Draft
Archaeological Data Recovery Plan for SIHP # 50-80-14-7655, Block C West Project, Kakaʻako Ahupuaʻa, Honolulu (Kona) District, Oʻahu TMK: [1] 2-3-001:005 (por.)

Prepared for

Howard Hughes Corporation

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(Job Code: KAKAAKO 143)

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Management Summary

Reference	Archaeological Data Recovery Plan for SIHP # 50-80-14-7655, Block C West Project, Kaka‘ako Ahupua‘a, Honolulu (Kona) District, O‘ahu, TMK: [1] 2-3-001:005 (por.) (Sroat and McDermott 2014)
Date	August 2014
Project Number (s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: KAKAAKO 143
Investigation Permit Number	CSH will likely undertake the data recovery fieldwork under archaeological permit # 14-04, issued by the Hawai‘i State Historic Preservation Division (SHPD) per Hawai‘i Administrative Rules (HAR) § 13-13-282.
Land Jurisdiction	Private, Victoria Ward, Limited (VWL)
Project Funding	Private
Agencies	SHPD
Project Location	The Block C West project is a discrete project within the larger Ward Neighborhood Master Plan project. The project area consists of the southern portion of the current Ward Warehouse commercial complex. The project area is bounded to the northeast by Auahi Street and to the southwest by Ala Moana Boulevard. The project area is depicted on the 1998 Honolulu U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle.
Project Description	The Block C West project is a discrete project of VWL’s 60.5-acre (24.5-hectare) Ward Neighborhood Master Plan, a long-range development plan of 20-plus years. It follows guidelines set forth in the Mauka Area Plan of the Hawai‘i Community Development Authority (HCDA). The Block C West project is part of the Ward Village Gateway project, which also includes the adjacent Block B East project area. The Ward Village Gateway project consists of a central plaza flanked on either side by low-rise villas, a residential tower, a parking structure, and ground level retail space. The Block C West project consists of the southern half of the Ward Village Gateway project. Ground disturbance associated with project construction includes demolition and removal of Ward Warehouse and at grade parking lot, borings related to foundation pile installation, and excavation related to the project area’s development, including structural footings, utility installation, roadway and parking area installation, and landscaping.
Project Acreage	Approximately 2.2 acres (0.89 hectares)

Historic Preservation Regulatory Context	This document was prepared to support the proposed project's historic preservation review under Hawai‘i Revised Statutes (HRS) § 6E-8 and Hawai‘i Administrative Rules § 13-275. In consultation with SHPD, an Archaeological Inventory Survey (AIS) was conducted of the approximately 2.2-acre Block C West project area. The AIS report, entitled (Sroat et al. 2014), was submitted for SHPD review on 3 July 2014. The AIS investigation identified two historic properties: 1) State Inventory of Historic Properties (SIHP) # 50-80-14-7655, subsurface historic salt pan remnants, documented as laminated organic material and associated man-made berms; and 2) SIHP # 50-80-14-7658, buried historic surfaces, including asphalt, concrete, coral and tar pavement, oil-rolled surfaces, and fence-lines associated with the historic development of the project area. In consultation with the SHPD, it has been determined that an archaeological data recovery program is an appropriate mitigation measure for the historic salt pan remnants SIHP # 50-80-14-7655, located within the central and *mauka* portions of the project area. Additional mitigation measures recommended for the Block C West project area consist of an archaeological monitoring plan. CSH has prepared this archaeological data recovery plan in consideration of the *Secretary of the Interior's Guidelines for Archeology and Historic Preservation,* and in accordance with HAR §13-278 governing the preparation of data recovery programs.

Data Recovery Plan Summary	Data recovery within the Block C West project area will address one historic property: SIHP # -7655, historic salt pan remnants. The Block C West research objectives and strategy for SIHP # -7655 are intended to work in tandem with the data recovery program proposed for the adjacent Block B East. Research objectives for SIHP # -7655 will include: **Research Objective 1**: To better determine the form, characteristics, and function of the salt pan berm structures. In particular, can variation in the width, height, slope, and orientation of the berms be further defined and does this variation correspond to functional differences? For instance, do wider and/or steeper berm structures indicate a large salt pan grid (e.g. the boundaries of a large set of ponds) and/or do they indicate other functions, for example causeways utilized for access to/from the pans? Can lower, narrower berms be identified, and if so, what function did they serve; for example, do smaller berms indicate “inner” grids within a large pond set? Can the orientation of the salt pan grids be confirmed to conform to a *mauka-makai* and ‘Ewa-Diamond Head grid pattern? **Research Objective 2**: To better determine the characteristics and function of the salt pan beds. In particular, to further identify the organic content of the salt pan bed laminations in order to characterize salt production methodology and to differentiate potential salt pan bed deposits from natural organic deposits and wetland sediments. **Research Objective 3**: To further characterize the Ward Estate salt production commercial enterprise in the wider context of historic salt production on O‘ahu and salt production methodologies.

Table of Contents

List of Figures

List of Tables

Section 1 Introduction

1.1 Project Background

At the request of Victoria Ward, Limited (VWL) and the Howard Hughes Corporation (HHC), Cultural Surveys Hawai‘i, Inc. (CSH) has prepared this archaeological data recovery plan (DRP) for the Block C West project area, Kaka‘ako Ahupua‘a, Honolulu (Kona) District, O‘ahu, TMK: [1] 2-3-001:005 (por.). The project area is located in the southern portion of the current Ward Warehouse commercial complex. It is bounded to the northeast by Auahi Street and to the southwest by Ala Moana Boulevard. The project area is depicted on the 1998 Honolulu U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle (Figure 1), a tax map plat (Figure 2), and a 2013 aerial photograph (Figure 3).

The proposed project is a discrete project within the larger VWL's 60.5-acre (24.5-hectare) Ward Neighborhood Master Plan (General Growth Properties Inc., 2008), described as "a long-range development plan of 20-plus years that would evolve over time to fulfill the needs of the community." It follows the guidelines set forth in the Mauka Area Plan of the Hawaii Community Development Authority (HCDA).

The 2.2-acre (0.89-hectare) Block C West project is part of the Ward Village Gateway project, which also includes the adjacent Block B East project area. The Ward Village Gateway project consists of a central plaza flanked on either side by low-rise villas, a residential tower, a parking structure, and ground level retail space (Figure 4). The Block C West project consists of the southern half of the Ward Village Gateway project. This is a private development owned and funded by HHC. Ground disturbance associated with project construction will include demolition of Ward Warehouse and at-grade parking lot, borings related to foundation pile installation, and excavation related to the project area's development, including structural footings, utility installation, roadway and parking area installation, and landscaping.

1.2 Historic Preservation Regulatory Context

The proposed project is subject to Hawai‘i State environmental and historic preservation review legislation: Hawai‘i Revised Statutes (HRS) § 343 and HRS § 6E-42, and Hawai‘i Administrative Rules (HAR) § 13-284, respectively. As part of the historic preservation review process, a cultural impact assessment (CIA) (Cruz et al. 2012) and an archaeological literature review and predictive model study (O'Hare et al. 2012) of the entire Ward Neighborhood Master Plan project area were submitted to the SHPD on 20 July 2012. An archaeological inventory survey plan (Sroat et al. 2014) for the Block C West project area was accepted by the SHPD in a letter dated 24 January 2014 (LOG NO.: 2013.6925, DOC. NO.: 1401SL19). The AIS for Block C West was completed in June 2014. An AIS report (Sroat et al. 2014) detailing the results of the AIS was submitted to the SHPD on 3 July 2014. In consultation with the SHPD, mitigation recommendations included within the AIS report for the Block C West project consisted of a data recovery program and a monitoring plan.

This archaeological data recovery plan is designed to fulfill the requirements of Hawai‘i Administrative Rules (HAR) § 13-13-278-3 governing preparation of a data recovery plan and was specifically prepared to address State Inventory of Historic Properties (SIHP) # 50-80-14-7655, documented during the project AIS (for full site description see Appendix A).

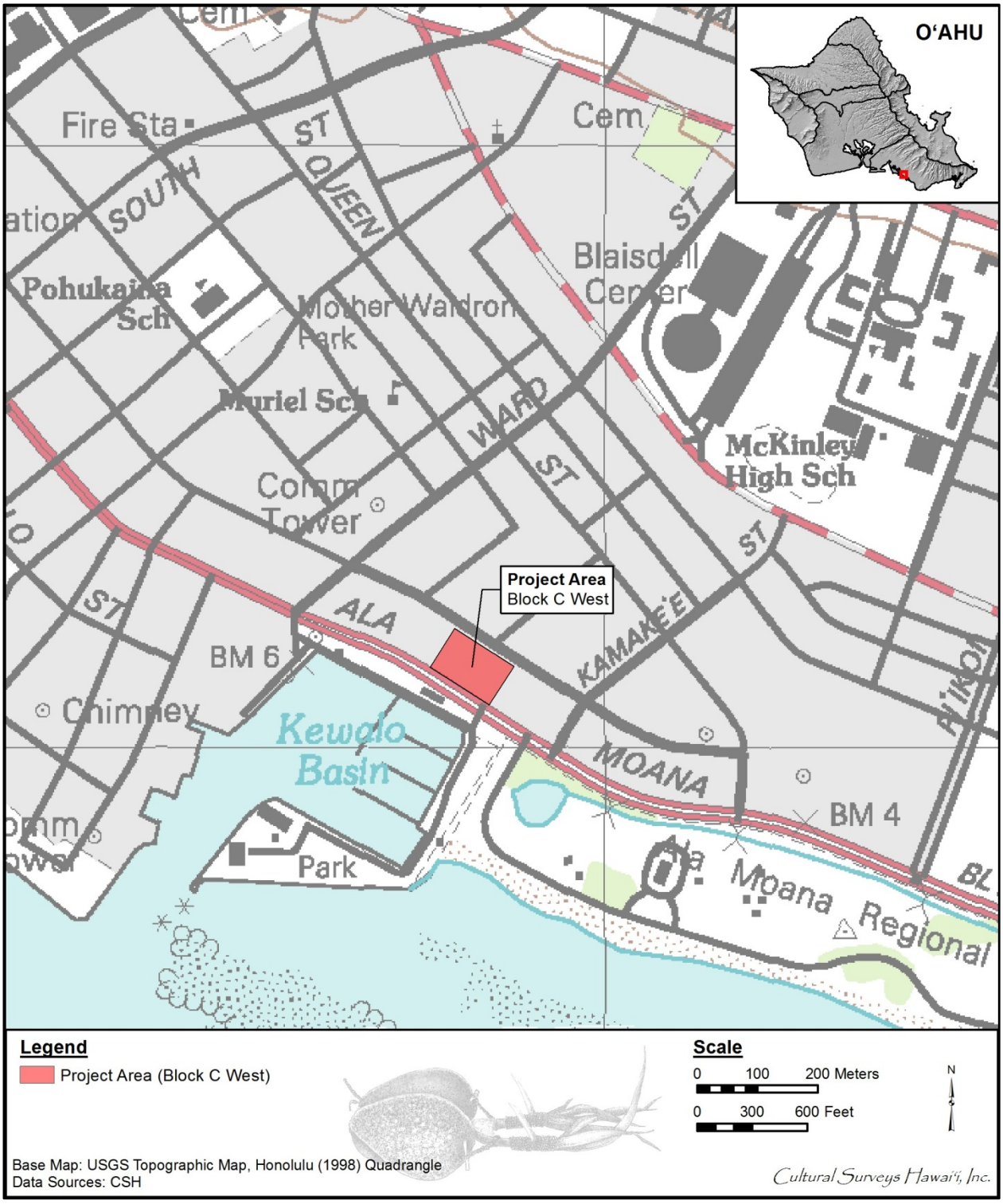

Figure 1. 1998 Honolulu USGS 7.5-minute topographic quadrangle showing the location of the Block C West project area south of the intersection of Ala Moana Boulevard and Ward Avenue

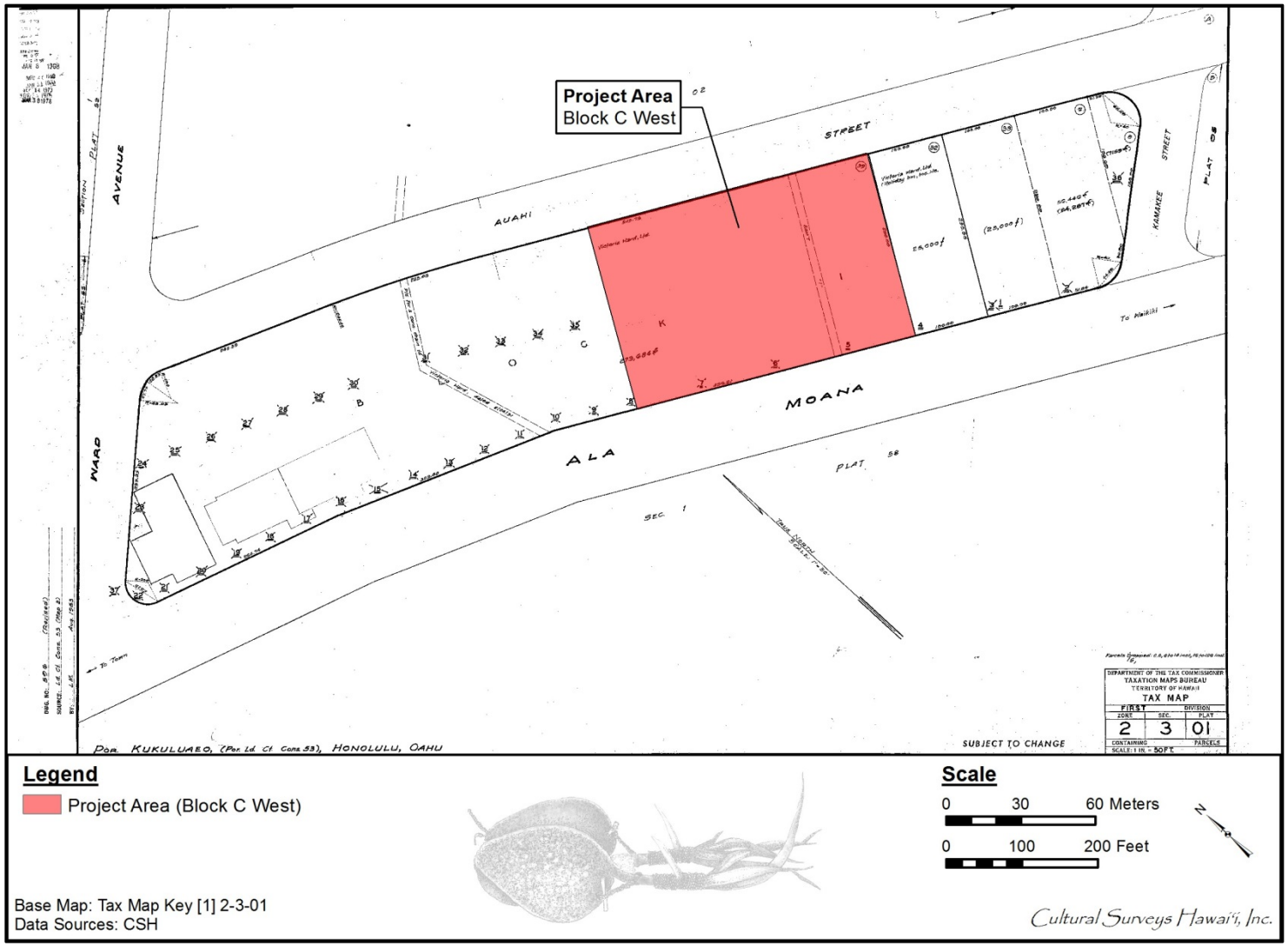

Figure 2. Tax Map Key (TMK) [1] 2-3-01, showing the location of the Block C West project area

Figure 3. Aerial photograph showing the location of the Block C West project area (Google Earth 2013)

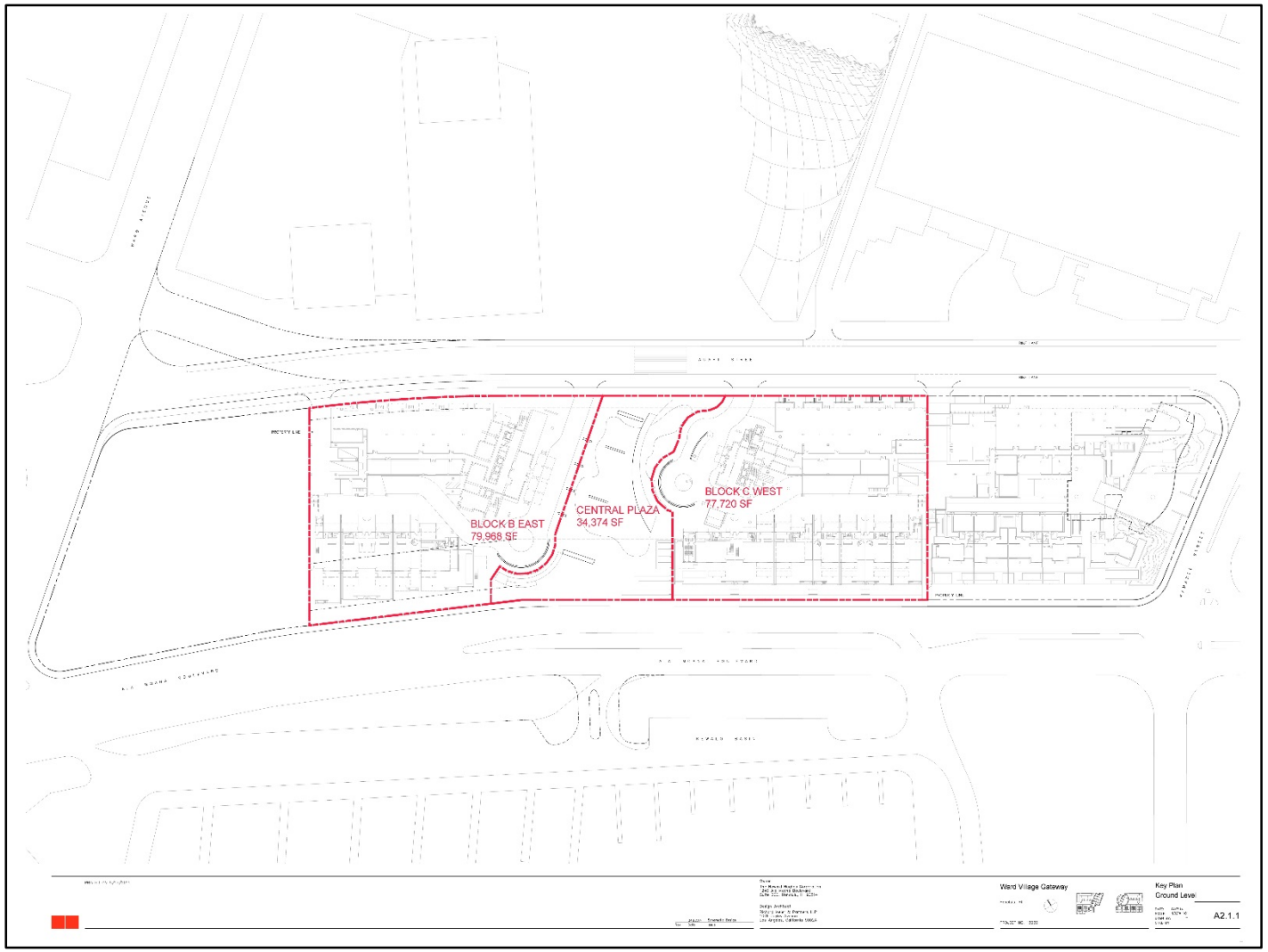

Figure 4. Project design showing the Ward Village Gateway building complex, straddling the Block B East and Block C West project areas, consisting of low-rise villas, residential towers, and commercial retail shops separated by a central plaza

1.3 Scope of Work

The scope of work for this DRP is detailed in HRS § 13-278-3:

a. An archaeological data recovery plan (research design) shall be prepared by an archaeologist who meets the minimum requirements under § 13-281 prior to the start of archaeological data recovery. The plan shall:

   1. Identify historic properties to be studied;
   2. Identify research objectives to be addressed. This shall be done through reviewing prior archaeological and historical work in the parcel, *ahupua‘a*, and wider region. The specifics of these research objectives will vary with the extent of prior work;
   3. Identify data needed to address the research objectives;
   4. Identify field methods to be used to acquire and analyze the data. Any sampling approaches to be used shall be noted here. The plan shall also use the most efficient methods to try to answer the research objectives;
   5. Identify any necessary lab work. This work may include, but not be limited to, dating, faunal analyses, soil analyses, botanical analyses, and artifact analyses. If osteological analysis of human skeletal remains is to be undertaken it shall conform to § 13-300 and 13-283;
   6. Identify a procedure for depositing collections after conclusion of the data recovery project;
   7. If burials are to be disinterred, a written data recovery plan is not required for inadvertent discoveries. For burials the procedures of HRS § 6E-43 and HAR § 13-300 shall be followed; and
   8. If properties deemed significant under paragraphs § 13-275-6(b) (5) or 13-284-6(b) (5) are involved, the archaeologist shall consult with members of the relevant ethnic group and consider any comments when preparing this plan. The plan shall describe the consultation process, list the consulted individuals and organizations, and summarize their comments.

