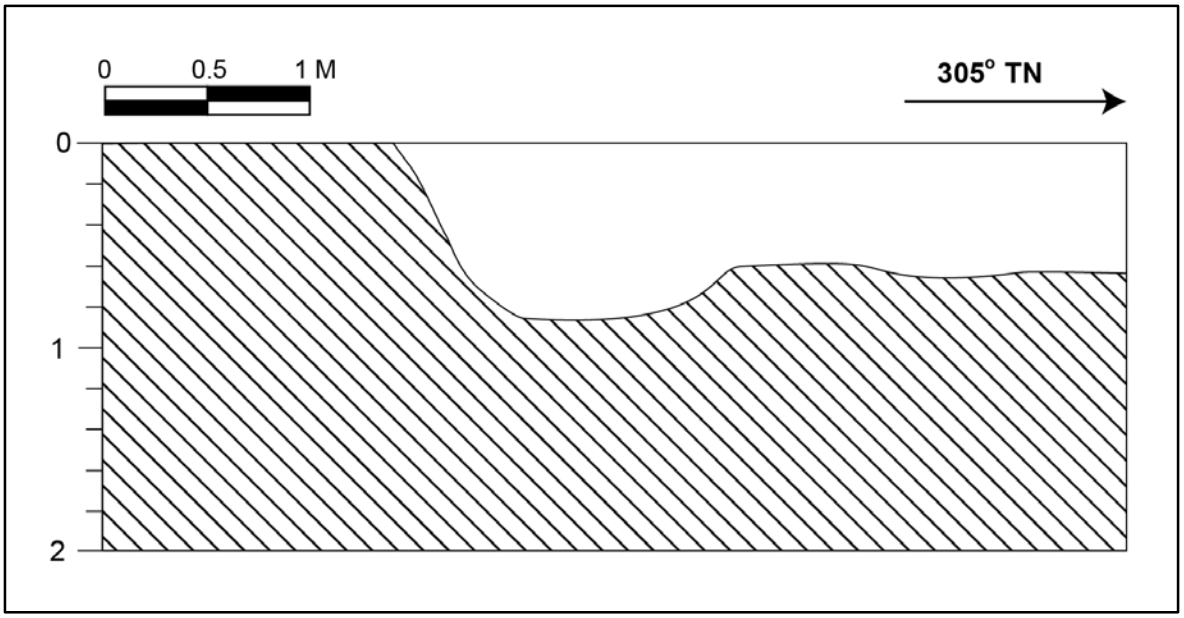

Figure 268. CS-15, cross section of Feature O

Figure 269. Feature P, view to northwest

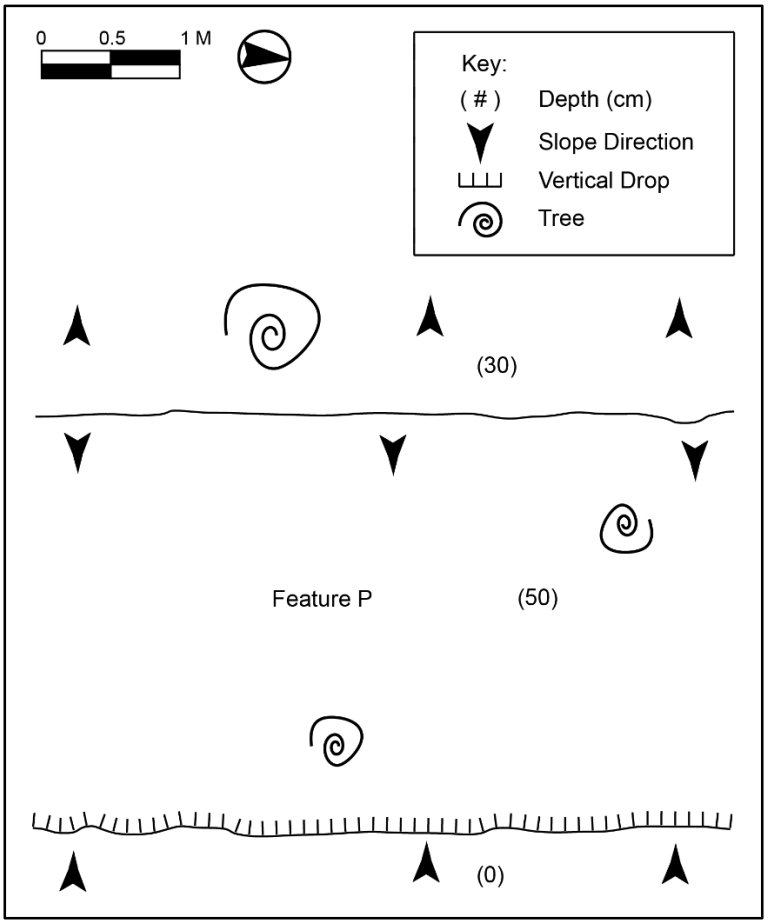

Figure 270. Plan map of Feature P

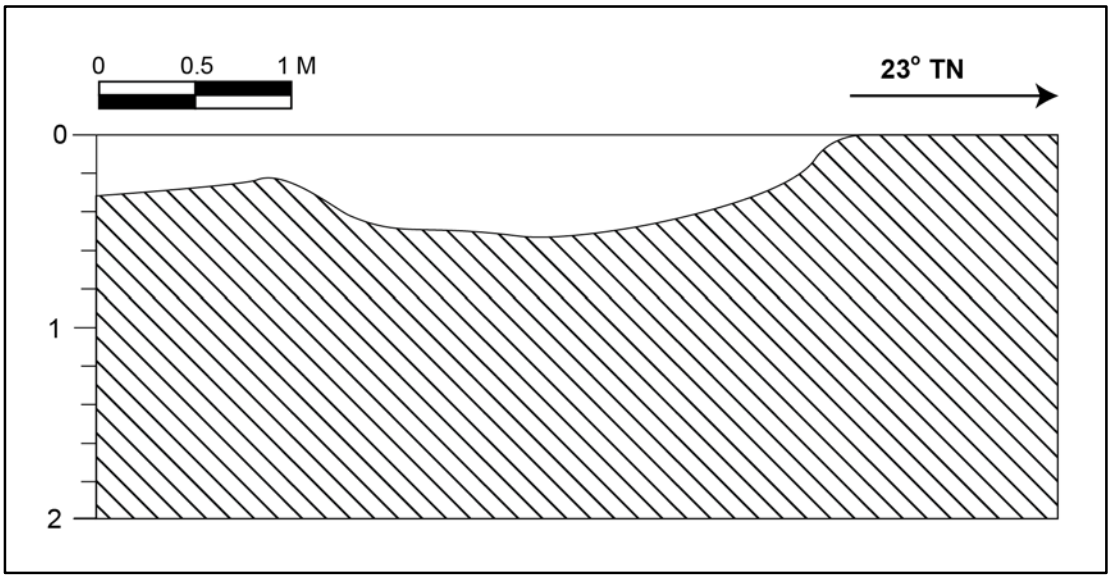

Figure 271. CS-16, cross-section of Feature P

Figure 272. Photo of southeast tunnel opening (Sub-feature P1), view to southwest

Figure 273. Photo of northwest tunnel opening (Sub-feature P1), southeast opening in the background, view to southeast

Figure 274. Inside of ditch tunnel (Sub-feature P1) showing hearth feature, view to southeast

Figure 275. Hearth and bottle observed in ditch tunnel (Sub-feature P1), showing past use of abandoned tunnel, view to east