The historic property addressed in this DRP, SIHP # 50-80-14-7655, was assessed as significant under Hawai‘i Register of Historic Places (HR) criteria “c” and “d” (Sroat et al. 2014:385) (see Appendix A). Thus, this DRP study does not fall under HAR § 13-278-3(b) requirements for consultation. No consultation was undertaken.

1.4 Environmental Setting

1.4.1 Natural Environment

The Block C West project area is within a portion of O‘ahu called the Honolulu Plain, an area generally less than 4.5 m, or 15 ft, above sea level (Davis 1989:5). The Honolulu Plain is stratified with late-Pleistocene coral reef substrate overlaid with calcareous marine sand or terrigenous sediments, and stream-fed alluvial deposits (Armstrong 1983:36). The top soil stratum consists of

Fill land (FL), containing areas filled with material dredged from the ocean and hauled from nearby areas (Foote et al. 1972).

The modern Hawaiian shoreline configuration is primarily the result of 1) rising sea level following the end of the Pleistocene (Stearns 1978; Macdonald et al. 1983); 2) the mid- to late Holocene approximately 1.5-2.0 m high-stand of the sea (see summary in Dye and Athens 2000:18-19); and 3) pre-Contact and post-Contact human landscape modification.

At the end of the Pleistocene, between approximately 20,000 and 5-6,000 years ago, water previously locked in glacial ice returned to the world's oceans, and the sea level rose over 100 m to approximately its current level. In the vicinity of the C West project area, rising sea levels flooded the previously dry, earlier Pleistocene reef deposits, which had formed hundreds of thousands of years previously when sea level was comparable to modern levels. When sea levels reached approximately modern levels, the now coastal regions became depositional environments, where for tens of thousands of years previously, during the lower sea levels, they had been erosional environments.

A high stand of the sea for the Hawaiian Islands, approximately 1.5 to 2.0 m above present sea level, has been well documented between 4,500 and 2,000 years ago (Stearns 1978; Athens and Ward 1991; Fletcher and Jones 1996; Grossman and Fletcher 1998; Grossman et al. 1998; Harney et al. 2000). During this high stand, there appears to have been an increase in coral reef production and the production of detrital reef sediments. Littoral environments appear to have been augmented substantially by the deposition of marine sediments. "What this means is that the great shoreline sand berms must have developed around the islands at this time because this was when calcareous sand was being produced and delivered to the shorelines in large quantities" (Dye and Athens 2000:19).

The Honolulu coastline was likely greatly affected by the deposition of marine sediments during this elevated sea level. The subsequent drop in sea level to its present level, ca. 2,000 years ago, most likely created a slightly erosional regime that may have removed sediments deposited during the preceding period of deposition (Dye and Athens 2000:19). However, the net gain in sediments would have been substantial. In 1911, it was estimated that about one-third of the Honolulu Plain was a wetland (Nakamura 1979:65, citing a Hawaiian Territory Sanitary Commission report). Pre-Contact Hawaiians used the lagoonal/estuary environment of the Honolulu plain to construct fishponds. Fishpond walls served as sediment anchors for the accumulation of detrital reef sediments. They also likely affected along-shore sedimentary transport, resulting in new littoral deposition and erosion patterns. In the post-Western Contact period, when the fishponds were no longer utilized, they became obvious locations for the deposition of fill. These reclaimed areas provided valuable new land for expanding urban development near the heart of growing urban Honolulu.

Foote et al. (1972) show the study area as being fill (FL), as shown in Figure 5. The authors describe fill land as: "This land type occurs mostly near Pearl Harbor and in Honolulu, adjacent to the ocean. It consists of areas filled with material dredged from the ocean or hauled from nearby areas, garbage, and general material from other sources" (Foote et al. 1972:31).

Figure 5. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), showing Fill lands (FL) within and surrounding the Block C West project area (base map: Google Earth 2013)

While fill materials will likely be found throughout the project area, the coastal location of Block C West indicates natural Jaucas sand (JaC) may be encountered underneath portions of the Block C West project area. Foote et al. (1972) describe Jaucas sand as:

> In a representative profile the soil is single grain, pale brown to very pale brown, sandy, and more than 60 inches deep. In many places the surface layer is dark brown as a result of accumulation of organic matter and alluvium. The soil is neutral to moderately alkaline throughout the profile. [Foote et al. 1972:48]

In this area of the Honolulu District, rainfall averages less than 30 inches per year (Armstrong 1983:62). Northeasterly trade winds prevail throughout the year, although their frequency varies from more than 90% during the summer months to 50% in January; the average annual wind velocity is approximately 10 miles per hour (Wilson Okamoto 1998:2-1). Vegetation within the project area is limited to a few ornamental trees and shrubs along the project area margins.

1.4.2 Built Environment

The project area is located within central Honolulu, surrounded by modern urban development including commercial buildings, paved streets, sidewalks, utility infrastructure, and landscaped margins.

Section 2 Historical and Cultural Background

2.1 Mythological and Traditional Accounts

2.1.1 Explanation of Place Names

As noted in the introduction, the project area is within the Kaka‘ako Community Development District. However, the boundary of this development district is not the same as the ancient boundary of Kaka‘ako. The development district is comprised of the *‘ili* (land section) of Kaka‘ako and lands once known as Ka‘ākaukukui, Kukuluāe‘o, and Kewalo, and even smaller areas—portions of *‘ili*—called Kawaiaha‘o, Honuakaha, Ka‘ala‘a, ‘Āpua, ‘Auwaiolimu, Pualoalo, Pu‘unui, and Kolowalu. The Block C West project area is within the *‘ili* of Kukuluāe‘o (Figure 6).

The land called Kukuluāe‘o was named for the Hawaiian stilt bird (*Himantopus himantopus*), also called *kukuluāe‘o,* which means “to walk on stilts.” The area was described as having contained “marshes, salt ponds, and small fishponds,” an environment well suited for this type of bird (Griffin et al. 1987:36). Kekahuna (1958:4) described it as “the land on the upland side of Ka‘ākaukukui. Salt was formerly made there.”

John Papa ‘Ī‘ī mentions some of these lands while discussing early nineteenth century trails in the Honolulu/Waikīkī area (Figure 7). The fact that the trail traversed this region—characterized by ponds, marshlands and *lo‘i* (irrigated fields)—suggests the trail, especially as it neared the coastline at Kālia, must have run on a sand berm raised above surrounding wetlands and coral flats. On this inland trail (probably close to the current alignment of Queen Street), walking from Waikīkī to Honolulu, “The trail from Kalia led to Kukuluaeo, then along the graves of those who died in the smallpox epidemic of 1853, and into the center of the coconut grove of Honuakaha” (‘Ī‘ī 1959:89).

The smallpox epidemic graves referred to are within the Honuakaha Cemetery, designated SIHP # 50-80-14-3712, near the corner of Halekauwila and South Streets, *makai* (seaward) of Kawaiaha‘o Church. Honuakaha was a settlement located generally between Punchbowl and South Streets, on the *makai* side of Queen Street.

2.1.2 Legendary Accounts

The Block C West project area is located in an area called Kukuluāe‘o on historic maps. The place name Kaka‘ako is found in various legends and traditions, but Kukuluāe‘o does not appear in any sources referenced in the *Hawaiian Island Legends Index* (Gotanda 1989) or in the index to *Fornander’s Collection of Hawaiian Antiquities and Folklore* (Fornander 1916-1920).

However, a *heiau* (place of worship) called Pu‘ukea may have once been located in Kukuluāe‘o. This *heiau* is mentioned in a *mele* (chant) to the chief Huanuikalala‘ila‘i, who was born in Kewalo, the land section north and adjacent to Kukuluāe‘o.

‘O Hua-a-Kamapau ke ‘li‘i	Hua-a-Kamapau the chief
O Honolulu o Waikīkī	Of Honolulu, of Waikīkī

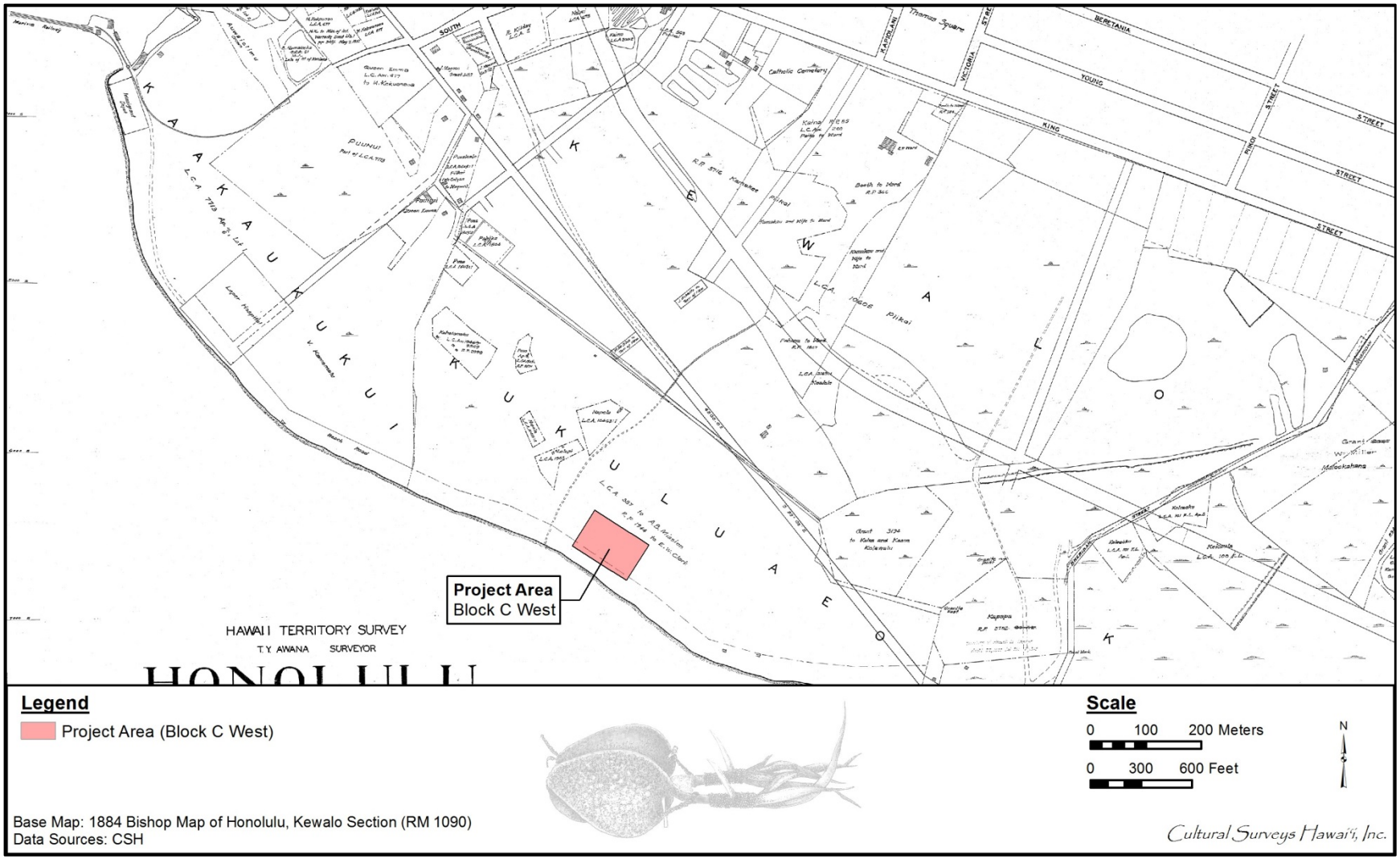

Figure 6. 1884 map of Honolulu, Kewalo Section (portion), by S.E. Bishop, showing place names and Land Commission Award (LCA) locations within and near the project area (Hawai‘i Land Survey Division, Registered Map 1090)

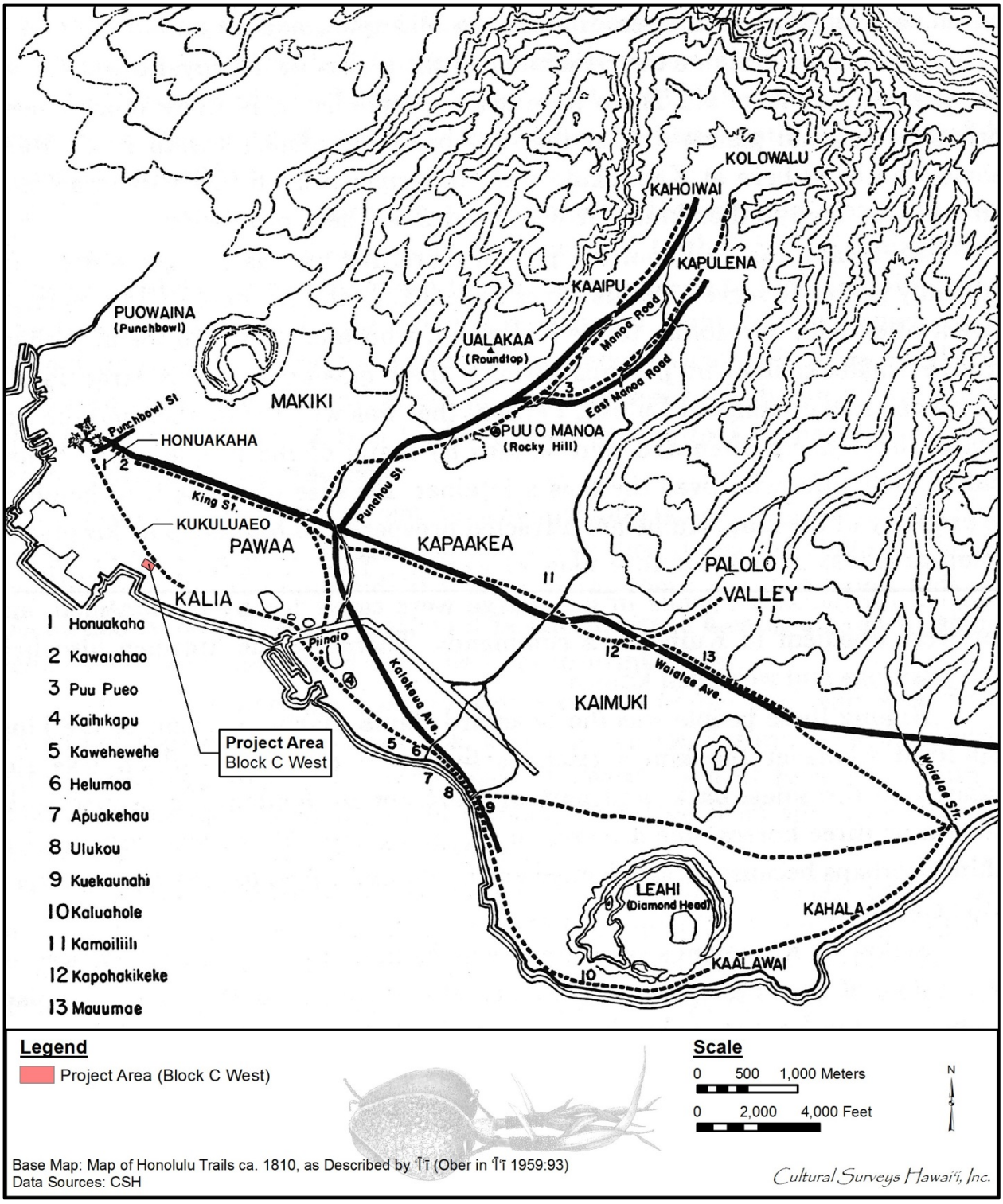

Figure 7. Early nineteenth century (ca. 1810) trails on the southwest coast of O‘ahu (illustration by Gerald Ober from ‘Ī‘ī 1959:93), showing the location of Honuakaha, Kukuluāe‘o, and Kālia

*I hanau no la i kahua la i **Kewalo**,*	Was born at **Kewalo**,
‘O Kālia la kahua	Kālia was the place [the site]
O Makiki la ke ēwe,	At Makiki the placenta,
I Kānelā‘au i Kahehuna ke piko,	At Kānelā‘au at Kahehuna the navel cord,
I Kalo i Pauoa ka ‘a‘a;	At Kalo at Pauoa the caul;
I uka i Kaho‘iwai i	Upland at Kaho‘iwai, at
Kanaloaho‘okau . . .	Kanaloaho‘okau . . .
[Kamakau 1991:24]	

The chief Hua was famous for his love of cultivation and his care for the people. His *heiau,* Pu‘ukea, is mentioned in a traditional *wānana* (prophecy) recorded by Kamakau (1991:24-25) as follows:

[*Ka makaua ua kahi o ‘Ewa*]	[The increasing “first rain” of ‘Ewa]
Ua puni ka i‘a o Mokumoa,	Overcomes the fish of Mokumoa,
Ua kau i‘a ka nene;	Washes up fish to the nene plants;
Ua ha‘a kalo ha‘a nu;	Lays low the taro as it patters down;
Ha‘a ka i‘a o kewalo,	Lays low the fish of Kewalo,
Ha‘a na ‘ualu o Pahua,	Lays low the sweet potatoes of Pahua,
*Ha‘a ka mahiki i **Pu‘ukea**,*	Lays low the mahiki grass at **Pu‘ukea**,
Ha‘a ka unuunu i Pele‘ula,	Lays low the growing things at Pele‘ula
Ha‘a Makaaho i ke ala.	Lays low Makaaho [Makāho] in its path
E Kū e, ma ke kaha ka ua, e Kū,	O Kū, the rain goes along the edge [of the island], O Kū
[*I ‘ai ‘na ka i‘a o Maunalua*] . . .	[Eating the fish of Maunalua] . . .

The chant mentions the *mahiki* grass of Pu‘ukea Heiau. The Hawaiian term *mahiki* means “to peel off” (Andrews 2003:369). The word was also used to describe a rite to exorcise an evil spirit, as the skilled *kahuna* (priest) “peeled” the malicious spirit from the afflicted. Used in the ritual was a shrimp called *mahiki* or a native grass called *mahiki*. *Mahiki,* or *‘aki‘aki,* is a tufted rush (*Sporobolos* sp.) found near the seashore. The ethnologist Mary Kawena Pukui states that even during her youth, parents put “*ti* leaves, or *hala,* or *‘aki‘aki* grass, in a little sea-salt water and [would] have the child drink it” (Pukui et al. 1972:163) to rid them of badly-behaving spirits. The use of this grass in a ritual may explain its association with a ceremonial *heiau,* or it may simply be that the Kukuluāe‘o coast was a good habitat and thus a favored place for healers to collect this type of grass. The literal meaning of Pu‘ukea is “white hill” (Pukui et al. 1974:199), although it may have alternate meanings. Pu‘ukea is also the name of a small land division within the *‘ili* of Kukuluāe‘o, mentioned in at least two LCA 1502 (not awarded) and 1504. LCA 1504 was located near the junction of Halekauwila Street and Cooke Street.

It is fairly common for a *heiau* to have the same name as the *‘ili* it is located within, so it is possible that Pu‘ukea Heiau was also near the junction of Halekauwila and Cooke streets. The majority of the house sites in the mid-nineteenth century in Kukuluāe‘o were located near Halekauwila Street and Queen Street, *mauka* (inland) of the low-lying coastal swamplands on higher dry ground. It is possible that the *heiau* platform or the area that it was built on was one of the few “high spots” in the flat, low-lying swamp that surrounded it, and thus gained the name *pu‘u kea* (white hill).

From these legendary accounts it can be seen that Kukuluāe‘o was traditionally noted for its fishponds and salt pans, for the marsh lands where *pili* grass and other plants could be collected, for ceremonial sites such as Pu‘ukea Heiau, and for the trails that allowed transport between the more populated areas of Waikīkī and Honolulu. Important chiefs were born in the area and conducted religious rites, and commoners traveled to the area to procure food and other resources; some commoners probably also lived in the area, possibly adjacent to the ponds and trails.

2.2 Early Post-Contact History and Population Centers

Kukuluāe‘o is between two centers of population, Kou and Waikīkī, on the southern shore of pre-Contact O‘ahu. In Waikīkī, a system of taro *lo‘i* (irrigated terrace) fed by streams descending from Makiki, Mānoa, and Pālolo valleys blanketed the plain, and networks of fish ponds dotted the shoreline. Similarly, Kou—the area of downtown Honolulu surrounding the harbor—possessed shoreward fishponds and irrigated fields watered by ample streams descending from Nu‘uanu and Pauoa Valleys. The pre-Contact population and land use patterns of Kukuluāe‘o may have derived from its relationship to these two densely populated areas; this population may have participated in some of the activities associated with them. Thus, the attempt to reconstruct the Kukuluāe‘o region (and the present study area)—as it existed for the Hawaiians during the centuries before Western Contact and the modern urbanization that has reconfigured the landscape—must begin with accounts of Kou and Waikīkī.

Waikīkī is actually the name of a large *ahupua‘a* (traditional land division) encompassing lands stretching from Honolulu to Maunalua Bay. Within that *ahupua‘a*, by the time of the arrival of Europeans during the late eighteenth century, the area today known as Waikīkī had long been a center of population and political power on O‘ahu. According to Martha Beckwith (1940:383), by the end of the fourteenth century, Waikīkī had become “the ruling seat of the chiefs of O‘ahu.” The pre-eminence of Waikīkī continued into the eighteenth century and is confirmed by the decision of Kamehameha, in the midst of unifying control of the islands, to reside there after winning control of O‘ahu by defeating the island’s chief, Kalanikūpule. The nineteenth century Hawaiian historian John Papa ‘Ī‘ī, himself a member of the *ali‘i* (chiefly class), described the king’s Waikīkī residence:

> Kamehameha’s houses were at Puaaliilii, makai [seaward] of the old road, and extended as far as the west side of the sands of Apuakehau. Within it was Helumoa where Kaahumanu ma went to while away the time. The king built a stone house there, enclosed by a fence; . . . [‘Ī‘ī 1959:17]

‘Ī‘ī (1959:17) further noted that the “place had long been a residence of chiefs. It is said that it had been Kekuapoi’s home, through her husband Kahahana, since the time of Kahekili.”

Chiefly residences were only one element of a complex of features sustaining a large population that characterized Waikīkī up through the pre-Contact period. Beginning at least by the fifteenth century, a vast system of irrigated taro fields was constructed, extending across the littoral plain from Waikīkī to lower Mānoa and Pālolo valleys. This field system, an impressive feat of engineering, the design of which is traditionally attributed to the chief Kalamakua, took advantage of streams descending from Makiki, Mānoa, and Pālolo Valleys, which also provided ample fresh water for the Hawaiians living in the *ahupua‘a*. Water was also available from springs in nearby Mō‘ili‘ili and Punahou. Closer to the Waikīkī shoreline, coconut groves and fishponds dotted the

landscape. A continuous zone of population and cultivation, from the shoreline of present day Waikīkī Beach, extended north well into Mānoa Valley. The western and eastern bounds of this zone are less clear, and there are no specific references to Waikīkī's abundance reaching into the Kewalo region.

A basic description of Honolulu and Kou, up to Western Contact, is given by E.S. Craighill and Elizabeth Handy:

> What is now Honolulu was originally that flatland area between the lower ends of Nu‘uanu and Pauoa Valleys and the harbor. [W.D.] Westervelt . . . wrote that ‘Honolulu was probably a name given to a very rich district of farm land near what is now . . . the junction of Liliha and School Streets, because its chief was Honolulu, one of the high chiefs at the time of Kakuhihewa’. . . . It is probable that the chief referred to by Westervelt took his name from the harbor and adjoining land. The original name of the land where the town grew when the harbor became a haven for foreign ships was Kou. . . . The number of *heiau* in this area indicates that it was a place of first importance before the era of foreign contact. [Handy and Handy 1972:479]

Rev. Hiram Bingham, arriving in Honolulu in 1820, described a still predominantly Native Hawaiian environment—still a "village"—on the brink of western-induced transformations:

> We can anchor in the roadstead abreast of Honolulu village, on the south side of the island, about 17 miles from the eastern extremity. . . . Passing through the irregular village of some thousands of inhabitants, whose grass thatched habitations were mostly small and mean, while some were more spacious, we walked about a mile northwardly to the opening of the valley of Pauoa, then turning southeasterly, ascending to the top of Punchbowl Hill, an extinguished crater, whose base bounds the northeast part of the village or town. . . . Below us, on the south and west, spread the plain of Honolulu, having its fishponds and salt making pools along the seashore, the village and fort between us and the harbor, and the valley stretching a few miles north into the interior, which presented its scattered habitations and numerous beds of kalo (arum esculentum) in its various stages of growth, with its large green leaves, beautifully embossed on the silvery water, in which it flourishes. [Bingham 1847:92-93]

The Kukuluāe‘o region would have been in Bingham's view as he stood atop "Punchbowl Hill" looking toward Waikīkī to the south; it would have comprised part of the area he describes as the "plain of Honolulu" with its "fishponds and salt making pools along the seashore."

Another visitor to Honolulu in the 1820s, Captain Jacobus Boelen, hints at the possible pre-Contact character of Honolulu and its environs, including the Kukuluāe‘o area:

> It would be difficult to say much about Honoruru. On its southern side is the harbor or the basin of that name (which as a result of variations in pronunciation [*sic*] is also written as Honolulu, and on some maps, Honoonoono). The landlocked side in the northwest consists mostly of tarro fields. More to the north there are some sugar plantations and a sugar mill, worked by a team of mules. From the north toward the

> east, where the beach forms the bight of Whytetee, the soil around the village is less fertile, or at least not greatly cultivated. [Boelen 1988:62]

Boelen's description implies that the Kukuluāe‘o region and the present study area are within a "not greatly cultivated" region of Honolulu perhaps extending from Pūowaina (Punchbowl Crater) at the north through Kaka‘ako to the Kālia portion of Waikīkī in the east.

An early, somewhat generalized depiction of the pre-Contact Native Hawaiian shaping of Waikīkī, Honolulu, and the Kukuluāe‘o region is given on an 1817 map by Otto von Kotzebue (1821), commander of the Russian ship *Rurick*, who had visited O‘ahu the previous year. The map (Figure 8) shows taro *lo‘i* (the rectangles, representing irrigated fields) massed around the streams descending from Nu‘uanu and Mānoa valleys. The depicted areas of population and habitation concentration (illustrated by the trapezoids) probably reflect distortions caused by the post-Contact shift of Hawaiians to the area around Honolulu harbor—the only sheltered landing on O‘ahu and the center of increasing trade with visiting foreign vessels. Kamehameha himself had moved from Waikīkī to Honolulu in 1809.

Kotzebue's map illustrates that the land between Pūowaina (Punchbowl Crater) and the shoreline—which would include the Kukuluāe‘o area—formed a "break" between the heavily populated and cultivated centers of Honolulu and Waikīkī; the area is only characterized by fishponds, salt ponds, trails connecting Honolulu and Waikīkī, and occasional taro *lo‘i* and habitation sites.

A clearer picture of Kukuluāe‘o and the present project area develops with accounts of other visitors to and settlers of Honolulu during the first half of the nineteenth century. Gorman D. Gilman, who arrived in Honolulu in 1841, recalled in a memoir the limits of Honolulu during the early 1840s:

> The boundaries of the old town may be said to have been, on the *makai* [seaward] side, the waters of the harbor; on the *mauka* [inland] side, Beretania street; on the Waikīkī side [i.e. the area just beyond Punchbowl Street], the barren and dusty plain, and on the Ewa [west] side, the Nuuanu Stream. [Gilman 1903:97]

Gilman further describes the "barren and dusty plain" beyond (east of) Punchbowl Street:

> The next and last street running parallel [he had been describing the streets running *mauka-makai*, or from the mountains to the shore] was that known as Punchbowl Street. There was on the entire length of this street, from the *makai* side to the slopes of Punchbowl, but one residence, the two-story house of Mr. Henry Diamond, *mauka* of King Street. Beyond the street was the old Kawaiahao church and burying ground. A more forsaken, desolate looking place than the latter can scarcely be imagined. One, to see it in its present attractiveness of fences, trees and shrubbery, can hardly believe its former desolation, when without enclosure, horses and cattle had free access to the whole place. [Gilman 1903:89]

That the environs of the missionary enclave and Kawaiaha‘o Church were indeed "forsaken" and "desolate looking" in the 1820s when the missionaries first settled there is confirmed in the memoirs of the American missionary C.S. Stewart who, arriving on Maui after living at the mission, declared Lahaina to be "like the delights of an Eden" after "four weeks residence on the

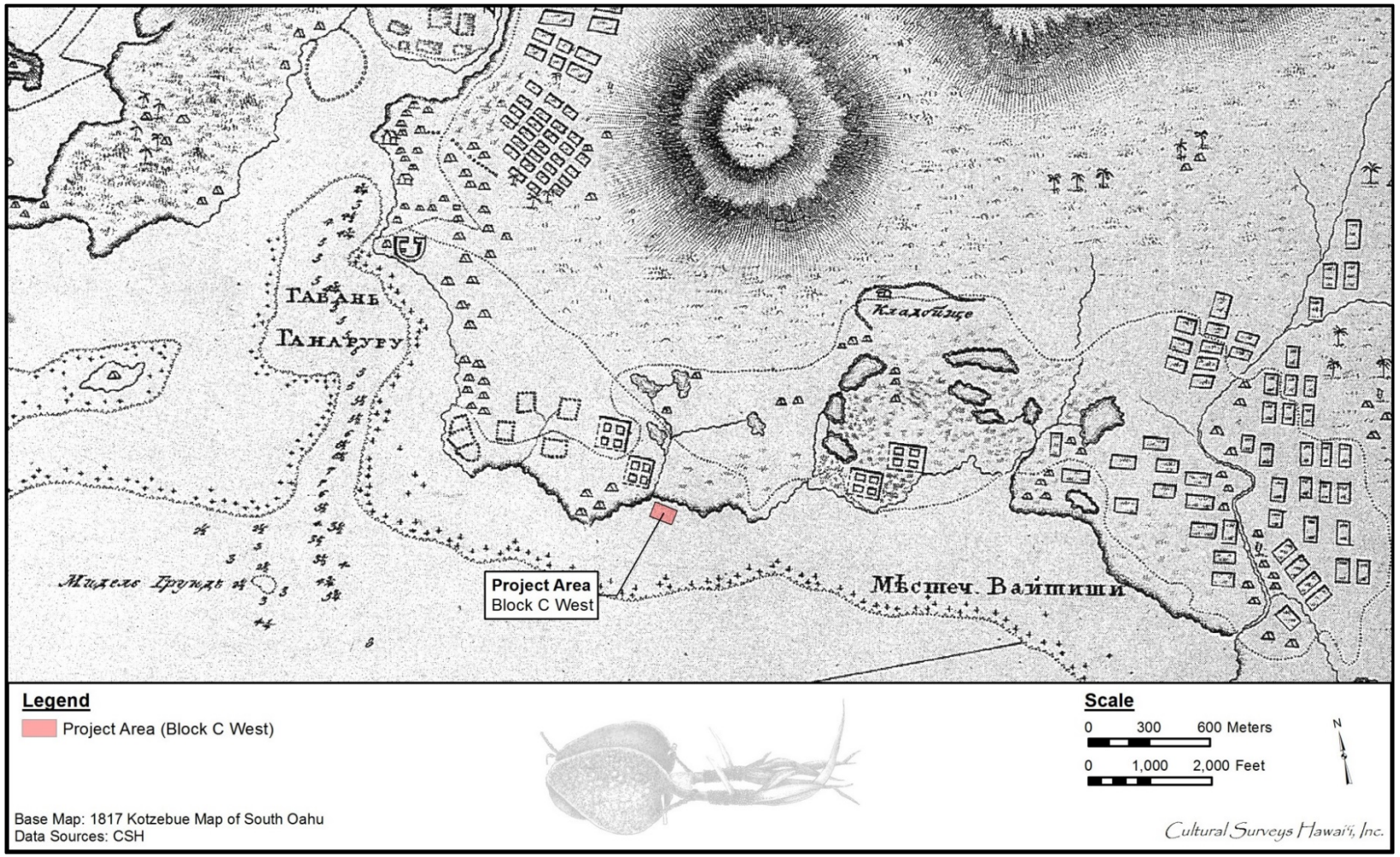

Figure 8. The 1817 map by Otto von Kotzebue of the Russian ship *Rurick* shows taro *lo‘i*, fishponds, and salt pans in Honolulu and Waikīkī; few habitations are depicted along much of the shoreline portions near the project area (map reprinted in Fitzpatrick 1986:48-49). (Note: Although geo-referencing in this map places the project area offshore, in historic times the block was always back from the shore)

dreary plain of Honoruru" (Stewart 1970:177). It is likely these descriptions of the Honolulu plain also include—at least for western sensibilities—the Kukuluāe‘o region. The barrenness of the Kukuluāe‘o area is illustrated in two sketches, one made in 1834 (Figure 9) when Kawaiaha‘o Church was still a long grass-thatched building and one made in 1853 (Figure 10) after the grass hut had been replaced by a large coral stone structure with a steeple. Between Kawaiaha‘o Church and the sea are only a few scattered huts along the shore and aligned along the inland trail (now covered by King Street). The project area would be *makai* and left (east) of the church along the shore. An 1887 photograph (Figure 11 and Figure 12) of the area also shows the marshy nature of the area, with only scattered houses near the ponds or near the shore *makai* of Kawaiaha‘o Church. The missionary families grazed their cows in the lands *makai* of the mission houses, possibly on lands within the project area (*Paradise of the Pacific* 1950:21).

2.3 Mid-Nineteenth Century and the Māhele

In 1845, the Board of Commissioners to Quiet Land Titles, also called the Land Commission, was established "for the investigation and final ascertainment or rejection of all claims of private individuals, whether natives or foreigners, to any landed property" (Chinen 1958:8). This led to the Māhele, the division of lands between the king of Hawai‘i, the *ali‘i,* and the common people, which introduced the concept of private property into Hawaiian society. In 1848, Kamehameha III divided the land into four divisions: certain lands to be reserved for himself and the royal house were known as Crown Lands; lands set aside to generate revenue for the government were known as Government Lands; lands claimed by *ali‘i* and their *konohiki* (supervisors) were called Konohiki Lands; and habitation and agricultural plots claimed by the common people were called *kuleana* (Chinen 1958:8-15). The common people presented their claim, several witnesses confirmed that the person lived on or used the land, the parcel was surveyed, and the claimant was presented with the award.

The *‘ili* of Kukuluāe‘o (LCA 387) was awarded to the American Board of Commissioners for Foreign Missions. The claim (in English) with witness testimony and the award (in Hawaiian) with a map of the surveyed lot are presented in Appendix A. Initially this land was associated with Punahou School in Makiki and Mānoa Valley, as Chief Boki gave the Punahou lands to Hiram Bingham, pastor of Kawaiaha‘o Church in 1829 (DeLeon 1978:3), as stated in the LCA testimony:

> The boundaries of that part which lies on the sea shore we cannot define so definitely, but presume there will be no difficulty in determining them as it is commonly known as pertaining to Punahou. This part embraces fishing grounds, coral flats & salt beds. [Land Commission Award 387; see Appendix A]

In the Māhele, however, this sea land became "detached" from the Mānoa award and was instead given to the pastor of the Kawaiaha‘o Church, as noted in Punahou School history:

> There belonged in former times, as an appurtenance to the land known as Kapunahou, a valuable tract of salt-ponds, on the sea-side to the east-ward of Honolulu harbor, called Kukuluaeo, and including an area of seventy-seven acres. At the time of the settlement of land claims before the Land Commission, application was made for it by the successor of Mr. Bingham in the pastorate of Kawaiahao Church—he believing it to be a glebe land for the support of that church. His claim was resisted by the then Principal of Punahou School, but without

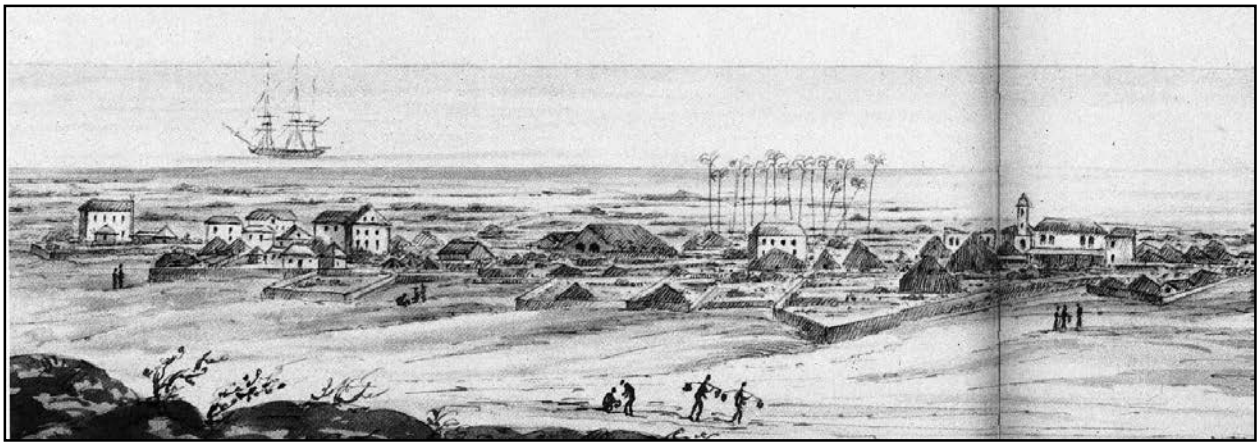

Figure 9. “Town of Honolulu: Island of Woahoo: Sandwich Islands,” portion of 1834 sketch by anonymous illustrator; the project area is west and south (left and back) of Kawaiaha‘o Church, the long thatched structure in the center of the sketch (original sketch at Bernice Pauahi Bishop Museum; reprinted in Grant 2000:64-65)

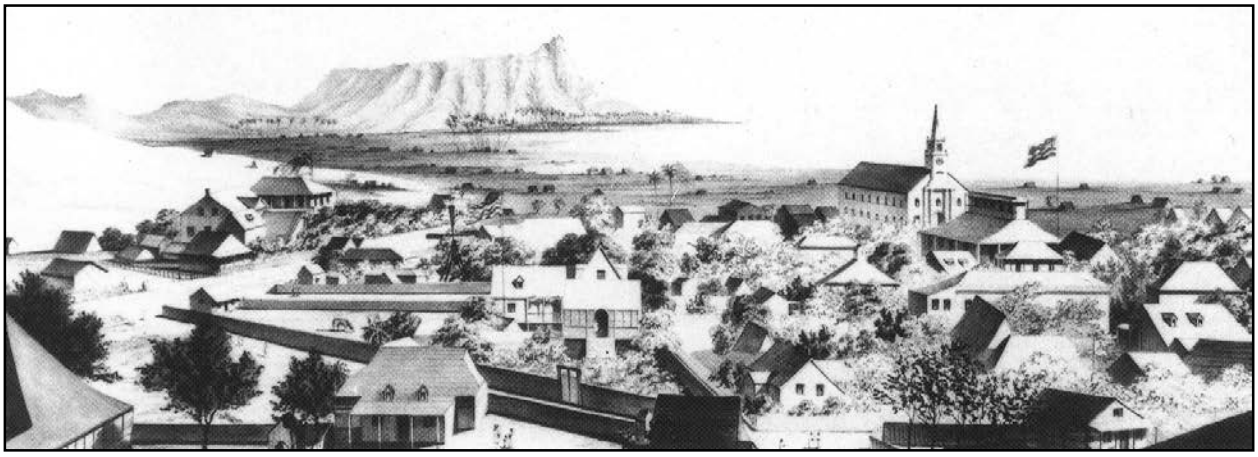

Figure 10. “View of Honolulu from the Catholic Church No. 2,” central panel of sketch by Paul Emmert ca. 1853; the project area is west and south (left and back) of the coral-block Kawaiaha‘o Church (structure with steeple completed in 1842) (original sketch at Hawaiian Historical Society; reprinted in Grant 2000:5)