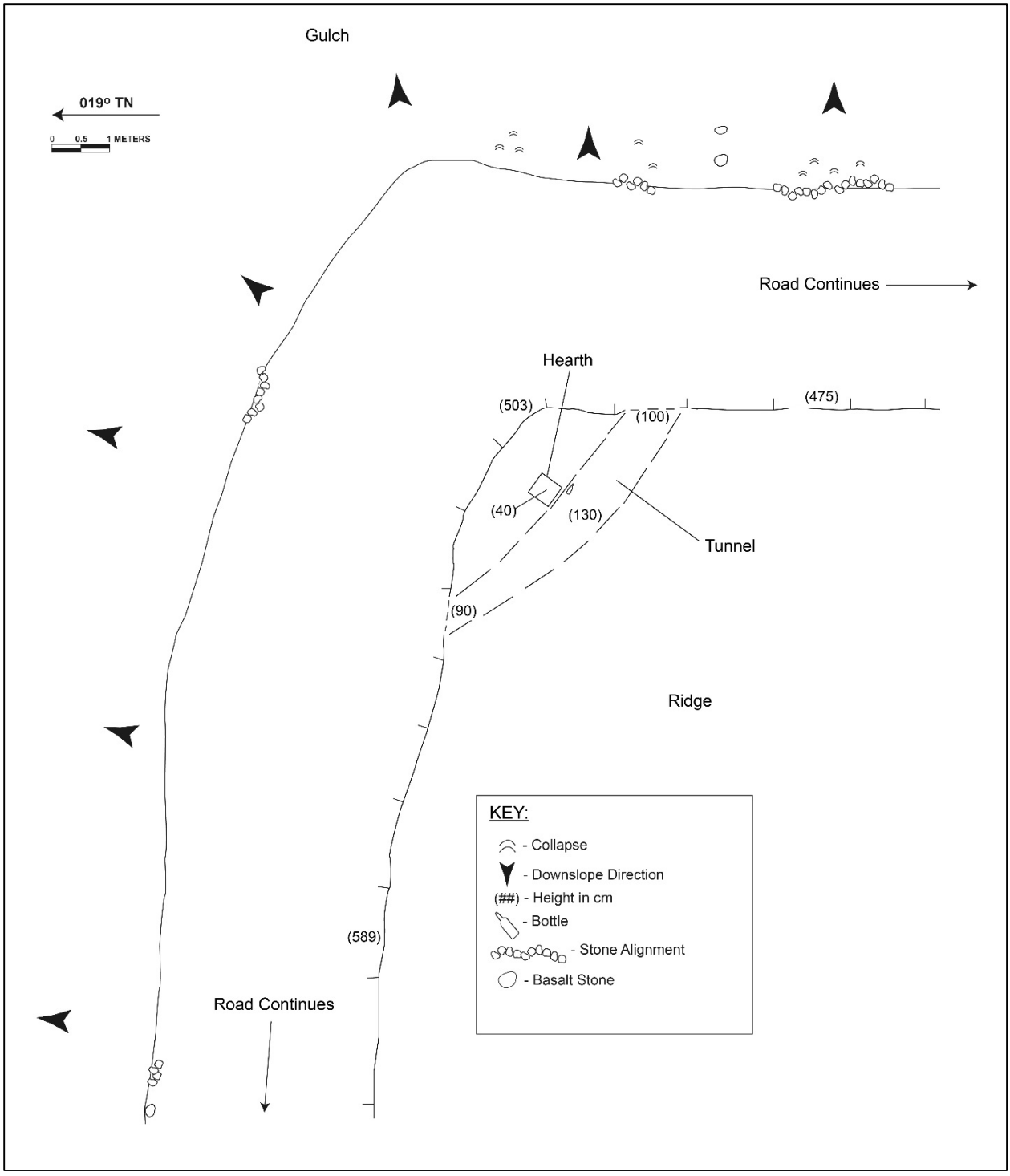

Figure 276. Plan map of Sub-feature P1, showing modern access road

Figure 277. South end of Sub-feature P2, showing the top portion of the ditch tunnel, and dirt accumulation from the collapse, view to south

Figure 278. North end of Sub-feature P2, ditch tunnel not visible, view to north

Figure 279. View of Sub-feature P2 from modern access road, view to northwest

Figure 280. Sub-feature P2 showing collapse and eroded drainage channel in upper left corner, view to east

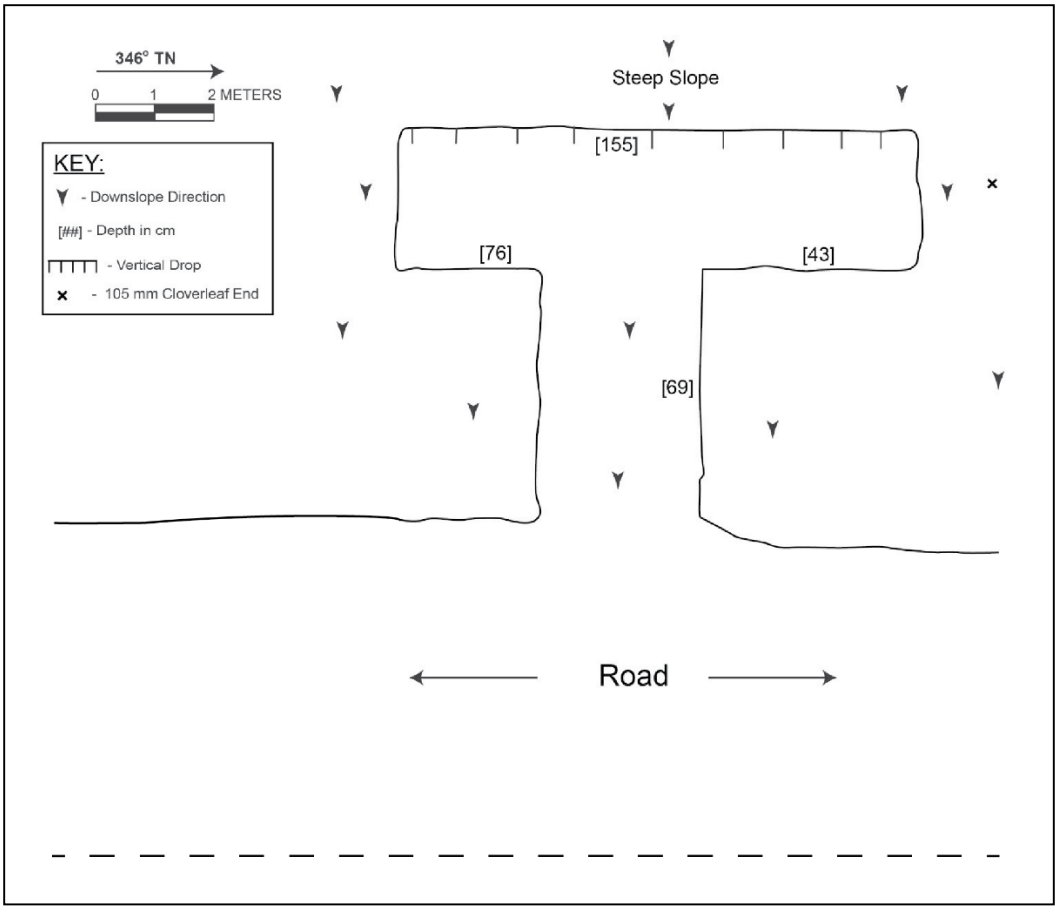

Figure 281. Plan view of Sub-feature P2

Figure 282. Photo of 105 mm cloverleaf end cap, downward view

of the tunnel on the slope of the gulch face; however, the gulch is heavily littered and it is unclear if the end cap is associated with the feature.

Sub-feature P3 is an abandoned earthen tunnel opening that functioned as the outflow for Feature P. The ditch tunnel is located on the west slope of the Puhi Stream Gulch near a confluence with a second stream. The ditch tunnel measures 1.5 m wide and is parabolic in shape. The ditch opening 0.3 m wide, due to the dirt accumulation at the opening. A large tree and erosion has obscured most of the ditch entrance. Based on the its relation to Sub-feature P2, it is likely that a ditch associated with Feature P, extended through Sub-feature P2, then turned west and exited the tunnel at Sub-feature P3, where it connected to the documented extent of Feature P. No evidence of the date of construction was observed.

Feature P and associated sub-features are not illustrated on any historic maps or aerial photographs. A date of construction or use could not be established. The ditch and associated tunnels are likely associated with the early ditch system, however definitive evidence could not be established.

In summary, SIHP # -2179 is an irrigation complex associated with the Grove Farm and Puhi Camp. A total of 16 features and 33 sub-features were documented as associated with SIHP # -2179 including 12 culverts, 10 irrigation ditches, 11 sluice gates, 9 associated with earthen tunnels, 4 reservoirs, 2 flumes and 1 stream ford. Many of the primary features were observed on historic maps and aerial photographs. Sub-features were not as evident in the illustrations. Features and sub-features with evidence of construction dates associated with SIHP # -2179 range from 1905 to 1969. The abandoned and in-use ditches and water control features represent several phases of the irrigation system for the plantation. Analysis of the available background information and field documentation suggests that there were likely three main phases of the irrigation complex. While modification and happened continuously to accommodate the growing plantation, it appears that the three phases of construction that were observed, occurred in the first decade of the 1900’s, around the 1930’s and around the 1960’s. This timeline concurs with historical background research described in Section 3.1.5.

SIHP # -2179, irrigation complex, is assessed as significant pursuant to HAR §13-275-6 under Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history). This assessment is based on the historic property’s potential to provide information regarding plantation era agricultural practices and the extensive irrigation systems in the area.