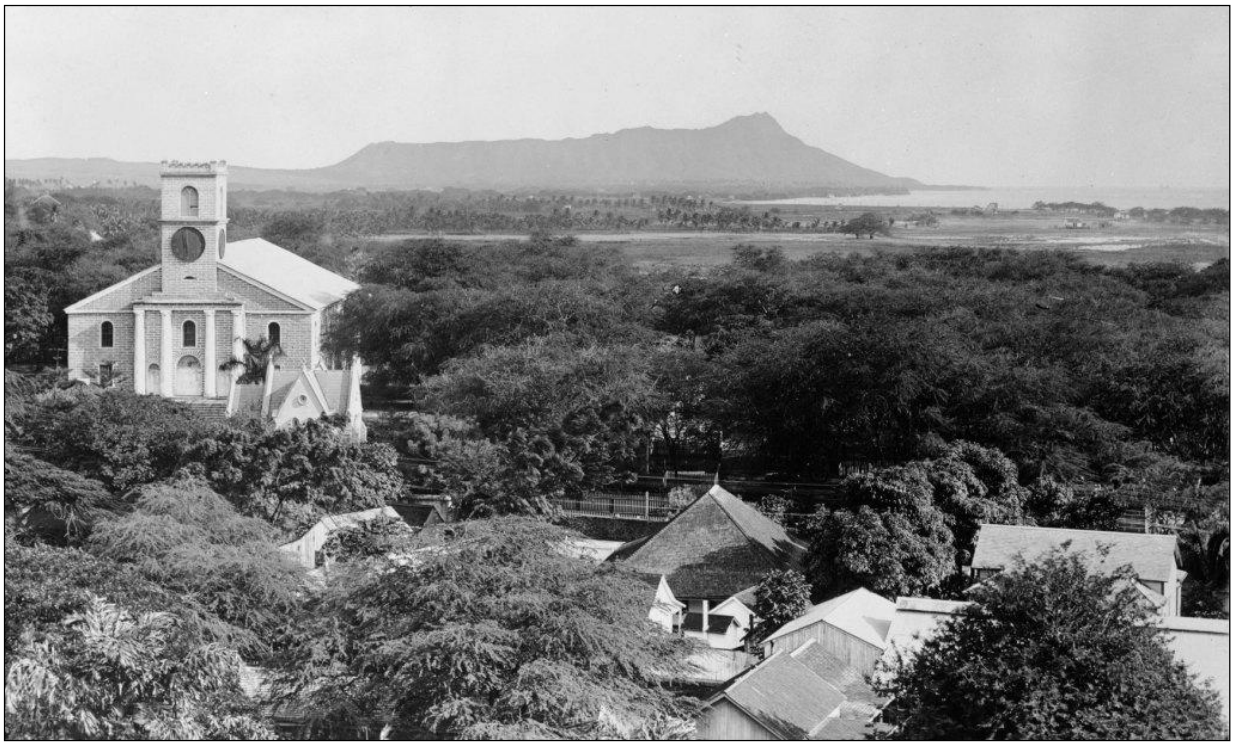

Figure 11. Kawaiaha‘o Church and Honuakaha Village, ca. 1887 photograph; the Ward’s House roof cupola, on the *mauka* end of Old Plantation, can be seen to the left of the church steeple; the project area is within the marshlands in the right upper background (Hawai‘i State Archives, Henry L. Chase Collection; reprinted in Stone 1983:84-85)

Figure 12. Kaka‘ako area, portion of a ca. 1887 (see Figure 11 above), close-up of right upper background area, showing marshlands and scattered huts along the coast

> success, and a Royal Patent was issued, severing it from the Punahou estate, and awarding it to the applicant as his private property. [Punahou School and Oahu College 1866]

Within this larger award were eight *‘āpana* (lots) of five *kuleana* awards to commoners: LCA 1503 (*‘Āpana* 1, 2, and 3), LCA 1504, LCA 1903 (*‘Āpana* 2), LCA 9549, and LCA 10463 (*‘Āpana* 1 and 2). The 1884 map by Sereno Bishop shows the location of these LCA parcels, and other parcels outside the project area. This figure (Figure 13) is color-coded to match the description of lands indicated in the LCA testimonies, blue for fishponds, yellow for salt ponds or salt lands, and orange for house lots. As can be seen, the salt lands are mainly along the coast, the fishponds are usually located *mauka* of Queen Street, and the house lots are clustered around established roads, especially Queen and King Streets.

The nearest LCA parcel to the Block C West project area was LCA 1903 to Lolohi. The claim and award documents for this award are presented in full in Appendix C. In his claim, he mentions the parcel contained two salt beds, two *hoʻoliu* (salt water drainage ditch), two *poho kai* (depression where salt is gathered), and one salt *kula* (dryland). The land was given to his father “when Haaliho had returned from Briton. Lolohi’s parents had received it during the lifetime of Kinau . . .” Kīnaʻu was the daughter of Kamehameha I and sister of Kamehameha III. She was the *kuhina nui* (generally analogous to a prime minister) to her brother from 1832 to his death in 1854 (Day 1984:78). Timothy Haʻalilio was the private secretary to Kamehameha III who made a trip in 1842 to Washington, London, and Paris to get agreement on political independence for the Hawaiian Islands. He died in 1842 on the ship carrying his party back to Hawaiʻi (Day 1984:47). Thus Lolohi’s family was given the land sometime between 1842 and 1854 (after Haʻalilio’s death and before Kamehameha III’s death). Lolohi also claimed a second *‘āpana*, a farm with taro patches in Kaliu, an *‘ili* of Honolulu. This *‘ili* is located near the corner of Liliha and Kuakini Streets in lower Nuʻuanu Valley.

2.4 Nineteenth Century Land Use in Kakaluāeʻo

2.4.1 Salt-Making

In the testimony for LCA 1903, four separate types of salt features are mentioned—the ponds near the shore that fill with salt water at high tide (*ālia*), the drains (*hoʻoliu*) where salt water is transferred to smaller clay-lined or leaf-lined channels, the natural depressions (or modified depressions) in the rocks along the shore where salt formed naturally (*poho kai*), and the salt *kula*, which was waste land, land that could probably not be used for agriculture as it was impregnated with salt. Lolohi did not live near his salt lands, but Pahiha, claimant of LCA 1504, did have a house near his fish pond and salt bed. The house was probably a simple grass hut, similar to those shown on an 1838 sketch entitled “Honolulu Salt Pans, Near Kakaako” and the one shown on an 1845 sketch of Kawaiahaʻo Church viewed from the “Old Salt Pans” (Figure 14 and Figure 15).

Salt was traditionally made by these methods before Western Contact for local use, but when Westerners began to land at the islands, salt became an important export commodity. In the next years after the discovery of the islands by Captain Cook in 1778, most visitors to the islands were British and American fur-traders, who stopped at Hawaiʻi on their way to China. One reason for their visit was to stock up on food and water, but another purpose was to buy or trade for salt, which was used to cure seal and mammal pelts collected from the Northwest Coast.

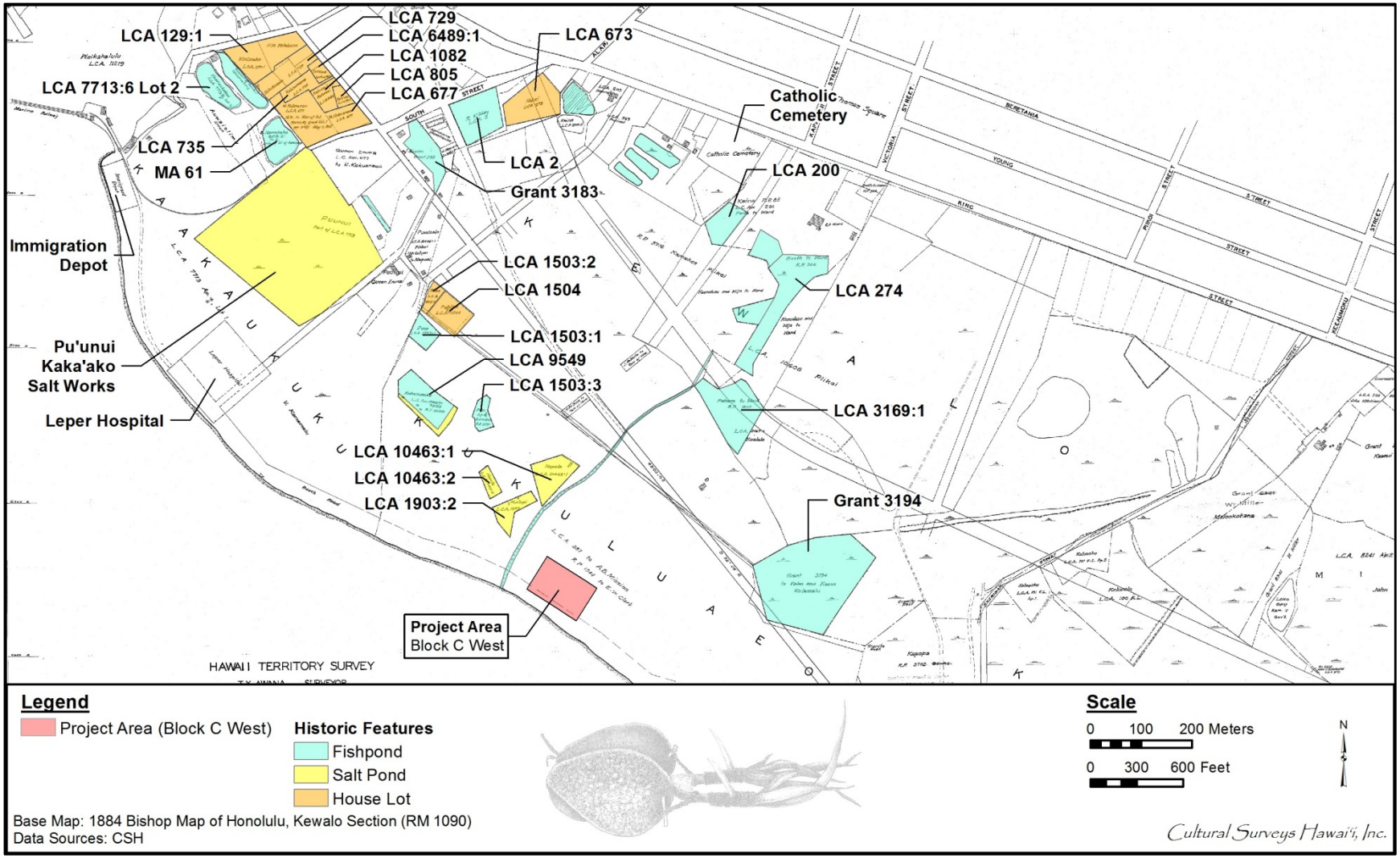

Figure 13. 1884 map of Honolulu, Kewalo Section (portion), by Sereno Bishop (Hawai‘i Land Survey Division, Registered Map 1090), showing the locations of LCA parcels, fishponds, salt lands, and house lots surrounding the project area

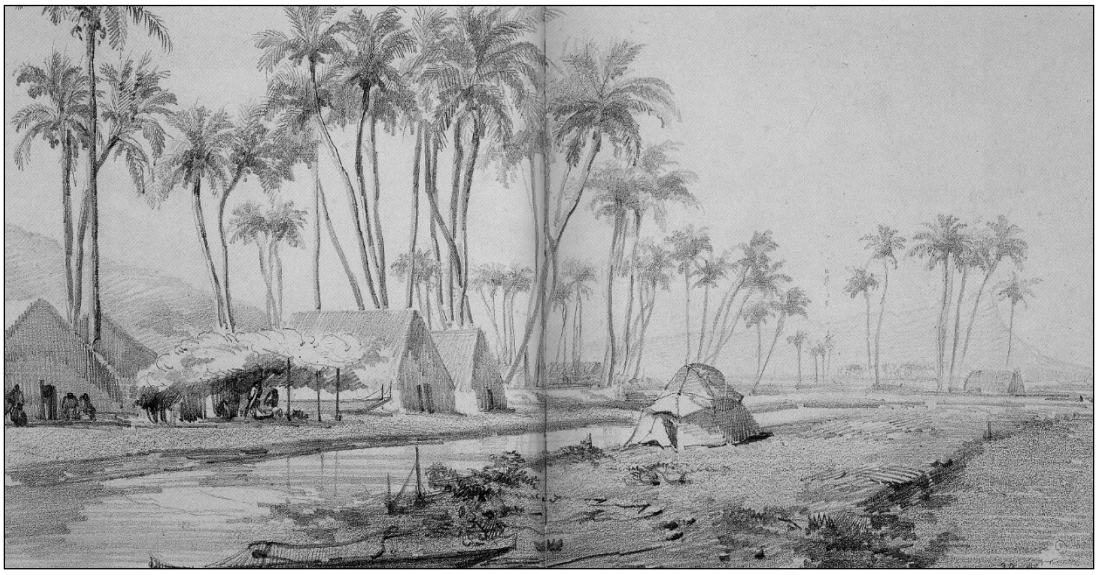

Figure 14. “Honolulu Salt Pan, near Kaka‘ako,” 1838 sketch drawn by a French visitor, Auguste Borget (original sketch at Peabody Essex Museum, Salem, Massachusetts; reprinted in Grant 2000:64-65)

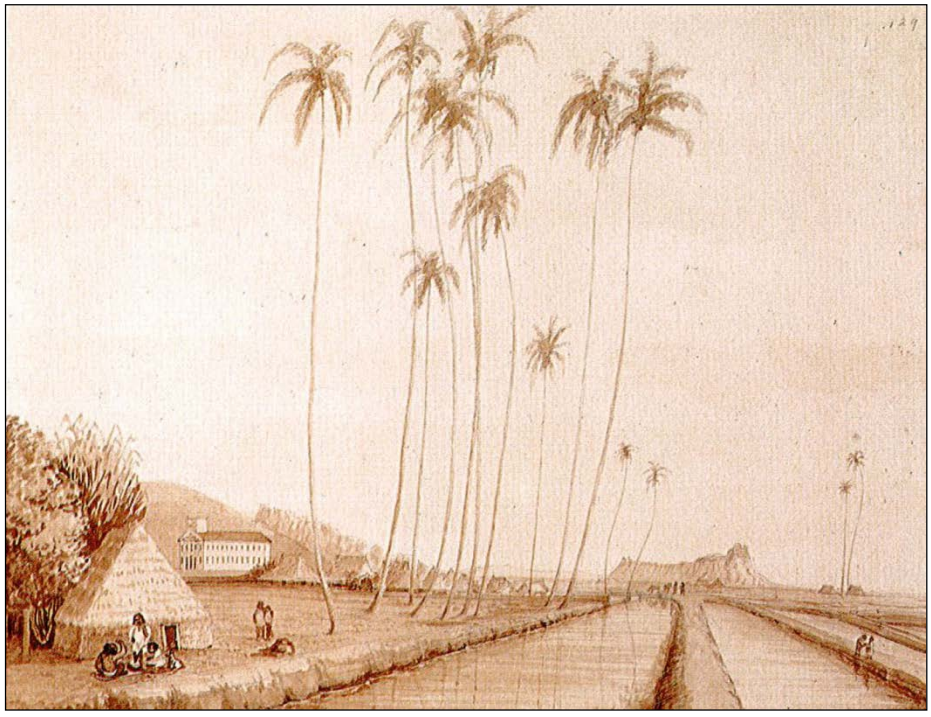

Figure 15. “Native Church [Kawaiaha‘o Church], Oahu, from the Old Salt Pans,” 1845 sketch drawn by John B. Dale, from the U.S. Exploring Expedition led by Lt. Charles Wilkes (J. Welles Henderson Collection, reprinted in Forbes 1992:126); the sketch is probably from the salt pans in Ka‘ākaukukui, west of the project area

During Kotzebue’s visit in 1816 and 1817, he noted that “Salt and sandalwood were the chief items of export” (Thrum 1905:50).

> The journals of none mention the object of call other than for refreshments, though one, 3 some years later, records the scarcity and high price of salt at the several points touched at, with which to serve them in the curing of furs obtained on the coast. In all probability salt was the first article of export trade of the islands and an object, if not the object, of these pioneer fur-traders’ call. [Thrum 1905:45]

In an article on Hawaiian salt works, Thomas Thrum (1924:112-117) discusses the large salt works at Ālia Paʻakai (Salt Lake in Moanalua) and at Puʻuloa on the western loch of Pearl Harbor. Kamakau (1961:409) reported “The king and Isaac of Puʻuloa are getting rich by running the salt water into patches and trading salt with other islands.” The salt was sent to Russian settlements in the Pacific Northwest, where it was used to pack salmon and other fish (Thrum 1924:115, 117). Thrum also mentions a salt works in Kakaʻako, likely in the vicinity of the present Ala Moana Shopping Center.

> Honolulu had another salt-making section in early days, known as the Kakaako salt works, the property of Kamehameha IV, but leased to and conducted by E.O. Hall, and subsequently E.O. Hall & Son, until comparatively recent years. This enterprise was carried on very much after the ancient method of earth saltpans as described by Cook and Ellis. [Thrum 1924:116]

Additional salt works in the Kakaʻako area shown on historic maps extended into the Block C West project area (Figure 16).

2.4.2 The Ward Estate

The *mauka* portion of the Ward Estate (north of Queen Street) is within the *ʻili* of Kewalo, and was part of LCA 272 to Joseph Booth. Joseph Booth was an early English resident of the Hawaiian Islands who operated a saloon and hotel in Honolulu, known at the time of the Māhele as the Eagle Tavern (Greer 1994:54). He was granted lands in downtown Honolulu (where the tavern was located), in Kewalo Uka (Pacific Heights area), in the *ʻili* of Kapuni, and in an area with “Three fish ponds, and a part of the plain near the road leading to Waikiki.” Little information on these three fishponds is given in the LCA testimony, but the Royal Patent No. 306 for these lands, mentions one known as “the large fishpond” or “long fishpond” (*loko ia nui*), which had two huts beside it. This pond would later be modified into the “lagoon” on the Ward estate.