Figure 283. Sub-feature P3, abandoned ditch tunnel, view mostly obscured by tree and roots, view to northeast

Figure 284. Close-up of tunnel opening, view to northeast

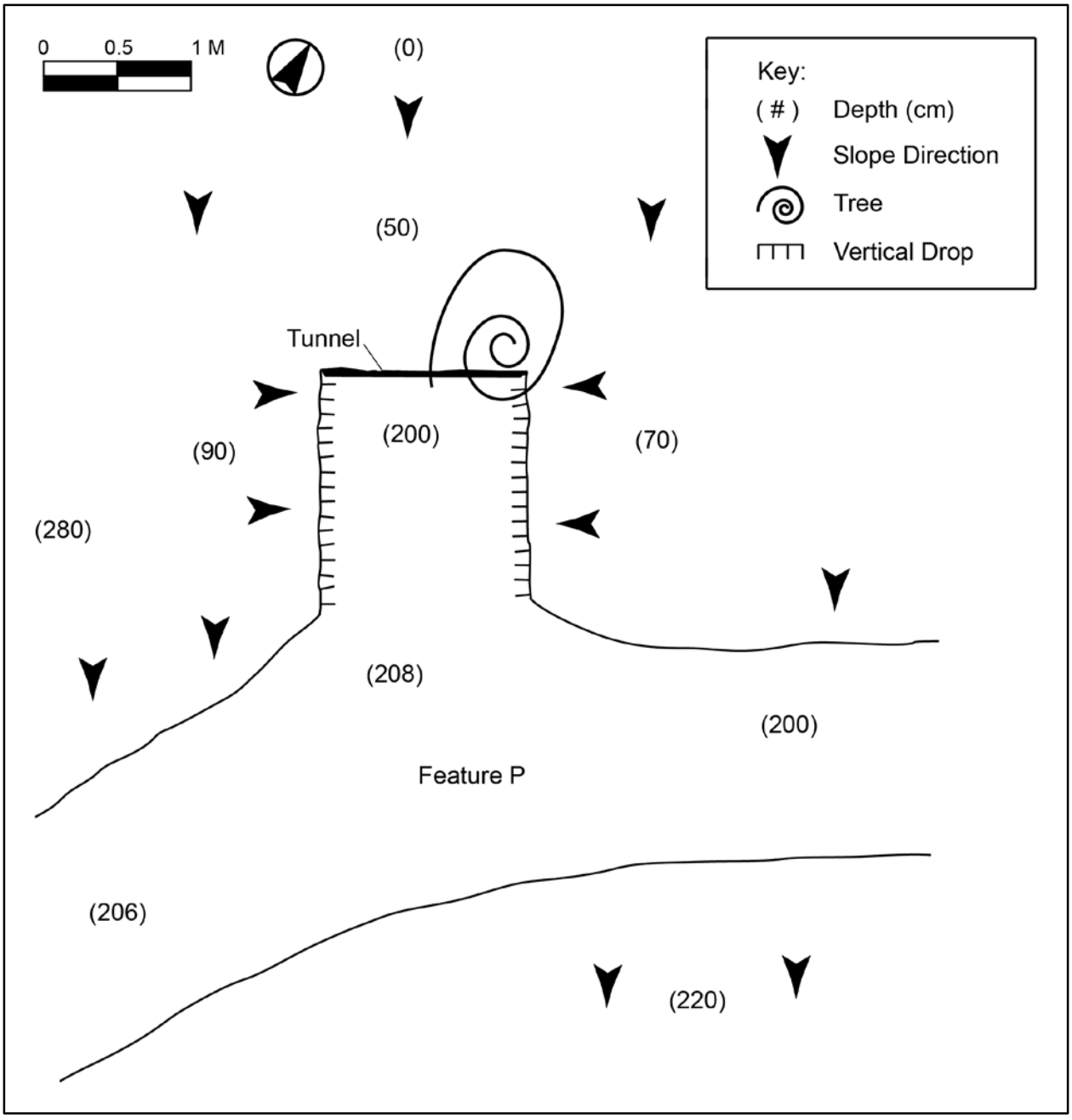

Figure 285. Plan map of Sub-feature P3, showing Feature P

6.3 SIHP # 50-30-11-2220

FORMAL TYPE:	Hawaii Territory Survey Marker and Transit Station
FUNCTION:	Survey marker
NUMBER OF FEATURES:	1
AGE:	Historic
TEST EXCAVATIONS:	None
TAX MAP KEY:	[4] 3-4-007:001
LAND JURISDICTION:	State of Hawai‘i
PREVIOUS DOCUMENTATION:	Hunkin et al. 2014

SIHP # -2220 is a basalt and concrete structure built over a Hawaii Territory survey marker previously identified by Hunkin et al. (2014). The structure is located on the east bank of SIHP # -2179 Feature B (see Figure 96, Figure 286, and Figure 287). The structure is approximately 2.70 m long and 1.98 m wide, with a maximum height of 1.72 m. The purpose of the structure is not completely clear (it is rather elaborate for protecting the survey marker) but almost certainly served as a transit station as well as a survey marker (Figure 291).