Curtis Perry Ward, a native of Kentucky, came to the Hawaiian Islands in 1853, and soon established a livery and draying business, moving goods from the harbor to Honolulu town and loading goods at the docks for the whaling and shipping industries. In 1865, he married Victoria Robinson, who was descended from the Hawaiian *aliʻi* and early French and British residents (Hustace 2000:21-29). For his new family, Ward purchased at auction the 12-acre estate of Joseph Booth, Royal Patent 306 and additional contiguous lands in the Kōʻula area in 1870. This constituted the *mauka* portion of the “Old Plantation,” from Thomas Square on King Street to the *makai* border at Waimanu Street. A few years later (before 1875), Ward added to his property with the purchase of 77 acres and 3,000 ft of ocean frontage in the *ʻili* of Kukuluāeʻo, *makai* of Queen Street (Hustace 2000:37-38) (Figure 17). The Wards had a permanent easement for the *ʻauwai* (ditch) that extended from the long fishpond to the sea through the Kukuluāeʻo section (Figure 18). *Makaloa* grass, used to make mats and hats, grew along this *ʻauwai* and was one source of

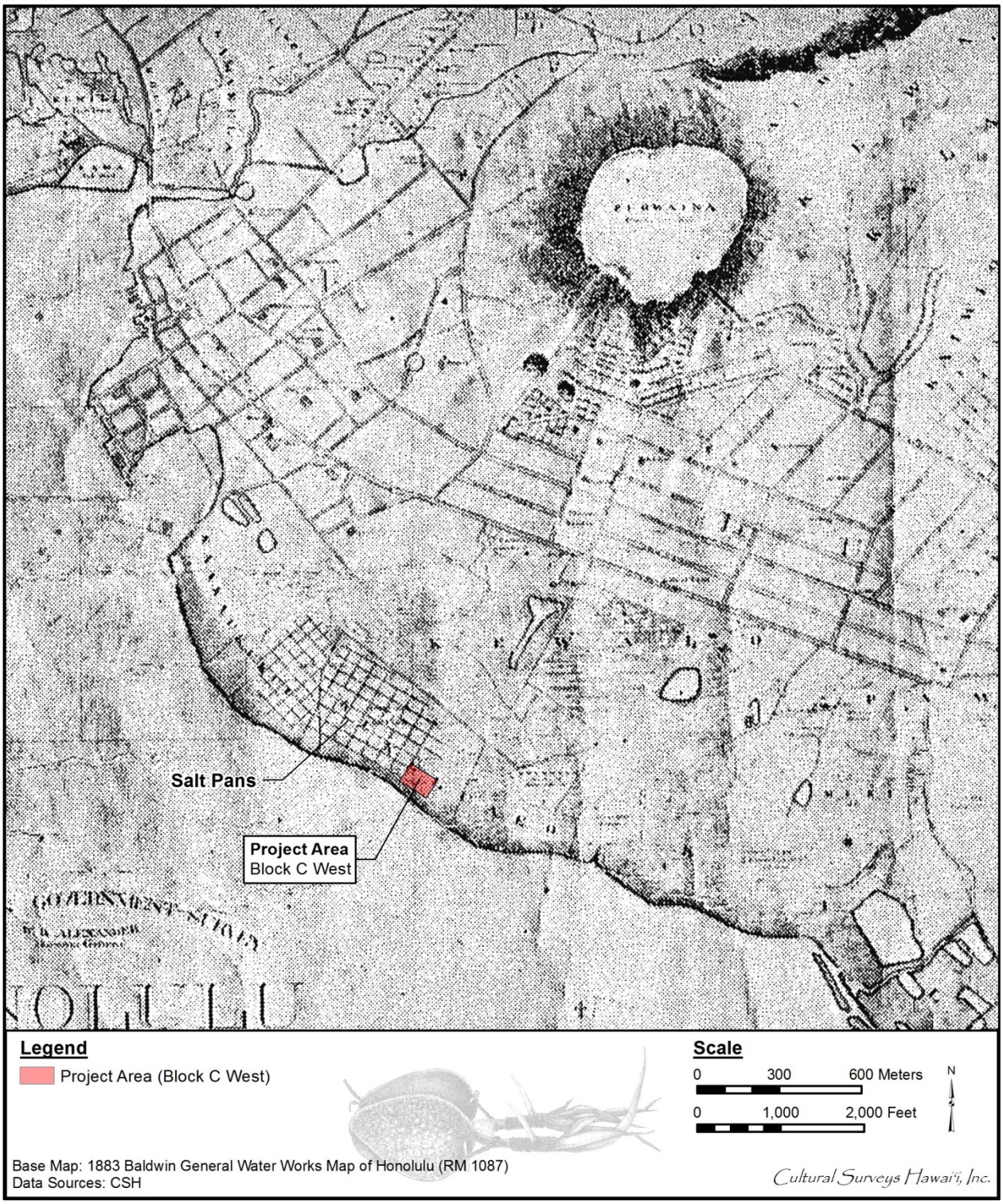

Figure 16. 1883 map of the Honolulu Water Works System by E.D. Baldwin (1883) (Hawai‘i Land Survey Division, Registered Map 1087); the grid symbol extending into the project area represents salt pans

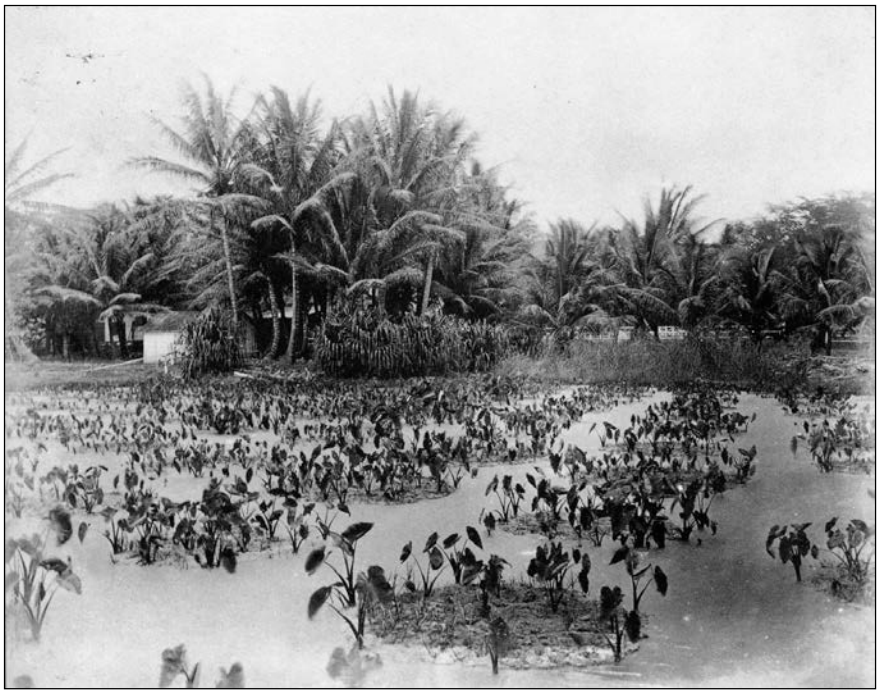

Figure 17. The Kukuluāe‘o portion of the Ward Estate, nineteenth century photograph (reprinted in Hustace 2000:49)

Figure 18. The Old Plantation *‘auwai*, extending from the sea to the *mauka* “lagoon” of the Ward Estate, nineteenth century photograph, view north toward Punchbowl (Hustace 2000:51)

income for the family (Hustace 2000:7-55). The alignment of this ditch is shown on Figure 19; today it is between the alignments of Ward Avenue and Cummins Street.

Workers were hired to clear the fishponds and ditches, plant taro in the fishponds, fence in pastures for the horse, plant 6,000 coconut trees, plant *kiawe* trees for firewood, and restore the *kāhaka* (salt pans) near the shore (Hustace 2000:41). A house in the southern style was built at the *mauka* end near King Street, and the fishponds were modified into a long “lagoon”. An article in the *Pacific Commercial Advertiser* reported:

> In taking a drive out on the Kulaokahua continuation of King street, attention is attracted to the premises just beyond the Catholic cemetery, the property of Mr. C.P. Ward. The lot consists of some thirty acres, and is thickly planted with algaroba and, in rows, there are some seven thousand thrifty young cocoanut trees. . . . The algarobas will certainly be valuable as firewood, and the cocoanuts alone will in a few years produce a handsome income. The property is well watered by means of pumps driven by windmills, there being an inexhaustible supply of water a few feet below the surface of the plains. [*Pacific Commercial Advertiser,* 4 September 1875:3]

Income from the 111-acre estate was also generated by leasing the rights to the Kukuluāeʻo fishery, which was part of the Kukuluāeʻo LCA 387 award. After the death of her husband in 1882, Victoria Ward derived much of her income from “eggs, bananas, firewood, *ʻawa*, taro leaf, *makaloa* grass, chickens, fish, hay, pigs, salt, white sand, *mānienie* grass, hides, butter, squid, and horses” (Hustace 2000:47) collected from the estate. On this estate, Victoria Ward raised her seven daughters, Mary (Mrs. Ernest Hay Wodehouse), Keakealani (Mrs. Robert Booth), Annie (Mrs. Wade Armstrong), Mele Elizabeth (Mrs. Frank Hustace, Sr.), and three unmarried daughters, Kathleen, Lucy, and Kulumanu Ward.

By 1901, most of the fishponds and salt pans *makai* of Queen Street were reported as abandoned. In that year, the Hawaii First Legislature Assembly (1901:185) proposed to build a ditch to drain away the “foul and filthy water that overflows that district at the present time.”

> The district makai of King St. and the Catholic Cemetery, Ewa of Mrs. Ward’s (the Old Plantation), mauka of Clayton St., and Waikiki of the land from King St., leading to the Hoomananaauao Church, consists of six large abandoned fish ponds and a large number of smaller ones, all in filthy condition, fed by springs and flowing into Peck’s ditches. Just makai of these ponds, at the end of Clayton street, next to Mr. Ward’s, is Peck’s place. An artesian well flushing the wash houses flows into two foul ditches, thence to the big pond which is Waikiki of what used to be Cyclomere and next to Mrs. Ward’s line [ditch] extending down to Waimanu St.
>
> The rear portion of Mrs. Ward’s property down to Waimanu St. used to be fish ponds all connecting to the sea by a ditch which is fed by an artesian well. These ponds, with the exception of three, are abandoned. [Hawaii First Legislature Assembly 1901:185]

In 1930, Victoria Ward incorporated Victoria Ward, Limited to manage the estate. In 1957, the City and County of Honolulu purchased the *mauka* portion of the estate to construct the new Blaisdell Civic Center (Hustace 2000:67, 77).

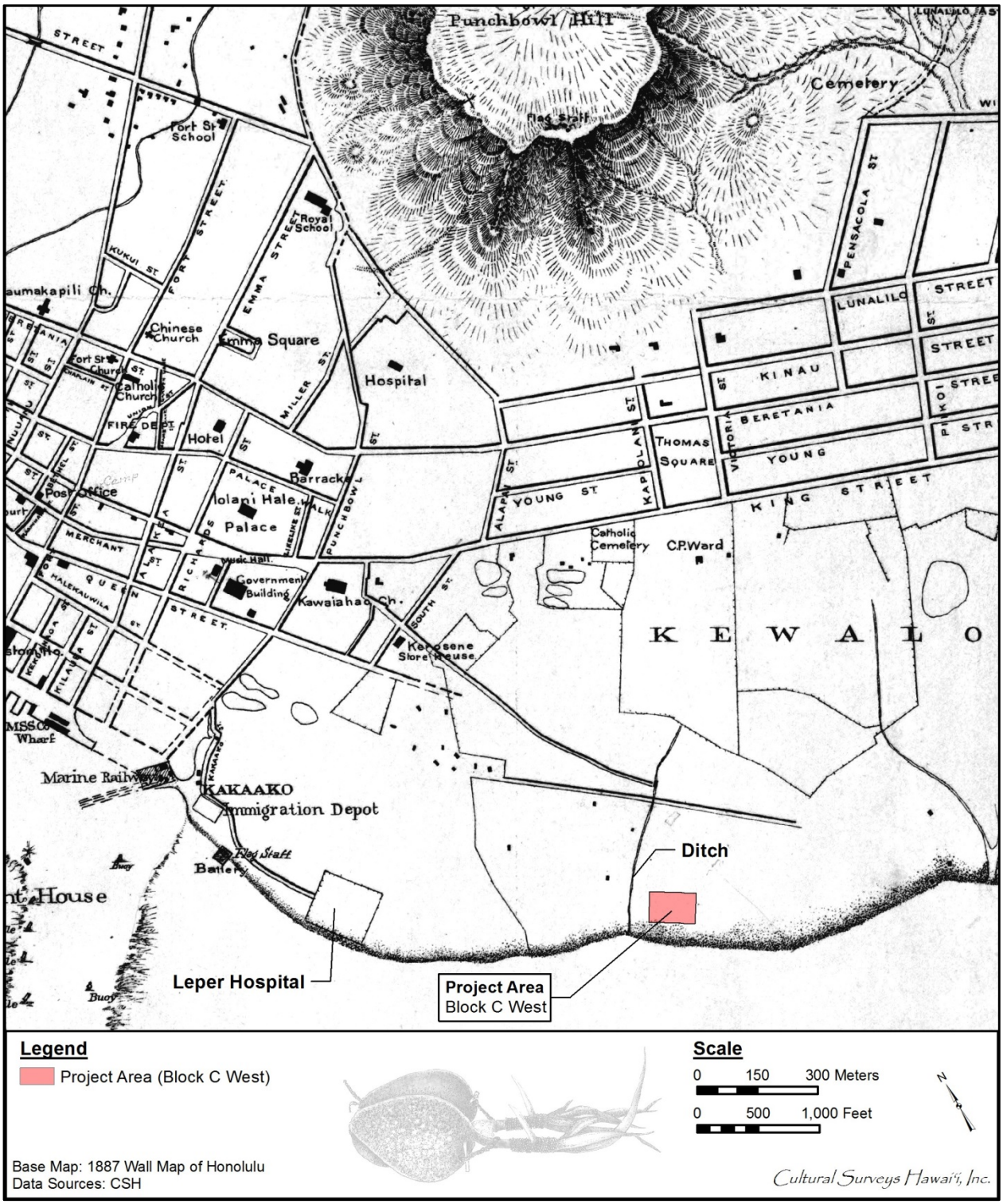

Figure 19. 1887 map of Honolulu (portion), by W.A. Wall (copy at Library of Congress, Geography and Map Division), showing the project area located to the east of the Ward Estate *‘auwai*

2.5 Twentieth Century Land Use

2.5.1 Trash Burning and the Kaka‘ako and Kewalo Incinerators

In the early years of garbage disposal, all trash was dumped into low-lying ground or landfills, or burned in an open area. To reduce the volume of waste, plans were made to build incinerators, where “putrescible” (mainly animal and fish waste) trash could be burned in incinerators, while non-animal material, called “combustible” waste was still disposed of in the earlier method (Young 2005). Thomas Thrum reported on the first incinerator in the Kaka‘ako area in 1905:

> Early in the year was completed the long projected garbage crematory for the disposal, daily, of the city's refuse by a patent and sanitary process. It is located on the shore of Kakaako, adjoining the sewer pumping station; is two stories in height and built of brick. [Thrum 1906:177]
>
> The dredging of Honolulu harbor and its channel is completed as far as planned for the present, and excavations for the *Alakea* and *Kinau* slips finished, the material therefrom being used to fill in a large area of Kakaako and the flats in the vicinity of the sewer pumping station and garbage crematory. The amount of material removed by the Federal dredging was a million and a half cubic yards. [Thrum 1907:148–149]

For the incinerator, Thrum noted:

> The new station is built on piles on reclaimed land that is being filled in from the coral dredgings that is going on, and is gradually taking on a tropical appearance. . . . Adjoining its premises on the mauka side is the new building designed for the Planters’s Association for their labor bureau. [Thrum 1907:148–149]

In the early 1920s, trash was burned in the open at the Ala Moana Dump (landfill area *makai* of Ala Moana Boulevard) (Figure 20). The Hawaii Public Works recommended that an incinerator should be built for the burning of “putrescible” waste. The Kewalo Incinerator (Incinerator Number 1) was built in the Italianate-style, at the intersection of Ahui and Olomehana Streets in 1930 by the City and County of Honolulu. The facility was built to dispose of waste from the Ala Moana dump and use the ash to fill the seawall in Ka‘ākaukukui in the late 1940s to create 29 additional acres of land, adjacent to Fort Armstrong (Figure 21). It ceased operations in 1945 when a new incinerator was built on Ohe Street. The second incinerator, built on Ohe Street in 1946–1948 was used for waste burning until 1997 (Mason Architects 2002).

2.5.2 Kaka‘ako Reclamation

The first efforts to deepen Honolulu Harbor were made in the 1840s. The idea to use this dredged material, composed of sand and crushed coral, to fill in low-lying lands, was quickly adopted. Between 1857 and 1870, the “Esplanade” between Fort and Alakea streets was created on 22 acres of filled-in former reef and tideland. By 1874, Sand (Quarantine) Island, site of the first immigration station, had been created over “reclaimed” land on reefs (Hawai‘i Department of Transportation, Harbors Division 2007:3).

By the 1880s, filling-in of the mud flats, marshes, salt ponds in the Kaka‘ako and Kewalo areas had begun. This filling was pushed by three separate but overlapping improvement justifications. The first directive or justification was for the construction of new roads and raising the grade of

Figure 20. Open-air burning of trash in area between Kewalo Basin and Ala Moana Park, 1921 photograph (Hill 1921, reprinted in Scott 1968:578)

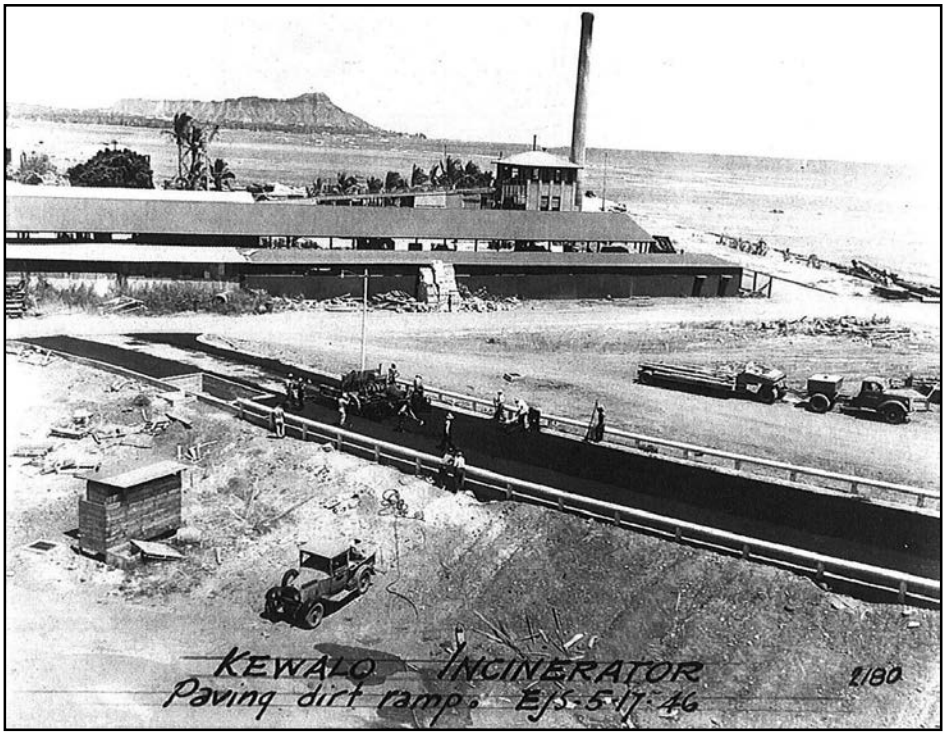

Figure 21. 1946 photograph of the Kewalo Incinerator No. 1, west side of Kewalo Harbor (Mason Architects 2002)

older roads so improvements would not be washed away by flooding during heavy rains. A report by the Hawaii Board of Health (1908) noted:

> I beg to call attention to the built-up section of Kewalo, ‘Kaka‘ako,’ where extensive street improvements, filling and grading have been done. This, no doubt, is greatly appreciated and desirable to the property owners of that locality, but from a sanitary point of view is dangerous, inasmuch as no provision has been made to drain the improved section, on which have been erected neat cottages occupied for the greater part by Hawaiian and Portuguese families, now being from one to three feet below the street surface, and which will be entirely flooded during the rainy season. Unless this is remedied this locality will be susceptible to an outbreak [of cholera] such as we experienced in the past. [Hawaii Board of Health 1908:80]

As mentioned in the above section, the justification most frequently cited was public health and sanitation, the desire to clean up rivers and ponds that were reservoirs for diseases such as cholera and that acted as breeding places for rats and mosquitoes. Thus as early as 1902, it is reported that:

> The Board [of Health] has paid a great deal of attention to low-lying stagnant ponds in different parts of the city, and has condemned a number of them. The Superintendent of Public Works has given great assistance to seeing that the ponds condemned by the Board are filled. In September a pond on South Street was condemned as deleterious to the public health. [Hawaii Board of Health 1902:80]

The first areas to be filled were those closest to Honolulu town, then areas moving outwards to Kaka‘ako (Griffin et al. 1987:13). The first fill material may have been set down for the Kaka‘ako Leper Branch Hospital (between Coral and Keawe Streets), which had been built on a salt marsh. Laborers were hired to “haul in wagonloads of rubble and earth to fill up that end of the marsh” (Hanley and Bushnell 1980:113). In 1903, five more lots in Kewalo, on Laniwai, Queen, and Cooke Streets, were condemned and order to be filled (Hawaii Board of Health 1903:6).