The walls are composed of stacked small to large sub-angular basalt boulders and mortar. The east and west walls are trapezoid-shaped, and the south end of the east wall has two built-in steps. Part of the bank has eroded, exposing part of the west wall base. The structure is topped with a square concrete slab with sides measuring approximately 1.85 m. At the center of the concrete slab is a “bump” with a hole and a metal pipe protruding upward from the hole. The top of the slab is also covered with hundreds of divots or small depressions (Figure 288). An inscription at the northern end of the slab reads, “KAUAI NORTH BASE 5-10-33-RTM.”

On the inside of the east and west walls, at the base, are short protruding walls made of basalt boulders and mortar, the same construction as the main outer walls. The two small walls support the metal base of a structure that includes the metal pipe that runs all the way to and through the concrete slab at the top of the larger structure (see Figure 286). This metal base and pipe component is directly over the survey marker (Figure 289 and Figure 290).

The structure appears to have functioned as a viewing or mapping platform. The metal pipe above the marker (see Figure 286, Figure 287, Figure 291 and Figure 292) could have allowed a surveyor to set up a transit in such a way as to center a plumb bob above the marker. “KAUAI NORTH BASE” and survey symbol is shown at the location of SIHP # -2220 on the 1939 Lihue Plantation map (see Figure 18), an undated Lihue Plantation map (see Figure 17), a 1933 Land Court Application 1087 map (see Figure 16), the TMK map (see Figure 2), 1963 (see Figure 10) and the 1996 (see Figure 1) Lihue USGS maps. No new features were observed during this current project for SIHP # -2220.

SIHP # -2220, Hawaii Territory Survey Marker and Transit Station, is assessed as significant under Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history) pursuant to HAR §13-13-275-6, for its potential to provide information about plantation era operations and infrastructure.

Figure 286. Photo of SIHP # -2220, showing the short protruding inner walls supporting the metal structure with a base and pipe that runs all the way to and through the concrete slab at the top

Figure 287. Photo of SIHP # -2220, showing the overall structure, including the trapezoid-shaped walls, the steps on the east wall, the square concrete slab topping the structure, and the metal pipe protruding outward from the top

Figure 288. Photo of SIHP # -2220, showing the top of the cement slab with the words “KAUAI NORTH BASE” and many divots, downward view to north

Figure 289. Hawaii Territory Survey marker shown underlying metal pipe, view to east

Figure 290. Photo of SIHP # -2220, showing the Hawaii Territory Survey marker that the structure covers, downward view

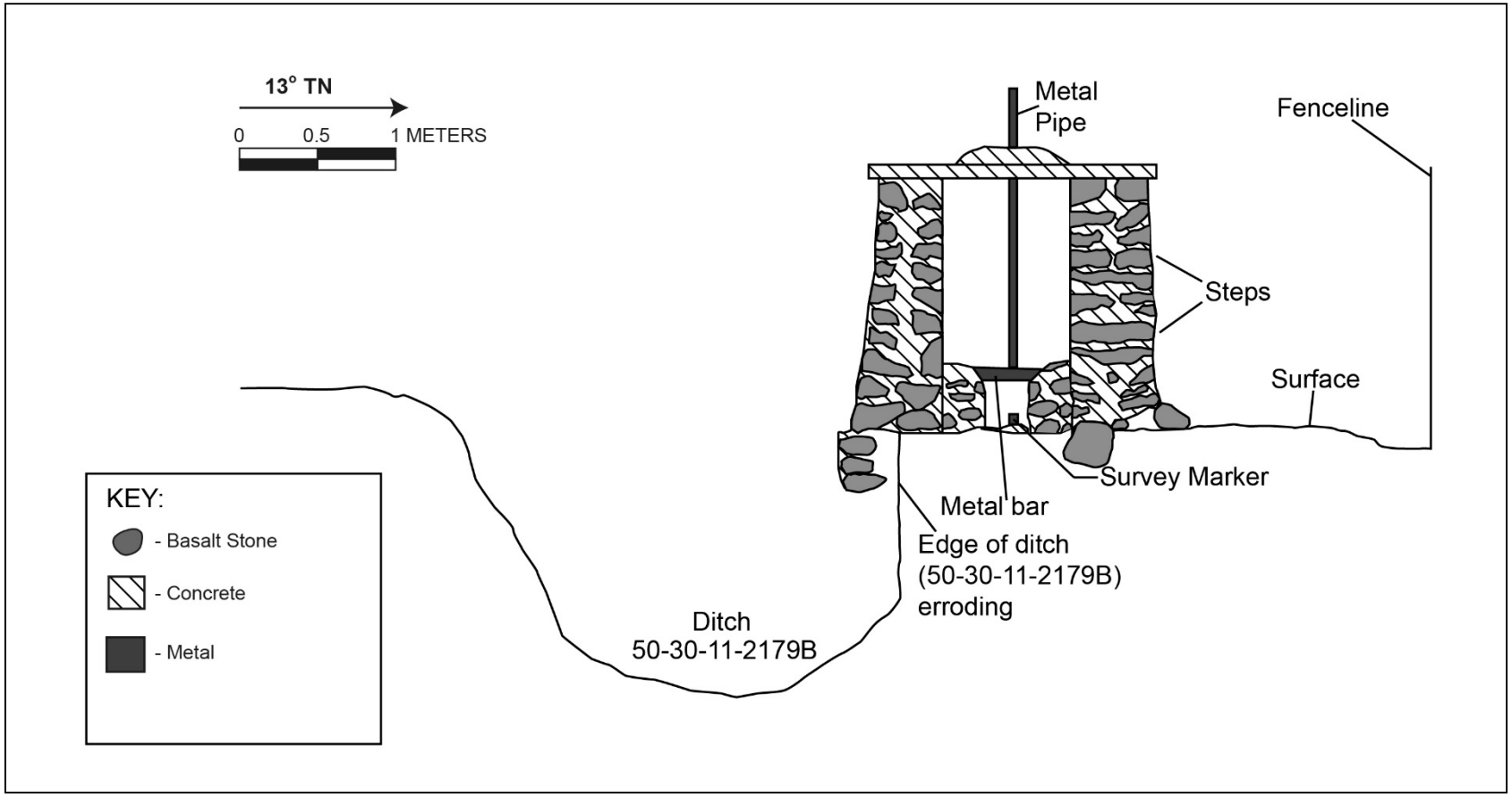

Figure 291. Elevation drawing of SIHP # -2220

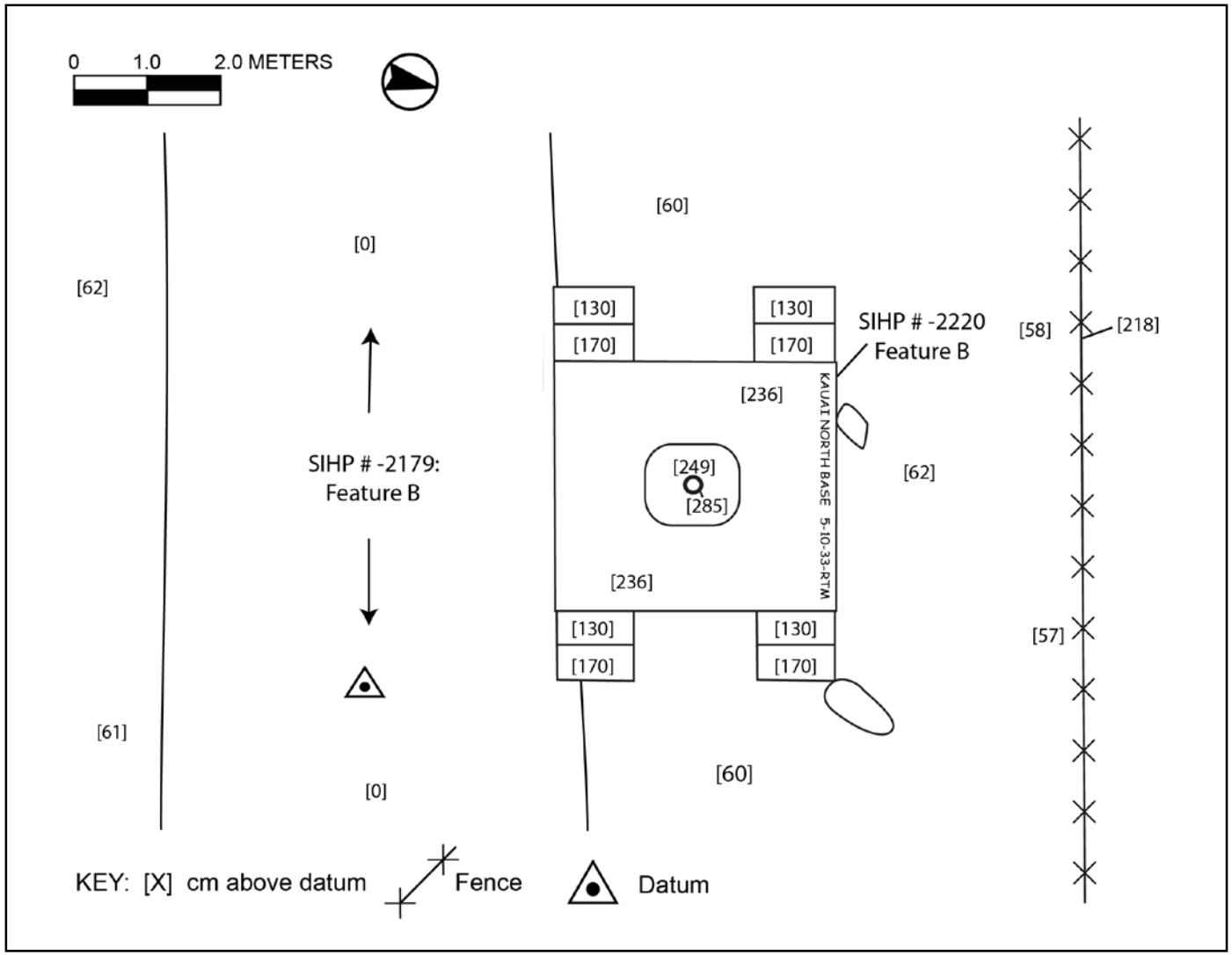

Figure 292. Plan map of SIHP # -2220 showing SIHP # -2719: Feature B in relation to survey station (SIHP # -2220)

6.4 SIHP # 50-30-11-2307

FORMAL TYPE:	Subsurface trash pit
FUNCTION:	Refuse disposal
NUMBER OF FEATURES:	1
AGE:	Post-1920s
TEST EXCAVATIONS:	T-11
TAX MAP KEY:	[4] 3-4-007:002
LAND JURISDICTION:	State of Hawai‘i
PREVIOUS DOCUMENTATION:	None

SIHP # -2307 is a historic subsurface trash pit identified during the subsurface testing program in the southwest portion of the project area, within the former Puhi Camp area (see Figure 37). The historic property was observed within Backhoe Trench 11 (T-11), beneath the modern land surface. SIHP # -2307 is approximately 1.7 m in width and starts at a depth of 100 cmbs and extends to 315 cmbs (BOE). The sediment matrix of the trash pit from 100 to 215 cmbs consists of sandy loam 10YR 5/2, grayish brown material and from 200 to 315 cmbs the sediment matrix consists of silty clay 7.5YR 3/2, dark brown material (see Figure 69, Figure 70, Figure 71 and Table 13).

Artifacts observed and collected consist of mostly non-burnable, commonly used household items of glass and metal including 24 glass bottles, six glass jars, one tin plate, four glass marbles, and plastic products (Acc. # 1-55). Diagnostic glass bottles suggest a date range of the 1950s, and possibly the late 1940s and early 1960s. For more detailed descriptions of artifacts, see Section 