A main concern in this area was the Kaka‘ako Ditch, which originated from the large fishponds in the *mauka* portion of the Ward Estate and extended to the sea. A Hawaii legislature report of 1901 asked for an appropriation to build a new drainage ditch through the Kewalo district to address problems with older ditches:

> The district makai of King St. and the Catholic Cemetery, Ewa of Mrs. Ward’s (the Old Plantation) . . . consists of six large abandoned fish ponds and a large number of smaller ones, all in filthy condition, fed by springs and flowing into Peck’s ditches. . . . The rear portion of Mrs. Ward’s property down to Waimanu St. used to be fish ponds all connecting to the sea by a ditch which is fed by an artesian well. These ponds, with the exception of three, are abandoned.
>
> When Desky opened Kewalo for settlement he dug a ditch from the pond on Peck’s place along Waimanu St. to Mrs. Ward’s ditch, and drained all the above described property. A law suit ensued, as the foul water drove away the fish, and the connecting ditch was torn out . . . and a dyke wall was built between Mr. Ward’s and Peck’s.
>
> The result was that as the Kakaako ditch, at the point of juncture with Peck’s ditch, was too high, the water in Peck’s ditch rose and backed up . . . and as it must

> necessarily go somewhere, it overflowed its banks and at present Ward avenue from end to end is a big pond with no footing for pedestrians, and a carriage driven through the other day sank to the body of the same in water and mud. [Hawaii First Legislative Assembly 1901:186]

Although public health and safety were prominently cited, according to Nakamura (1979), the main desire (and third justification) to fill in Honolulu, Kewalo, and then Waikīkī lands was to provide more room for residential subdivisions, industrial areas, and finally tourist resorts. In the early part of the twentieth century, Kaka‘ako was becoming a prime spot for large industrial complexes, such as iron works, lumber yards, and draying companies, which needed large spaces for their stables, feed lots, and wagon sheds. In 1900 (Thrum 1901:172), the Honolulu Iron Works, which produced most of the large equipment for the Hawaiian plantation sugar mills, moved from their old location at Queen and Merchant Streets near downtown Honolulu to the shore at Kaka‘ako, on land that had been filled from dredged material during the deepening of Honolulu Harbor. Other businesses soon followed. Thrum (1902) noted:

> The Union Feed Co. is another concern whose business has outgrown the limits of its old location, corner of Queen and Edinburgh streets. Like the Iron Works Co. they have secured spacious premises at Kakaako, erecting buildings specially adapted to the needs of their extensive business at the corner of Ala Moana (Ocean Road) and South Street. [Thrum 1902:168]

Private enterprises were not the only new occupants of Kaka‘ako. A sewer pumping station, an immigrant station, and a garbage incinerator were also built on “reclaimed land.” For the incinerator, Thrum noted:

> The new station is built on piles on reclaimed land that is being filled in from the coral dredgings that is going on, and is gradually taking on a tropical appearance. . . . Adjoining its premises on the mauka side is the new building designed for the Planters’s Association for their labor bureau. [Thrum 1907:148–149]

The new immigration station had seven large rooms for dormitories, surrounded by a breezy, open *lanai*, where immigrant workers would stay while waiting for clearance to go to their new work places on the sugar plantations. Adjacent to the dormitory was a hospital, which was used to check the new immigrants for any “loathsome or dangerous contagious disease” (Hawaii Governor 1905:77). The hospital was also used during epidemics to isolate contagious patients suffering from diseases such as smallpox, cholera, or plague.

In 1900, a pond surrounded by a bicycle racing track, called the Cyclomere (built in 1897), in the Kewalo area was filled. This was located on the *makai* side of Kapi‘olani Avenue between Cooke Street and Ward Avenue. In 1904, the area around South Street from King to Queen Streets was filled in. The Hawaii Department of Public Works (1904:7) reported “considerable filling [was] required” for the extension of Queen Street, from South Street to Ward Avenue, which would “greatly relieve the district of Kewalo in the wet season.”

2.5.3 Kewalo Reclamation Project

Although the Board of Health could condemn a property and the Department of Public Works could then fill in the land, the process was rather arbitrary and piecemeal. In 1910, after an epidemic of bubonic plague, the Board of Health condemned a large section of Kewalo, consisting

of 140 land parcels, (including areas once known as Kukuluāeʻo and Kaʻākaukukui), which had numerous ponds (Hawaii Department of Public Works 1914:196).

In 1914, the entire

> . . . locality bounded by King street, Ward avenue, Ala Moana and South street, comprising a total area of about two hundred acres, had been found by the board of health of the Territory to be deleterious to the public health in consequence of being low and below 'the established grades of the street nearest thereto' and at times covered or partly covered by water and improperly drained and incapable by reasonable expenditure of effectual drainage, and that said lands were in an insanitary and dangerous condition. [Hawaii Reports 1915:329]

The superintendent then sent a letter to all of the property owners, informing them that they must fill in the lands to the grade of the street level within sixty days. Only a few of the land owners complied, filling their land with a variety of materials. Most of the land owners did not comply with this notice, and in 1912 the bid to fill in the land was given to Lord-Young Engineering Company to fill in the land with "sand, coral and material dredged from the harbor or reef and the depositing of the same upon the land by the hydraulic method" (Hawaii Reports1915:331). The recalcitrant land owners sued to stop the work, and in the suit, the method of hydraulic filling is described:

> By this [hydraulic] method the material dredged is carried in suspension or by the influence of water which is forced through large pipes and laid upon the lands and intervening streets, and afterwards is distributed and leveled, the water having drained off through ditches provided for the purpose. The work is done in large sections around which bulkheads have been constructed. A section can be filled in about thirty days, the dredger working about fifteen hours per day. And in about two months after a section has been filled the ground will have dried out so as to be fit for use as before. . . . The character of the material varies from very fine sand to coarse bits of coral . . .
>
> It appears in evidence that though the method employed the finest of the material which is carried upon the land settles when the water which transports it becomes quiet and as the water runs off a sludge or mud remains which forms a strata more or less impervious to water. This strata, however, is covered by the coarser and more porous material. . . . it appears that by mixing in to a depth of a few inches ordinary soil small plants will grow without difficulty. . . . The character of the locality must be considered. It is not adapted to agriculture, but is suited more particularly to such business purposes as it is now partly used for, such as stables, laundries, warehouses, mills, etc., and for cottages with small yards for the accommodation of laborers engaged in connection therewith. Upon the whole, we are of the opinion that the material proposed to be used in the fill-in of the lands of the complainants is not of a character as should be held to be improper for any of the reasons urged. [Hawaii Reports 1914:351]

The first land to be filled in was the portion of the Ward Estate Kukuluāeʻo property west of Ward Avenue, which was completely filled in by June 1913. In July "25,000 cubic yards of sand and ground-up coral were deposited on the Bishop Estate in the vicinity of Ala Moana and Keawe

street, the reason for shifting operations to this part of the district being that the Hawaiian Sugar Planter’s Association had erected a reinforced concrete building there and wished to have the lot brought to grade” (Hawaii Department of Public Works 1914:198). By August, the rest of the Ward Kukuluāe‘o lands west of Ward Avenue had been completely filled and by February 1914, all of the land from South Street to Ward Street, and from Ala Moana to Queen Street had been filled.

Legal proceedings in 1914 did manage to shut down operations planned for the area from Ward Street to Waikīkī but the filling in was eventually completed (Thrum 1916:159-160). This land was mainly owned by the Bishop Estate, which leased the land to small farmers growing taro and rice and raising ducks in the ponds. In 1916, the Bishop Estate announced that as soon as their present tenant leases expired, they planned to fill the lands and divide them into residence and business lots (Larrison 1917:148-149). In 1919, a portion of the coastal section of the Bishop Estate lands was secured by the government in order to expand Kewalo Basin (Thrum 1920:148).

2.5.4 Kewalo Basin Dredging

Prior to dredging, Kewalo Basin was a natural deep pocket in the reef seaward of Ala Moana Boulevard between Ward Avenue and Kamake‘e Street. It had been used as a canoe landing in pre-Contact times. In 1919, the Hawaii Government appropriated $130,000 to improve the small harbor of Kewalo for the aim of “harbor extension in that it will be made to serve the fishing and other small craft, to the relief of Honolulu harbor proper” (Thrum 1920:147). As the area chosen for the harbor area was adjacent to several lumber yards, the basin was initially made to provide docking for lumber schooners, but by the time the wharf was completed in 1926, this import business had faded, so the harbor was used mainly by commercial fishermen. The dredged material from the basin was used to fill a portion of the Bishop Estate on the western edge of Waikīkī and some of the Ward Estate in the coastal area east of Ward Avenue (U. S. Department of Interior 1920:52). The new basin and the coral fill, used to fill inland areas and make new land offshore, can be seen in a 1933 oblique aerial photograph of Kaka‘ako and Waikīkī (Figure 22). In 1941, the basin was dredged and expanded to its current 55 acres. In 1955, dredged material was placed along the *makai* side to form an 8-acre land section protected by a revetment, now part of the Kewalo Basin Park (Kewalo Basin Harbor 2013).

2.5.5 Waikīkī Reclamation Project

It was during the 1920s that southeast O’ahu would be transformed when the construction of the Ala Wai Drainage Canal—begun in 1921 and completed eight years later—resulted in the draining and filling in of the remaining ponds and irrigated fields of Honolulu and Waikīkī. The canal was one element of a plan to urbanize Waikīkī and the surrounding districts, first conceived in 1906. Dredging for the Ala Wai Canal began in 1921 and was completed seven years later. The final result was a “canal three miles long, with an average depth of twenty-five feet and a breadth of two hundred fifty feet” (*Honolulu Advertiser*, 17 October 1928:2:16).

The land surface of modern Honolulu and Waikīkī is situated on the result of this decade-long dredging and fill project of which the creation of the Ala Wai Canal was part. In Nakamura’s (1979:113) *The Story of Waikīkī and the Reclamation Project*, he writes that this land “reclamation” program, under the subterfuge of “drainage” and “sanitation,” changed the ecology of Waikīkī from a once viable and important agriculture and aquaculture center. Many of the

Figure 22. Honolulu and Waikīkī from Fort Armstrong (lower right) to Diamond Head, 1933 oblique aerial photograph (Hawai‘i State Archives); new lands of coral fill are shown as white patches in inland areas, along Kapi‘olani Boulevard, and offshore for the new Ala Moana Park; Kewalo Basin is at the western (lower) end of the offshore fill area

original property owners lost their land or had serious damage to their property as a result of the reclamation activities and/or the costly expense for the mandatory filling in of their properties.

2.6 Twentieth Century Commercial and Residential Redevelopment

Subsequent maps show the future development of the Kukuluāeʻo area in a grid of streets extending from Honolulu town towards Waikīkī. Other maps and documents generated during the last decades of the nineteenth century and first decades of the twentieth century reveal the disappearance of the traditional Hawaiian landscape of Kukuluāeʻo, including the conversion of taro *loʻi* to rice fields. The urban development of the area is shown on a series of late nineteenth and twentieth century maps and aerial photographs from 1897 to 1978 (Figure 23 through Figure 33).

The 1884 Bishop map (see Figure 13) shows the nascent traces of the future development in the grid of roads stretching *mauka* of the project area. Kakaʻako was considered outside the Honolulu town boundary and was used in the mid- to late nineteenth century as a place for cemeteries, burial grounds, and for the quarantine of contagious patients. Then in the beginning of the twentieth century, the area was used as a place for sewage treatment and garbage burning, finally becoming an area for cheap housing, and commercial industries (Griffin et al. 1987:13). Other maps, photographs, and documents generated from the last decades of the nineteenth century up to the present reveal further characteristics of the original character of the Kewalo lands and the disappearance of that landscape.

An 1897 map (Figure 23) by M.D. Monsarrat shows Thomas Square and the Old Plantation, and makes evident the urbanization of the landscape of Honolulu that had taken place near the end of the nineteenth century. The map clearly displays the development occurring *mauka* and ʻEwa (westward) of the project area, and the "arm" of streets projecting from downtown Honolulu into Kakaʻako and Kewalo. It is on this map that Kamakeʻe Street first appears, running from Queen Street and dead-ending *mauka* of Waimanu Street towards where Kapiʻolani Boulevard would eventually be constructed. A large portion of Kakaʻako, however, remains open and the map reveals that the area adjacent (east) of the Old Plantation and *mauka* of the project area has become "Rice Fields." The 1897 map shows the Cyclomere, a pond surrounded by a bicycle racing track in the Kewalo area. This was located on the *makai* side of Kapiʻolani Avenue between Cooke Street and Ward Avenue.

A 1903-1909 U.S. Engineer's map (Figure 24) depicts houses clustered around the few paved roads, with a scatter of houses along the Ward Estate *ʻauwai* and along the shore. There is no indication on this map of the deep water channel east of Fort Armstrong that will later be dredged to create Kewalo Basin. Numerous ponds are shown to the east of the project area, especially Kolowalu Pond at the eastern terminus of Queen Street, and the "Long Lagoon" of the Ward Estate, north of the Queen Street terminus.

The 1919 U.S. Army War Department Fire Control map (Figure 25) shows residences clustered around Queen Street and Ward Avenue. There are still many ponds east of the project area, in the area northeast later to be part of McKinley High School, and the area east along the coast, which will be developed into Ala Moana Shopping Center and Park. Poor people, mainly Native Hawaiians, inhabited the area. In the 1920s, on the east side of Kewalo Basin they congregated at a camp named "Blue Pond," named after a large and deep pond near the shore. On the west side

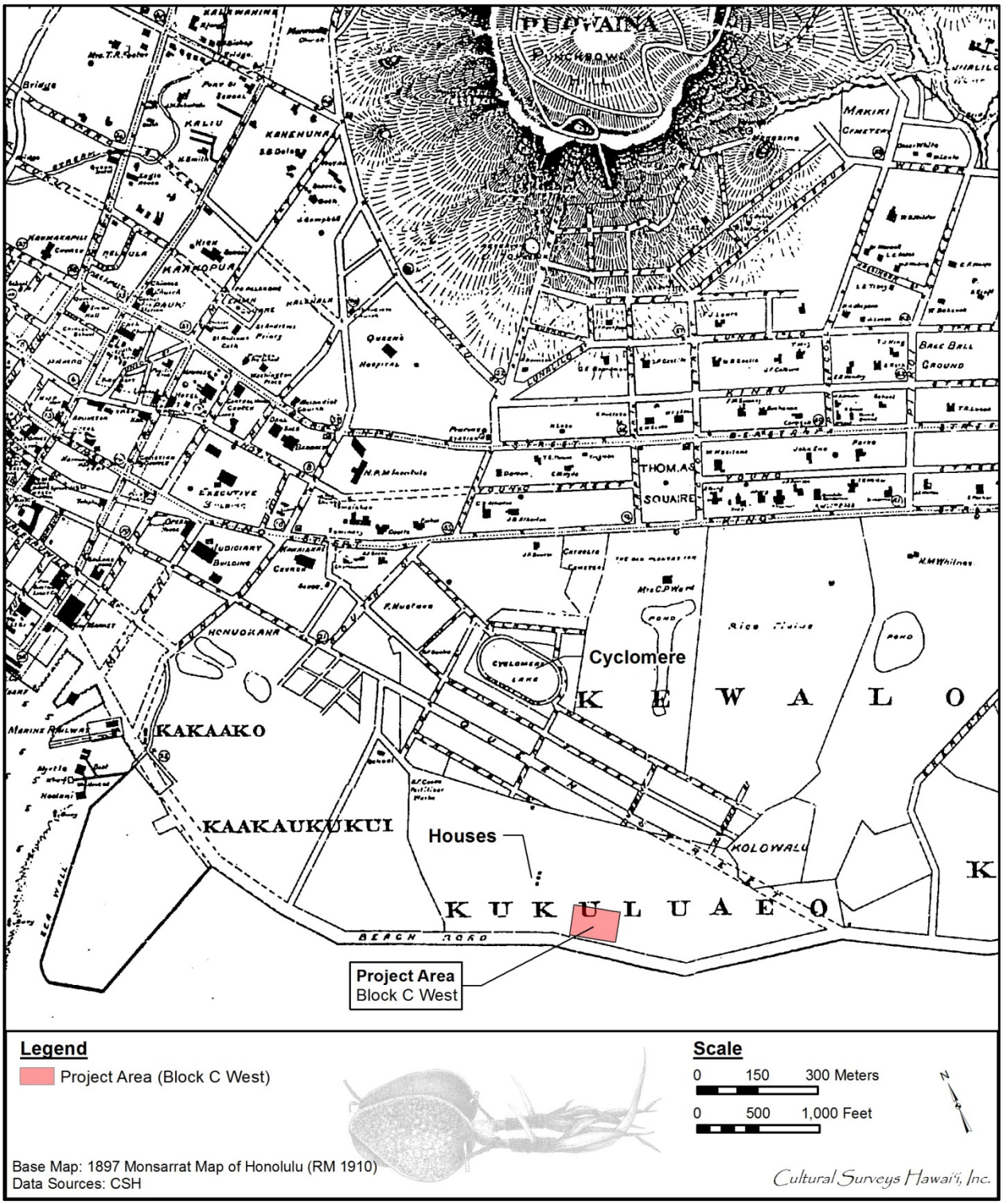

Figure 23. 1897 map of Honolulu by M.D. Monsarrat, showing the location of the project area; the map also shows the location of the “Cyclomere”

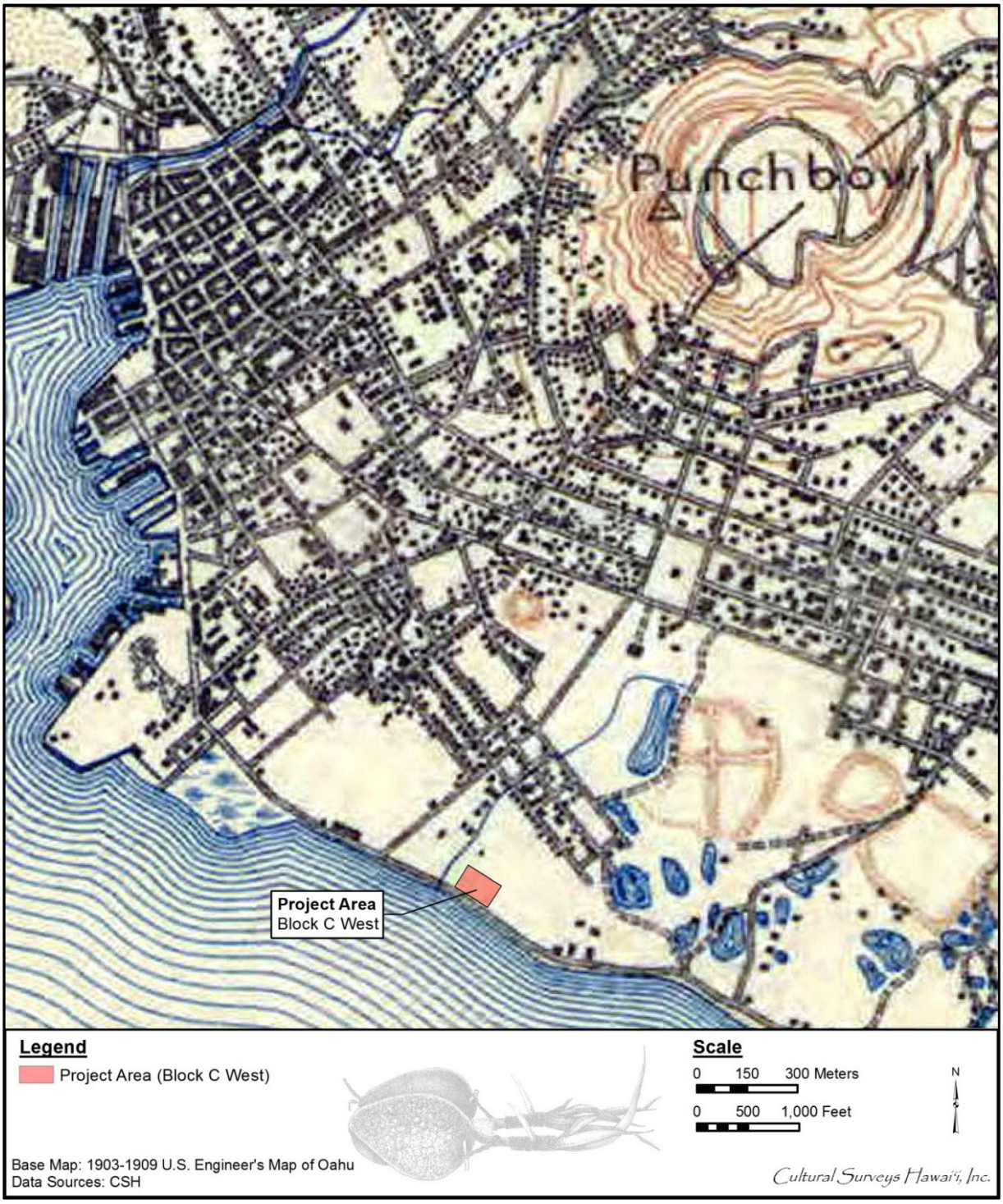

Figure 24. 1903-1909 (published 1917) U.S. Engineer’s map of O‘ahu (portion) depicting Kaka‘ako; many ponds, including Kolowalu and the Ward Estate “Long Lagoon” are still open and unfilled at the eastern terminus of the northwest-southeast aligned Queen Street