5. Puhi Camp was constructed in the 1920s, which suggests the pit feature was likely deposited after 1920. Although the majority of artifacts collected from the feature were dated between 1940 and 1950, it is possible that the lower/unexcavated portion of the feature may contain artifacts dating to the 1920’s or later.

The subsurface trash pit found in T-11 is located within the former Puhi Camp area, in the vicinity of the former camp roads of Fifth Avenue, between Koa Street and Algaroba Street. At its peak, Puhi Camp consisted of some 600 homes occupied by up to 1,200 workers and their families. Puhi Camp also contained a movie hall, three stores, a Chinese laundry, a slaughterhouse, and an area for social events (Chang 2007). Puhi Camp was in existence from the early 1920s, with various phases of renovation, until most of the Puhi Camp housing was removed in the 1970s prior to the construction of KCC. In the 1980s, the last homes in Puhi Camp were dismantled (Chang 2007). The artifact assemblage found in the T-11 pit feature correlates well with the historic use of Puhi Camp with many food and beverage containers, assorted household items, and toys indicative of use by plantation era residents.

SIHP # -2307, subsurface trash deposit, is assessed as significant pursuant to HAR §13-275-6 under Criterion “d” (have yielded, or is likely to yield, information important for research on prehistory or history) pursuant to HAR §13-13-284-6, for its potential to provide information about Puhi Camp and its former residents.