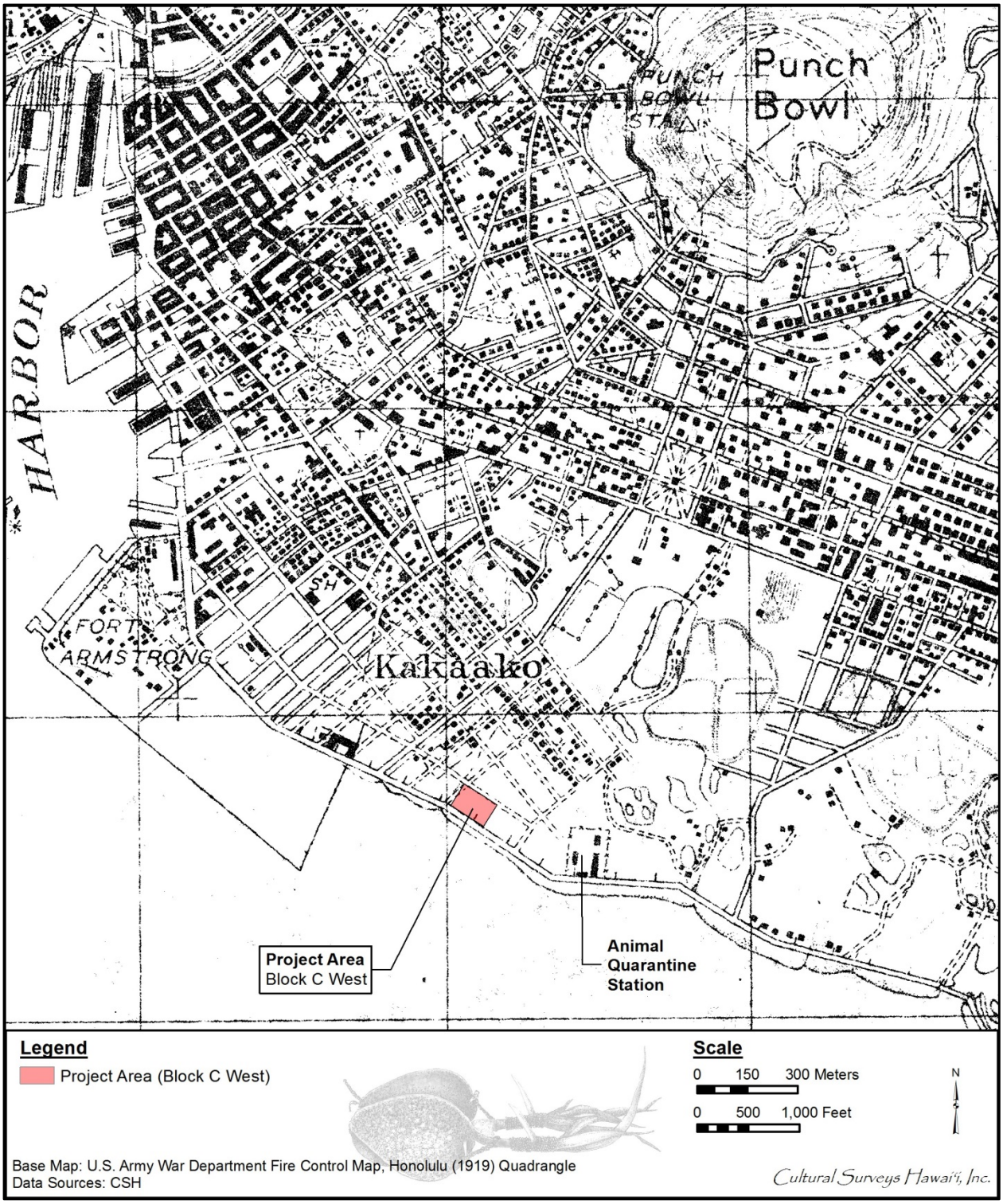

Figure 25. 1919 U.S. Army War Department Fire Control map of O‘ahu, Honolulu Quadrangle, showing the location of the project area within a grid of streets; solid lines denote paved streets, while dotted lines represent unpaved streets or planned streets

Figure 26. 1927 USGS aerial photograph of the Kaka‘ako area (UH SOEST 1927)

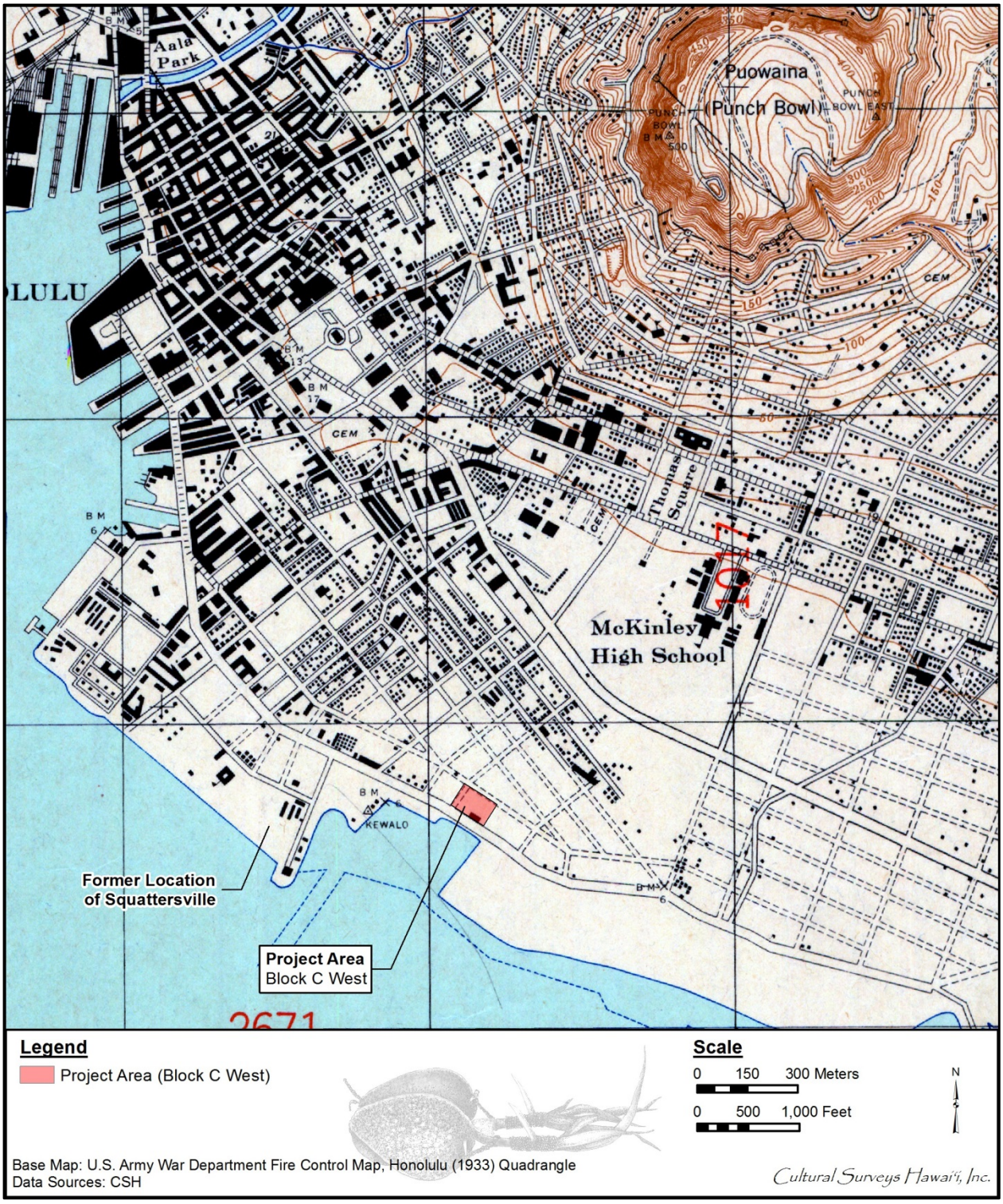

Figure 27. 1927-28 (published 1933) U.S. Army War Department Fire Control map of O‘ahu, Honolulu Quadrangle, showing the project area within a grid of streets; note the former location of Squattersville, adjacent to Kewalo Basin and east of Fort Armstrong

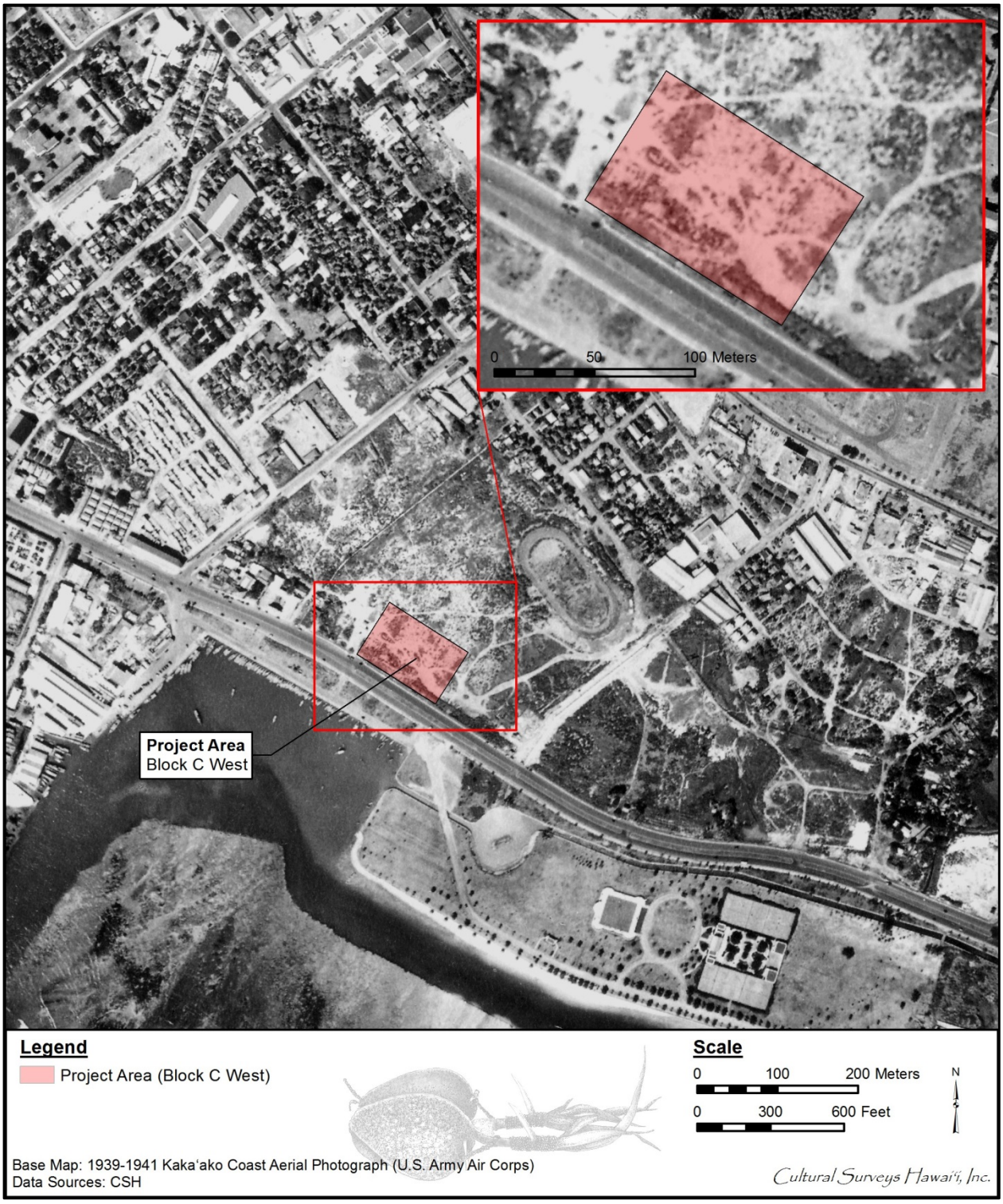

Figure 28. 1939-1941 aerial photograph (U.S. Army Air Corps) of Kaka‘ako; note the completion of Kewalo Harbor to the west and the construction of Ala Moana Park to the east along the shore

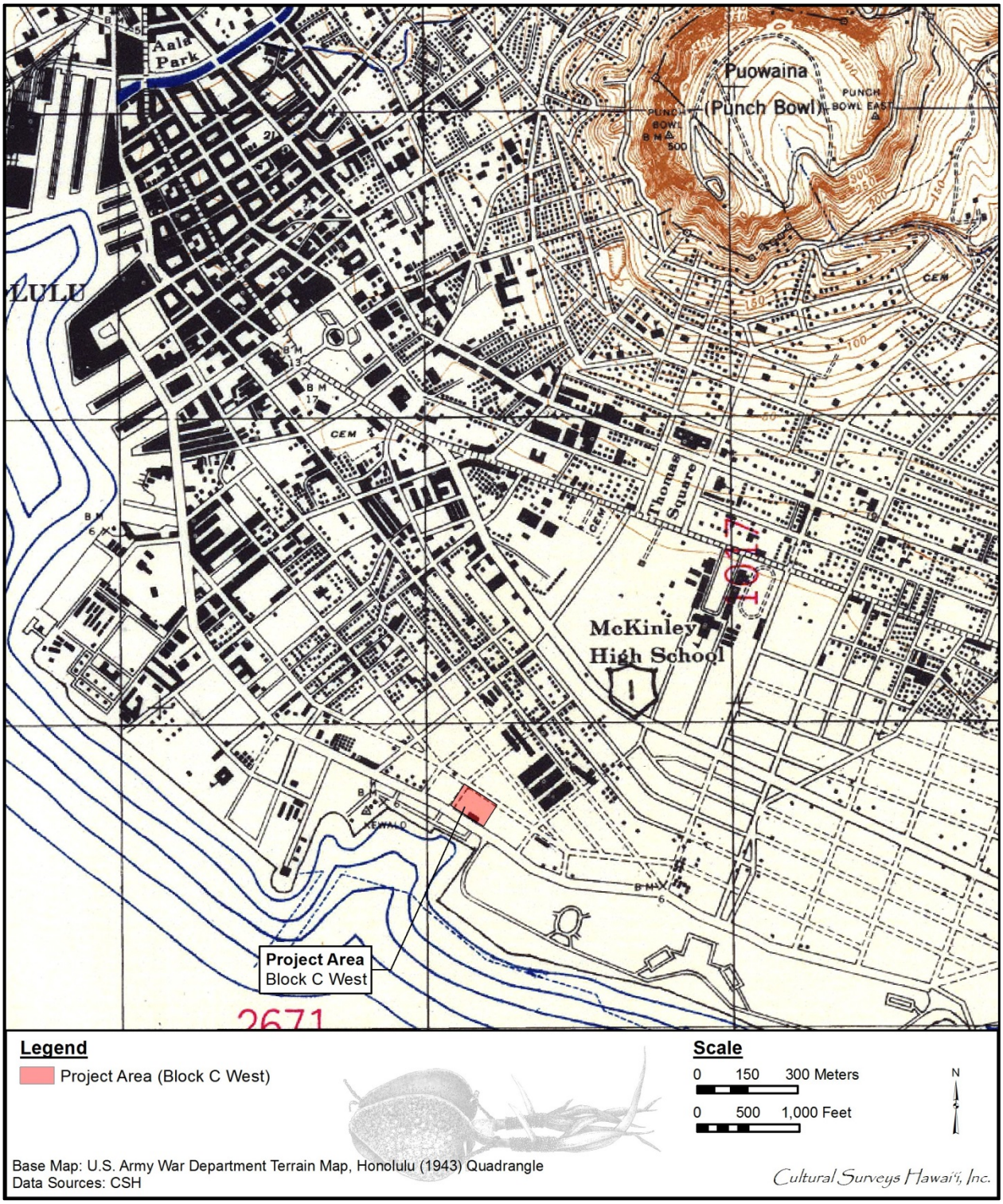

Figure 29. 1943 U.S. Army War Department Fire Control map of O‘ahu, Honolulu Quadrangle; note the location of a structure along Ala Moana Boulevard within Block C West

Figure 30. 1952 aerial photograph (U.S. Army Air Corps)

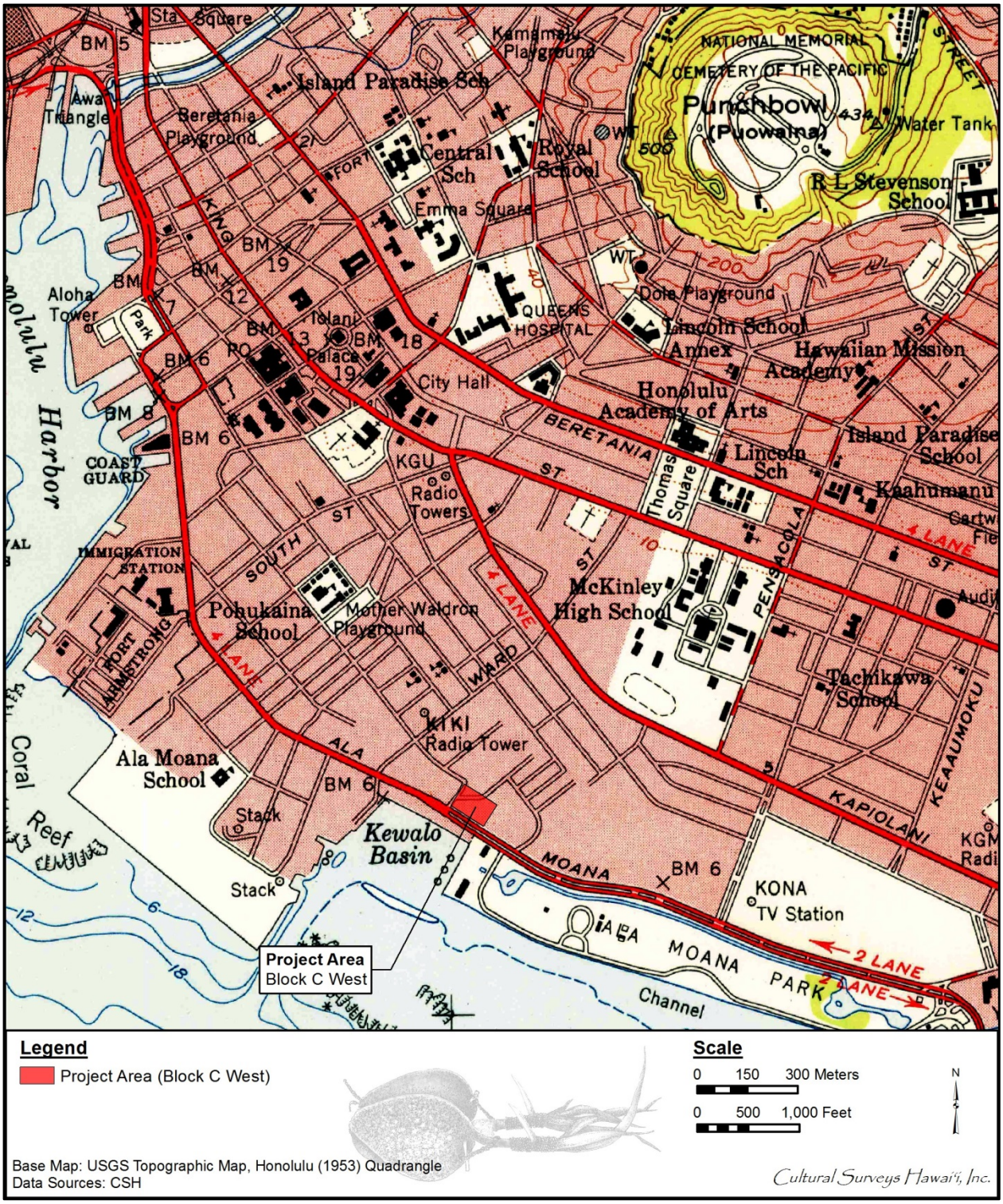

Figure 31. 1953 U.S. Army Mapping Service topographic map of O‘ahu, Honolulu Quadrangle, showing project area within an improved street grid

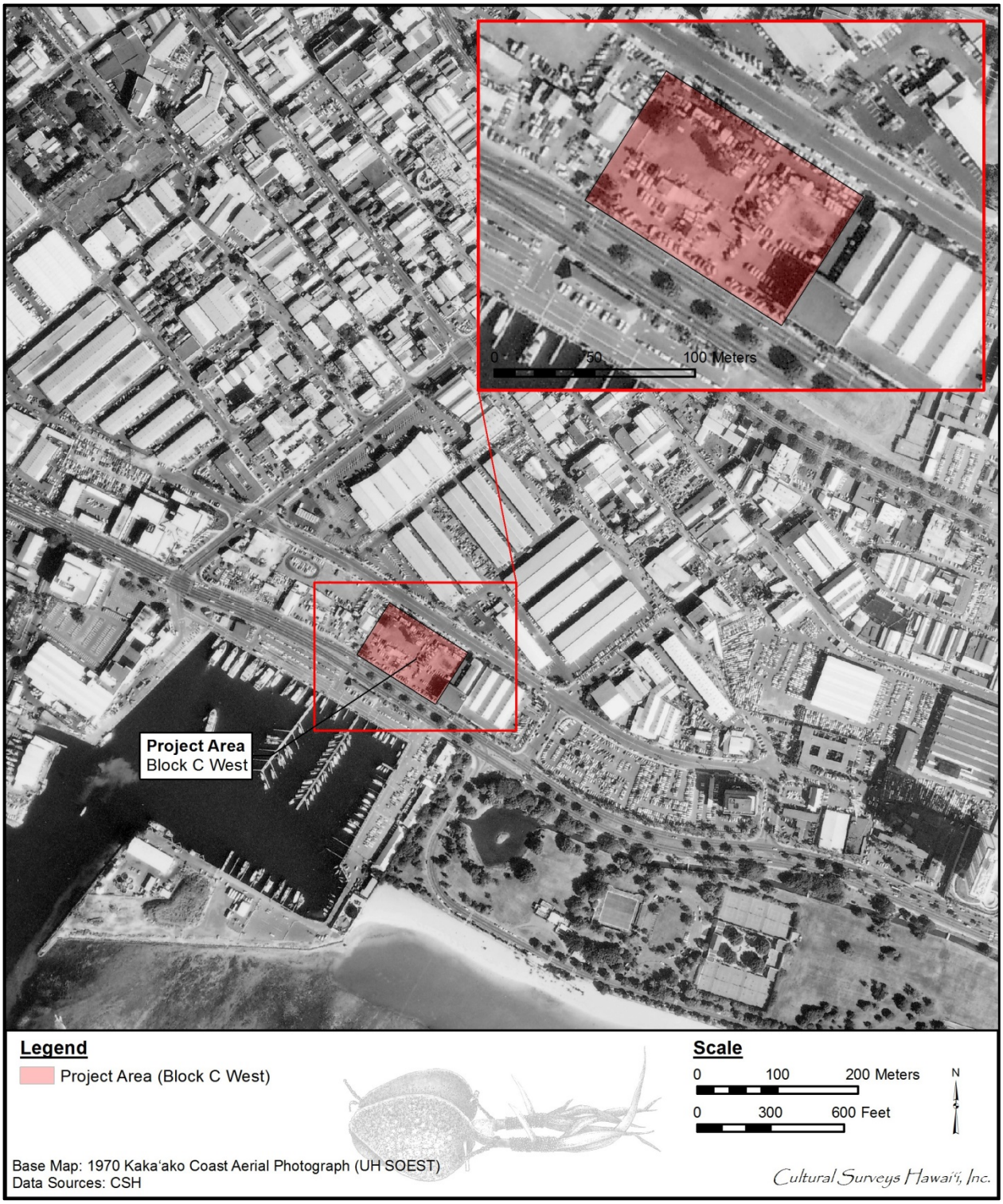

Figure 32. 1970 aerial photograph (UH SOEST), showing the project area

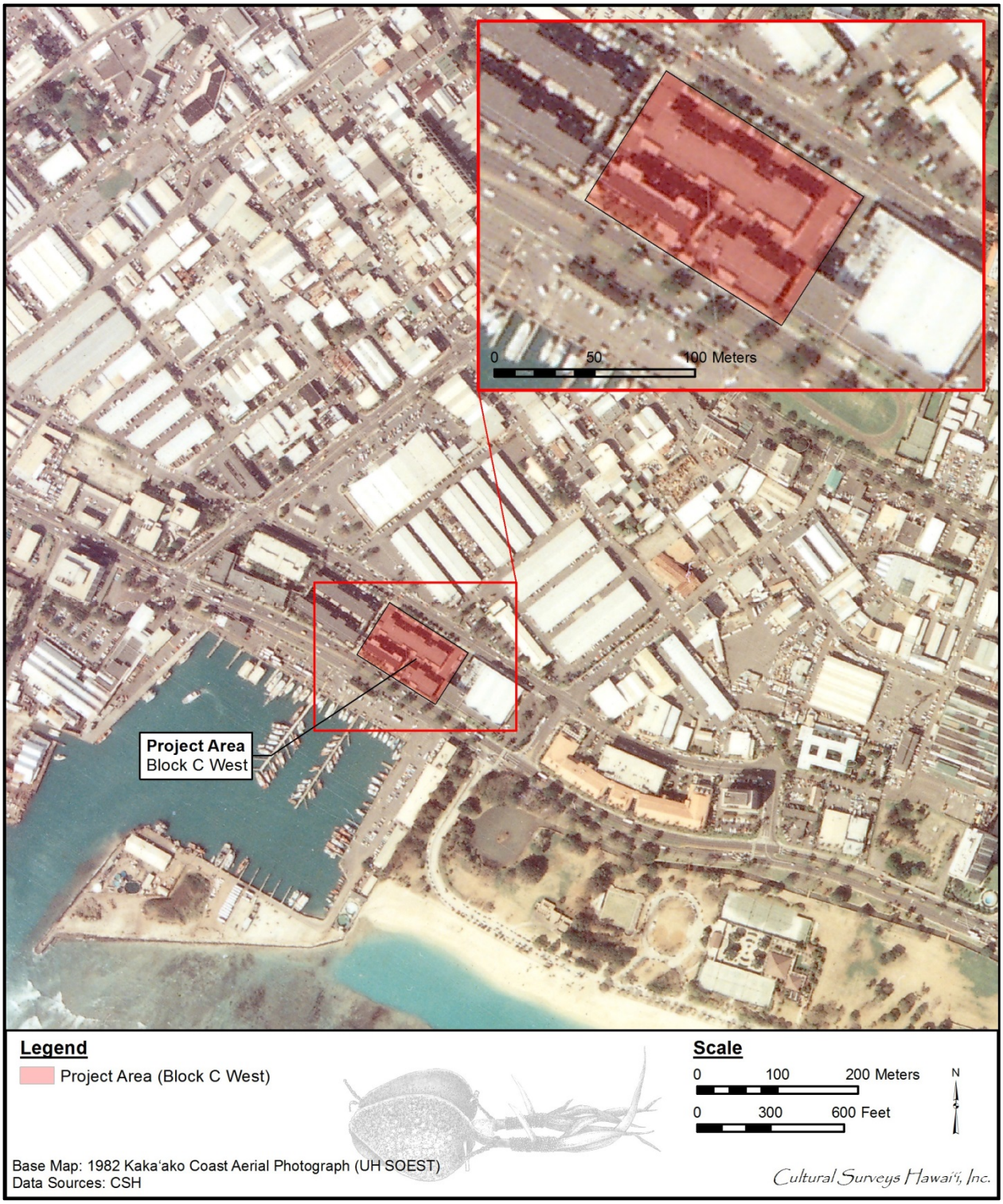

Figure 33. 1982 UH SOEST aerial photograph, depicting large warehouses throughout Kaka‘ako and Ward Warehouse within the project area

of the basin, in the Ka‘ākaukukui area (shortened to ‘Ākaukukui), they lived in shacks and sturdy houses in an area called “Squattersville,” named because they lived without authorization on government land. This camp was generally around Olomehani Street near the shore, protected from the waves by a long sea wall. There were around 700 Hawaiians and part-Hawaiians living in these two camps in the mid-1920s, but by 1926 they were all gone. The government evicted the families and razed the houses (Clark 1977:64).

A 1927 aerial photograph (Figure 26) shows the development of dredging and filling projects in Kaka‘ako. Areas west of Ward Avenue and *makai* of Ala Moana Boulevard are filled and developed, while the areas *mauka* and east, including Block C West, have only been recently filled (indicated by bare white coral fill areas) or are still open marsh/rice lands, such as *makai* of the new McKinley High School, the long lagoon of the Ward Estate, and the Kolowalu Pond. Kewalo Basin is an ill-defined dredged area of deep water east of Fort Armstrong directly *makai* of Block C West.

A 1933 U.S. Army War Department Fire Control map (Figure 27) shows the first buildings of the new McKinley High School campus and also illustrates that the eastern portion of Kaka‘ako is still undeveloped, with dotted lines showing unimproved or proposed streets, including within the area of Block C West. However, the land was more inhabited than is evident from this map. The Ward family leased to the Japanese lands for camps, schools, playground, temples and shrines (University of Hawai‘i 1978:847). Kaka‘ako was one of the first residential areas for working class families, housing people working at the laundries, the harbor, the Honolulu Iron Works, the Honolulu Brewery, and truck drivers, seamen, and fishermen. In 1940, Kaka‘ako had over 5,000 residents. Hawaiians, Portuguese, Chinese, and Japanese settled in camps based on their ethnic origins. The residents all came together for social and community functions.

On a 1939-1941 aerial photograph (Figure 28), Ala Moana Park, on new land created with dredged fill, is depicted with a deep-water channel meant to allow boats to sail from Kewalo Basin to the Ala Moana Yacht Harbor. Kewalo Harbor has been completed and ships line the shoreline. The former white coral areas east of Ward Avenue now have some vegetation, but they are still not greatly developed past the stage shown on the 1927 aerial photograph. One exception is the McKinley High School grounds, which have been completely filled in and leveled, and covered with several new campus buildings. The long lagoon of the Ward Estate is still unfilled. The project area is still undeveloped.

On a 1943 U.S. Army War Department Fire Control map (Figure 29), this eastern section of Kaka‘ako is an area of open lumber yards and large warehouses. After World War II, Kaka‘ako became increasingly industrialized, and residents moved out to the newer subdivisions away from the central Honolulu area. The 1943 map depicts the docks for Kewalo Basin. The McFarlane Tuna Company (now Hawaiian Tuna Packers) built a shipyard at the basin in 1929 for their fishermen’s “sampan fleet.” A new tuna cannery was built at the basin in 1933 and operated successfully. However, the entire cannery was taken over in 1941 by the military after the attack on Pearl Harbor. The cannery was converted to military use and used to make airplane gas tanks. Land in Kaka‘ako taken by the military was not returned until 1946 (Clark 1977:64; Gessler 1938:182-185).

A 1952 aerial photograph (Figure 30) shows major development in the eastern section of Kaka‘ako, with parking lots and scattered small structures within Block C West. Coral fill has been placed to create the substrate for the new Ala Moana Shopping Center to the east of the project

area, and new land has been created on the *makai* side of the former Fort Armstrong, west of Kewalo Basin. The dredged strip along the coast still extends from Kewalo Basin to Ala Moana Yacht Harbor and the western end of the Ala Wai Canal. A 1953 topographic map (Figure 31), less detailed than earlier maps, does indicate many of the improved or proposed roads in the eastern section of Kaka‘ako are now paved and improved.

In 1964, new land along the western boundary of the Ala Wai Yacht Club was created to make a peninsula called “Magic Island,” later renamed ‘Āina Moana State Recreation Area. The construction of this peninsula cut off access for boats between the Kewalo and Ala Moana boat docks, and the function of the channel along Ala Moana Beach Park was changed into a safe swimming area (Clark 1977:60-63). On a 1970 aerial photograph (Figure 32) of the eastern section of Kaka‘ako, the new Ala Moana Shopping Center is completed and the Blaisdell Civic Center has replaced the grounds, house, and lagoon of the Ward Estate. The Block C West project area is utilized primarily for parking.

In 1975, it was estimated there were 990 firms operating in Kaka‘ako and approximately 30% of the neighborhood residents also worked in the area (University of Hawai‘i 1978:A-116-117). In the 1970s to 1990s, portions of eastern Kaka‘ako were used for various small businesses that existed in warehouses and parking lots, as shown on a 1982 aerial photograph (Figure 33). Many of these warehouses were roofed, open-sided storage sheds for large lumber yards. Ward Warehouse was built in 1975 (Daysong 1997) and the shopping center can be seen as several adjacent structures on the 1982 aerial photograph. The Block C West project area is located within the eastern third of the Ward Warehouse complex.

In summary, the project area was apparently outside the two most intensely populated and cultivated areas—Waikīkī and Honolulu (or Kou)—along this portion of O‘ahu’s southern shore during the pre-Contact period. The area of Kaka‘ako was nonetheless well utilized by Hawaiians for activities appropriate to the specific environment, salt making and farming of fishponds, along with some wetland agriculture. The eastern portion of Kaka‘ako, including the project area, was also among the last areas of urban Honolulu to be built on and developed, with many of the roads in the area not developed until World War II.

Section 3 Previous Archaeological Research

3.1 Archaeological Research within the Vicinity of Block C West

3.1.1 Geological Study of Kaka‘ako and Kewalo

For his doctoral dissertation in Geology and Geophysics, Charles C. Ferrall (1976) synthesized all data from subsurface boring logs excavated in the Honolulu and Waikīkī areas to that time. The data were compiled from 800 borings made by the Hawai‘i Public Works, Board of Water Supply, and other state/city engineering departments.

Most of the coastal plain of Honolulu formed during the Pleistocene, during several sea level fluctuations related to the advance and retreat of glaciers. These fluctuations produced reef deposits at various levels, some above the present sea level. The Kaka‘ako area coral shelf was mainly formed during the Waimanalo High Sea Stand, about 120,000 years ago, which reached a maximum of 25 ft above the present sea level. The Waimanalo Sea Stand was preceded by the Waipio Low and was followed by the Mamala Low. During the Mamala Low when the sea receded as much as 300 ft below present levels, deep alluvial channels dissected the former reefs, including one which Ferrall called the HIC Channel. This channel was found in borings made within the Honolulu International Center (now called the Blaisdell Center), thus the name of the channel. Due to the scattered locations of the 800 borings, the exact path of this channel as it traverses *makai* to the ocean could not be determined; however, Ferrall postulated that the channel extends through the area in which Land Blocks 1 and 2 of the Ward Neighborhood Master Plan are located (Figure 34). Ferrall (1976:53) cautions that “given the sinuous course of this channel in the area where control is available, it could be expected to meander considerably from the direct route to the sea which is shown.” This carved channel contains alluvium with lenses of sand and volcanic cinder overlain by swamp deposits. The sediments overlying the channel are similar to the surrounding areas (i.e., above the general coral shelf).

For bores excavated in the Kaka‘ako area, the coral shelf is found at three different levels, at +5 ft above sea level and at -15 and -30 ft below sea level. The +5, -15, and -30 coral ledges were all formed during the Waimanalo High Sea Stand. Ferrall notes extensive coral “growth occurred during the Waimanalo High Sea Stand, probably as a result of the warmer climate of the interglacial stage” (Ferrall 1976:116). As the sea receded from a previous high of +25, it paused at +5 ft, long enough for the growth of corals that favor a high-energy reef flat environment. This reef developed in about 20 ft of water. The -15 ft ledge probably developed after this during a regression of the sea from the Waimanalo High Stand to the Mamala Low Stand. The -15 coral shelf also developed within a high-energy zone, but was formed in a more shallow water environment, in only a few feet of water. The -30 coral shelf was composed of coral that grows in low-energy lagoonal environments. It may represent the “seaward (forereef) reflection” of one of the +5 or -15 coral ledges rather than a separate time period (Ferrall 1976:125).

Ferrall (1976) remarks on the area with the +5, -15, and -30 coral ledges:

> . . . lagoonal deposits are widespread . . . overlying the -30 and -15 ledges, the alluvial channels, and the lower, seaward edge of the +5 ledge. In general, any area

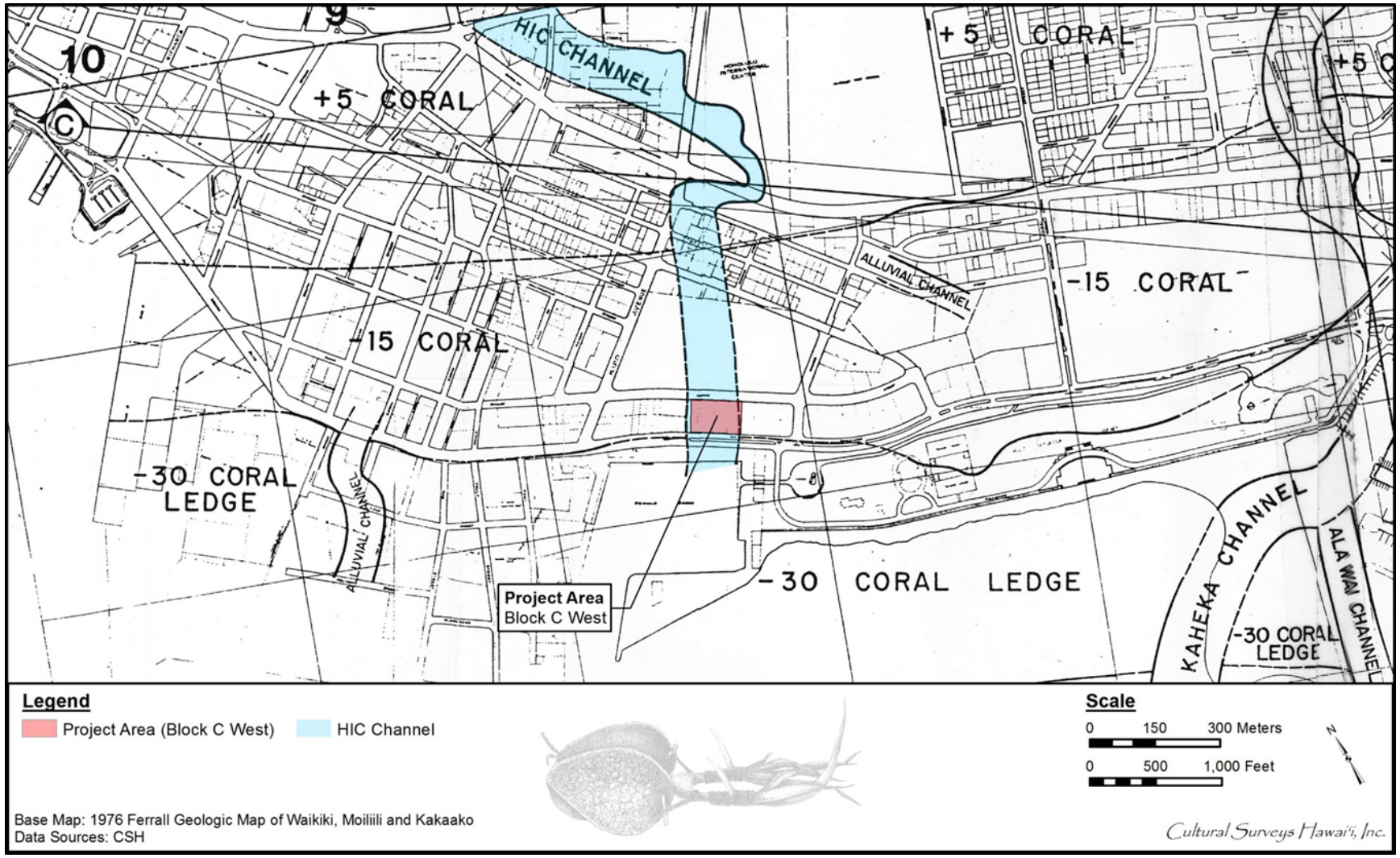

Figure 34. Coral shelf depth (+/- ft above or below sea level) and possible location of the HIC channel within the vicinity of the project area (modified figure of outsize map in Ferrall 1976)

> that was not above existing sea level prior to the [Mamala] transgression to the modern sea level became covered with lagoonal deposits. . . . After the sea more or less stabilized at its present level, the lagoon filled up and became a swamp. Swamp deposits, with peat layers are found from just below existing sea level, on top of the lagoonal deposits, to just above sea level. Even into historical time, much of the area seaward of the +5 ledge was dominated by swamp conditions. [Ferrall 1976:135]

According to Ferrall's work, the current project area is within the -15 coral ledge zone, *makai* of the +5 coral ledge and *mauka* of the -30 coral ledge.

The current project area falls within Quad B-8 of Ferrall's study. The closest boring within this quad was at the intersection of Ward Avenue and Auahi Street. The coral ledge was 15-22 ft below the surface overlain with lagoonal deposits and 3 ft of fill.

3.1.2 Archaeological Background

Most traditional Hawaiian surface structures had been demolished in the Kaka‘ako area by the time of the first scientific archaeological surveys (e.g., Griffin 1987). In his report on the survey of O‘ahu sites conducted in the early 1930s, McAllister (1933:80) says of Honolulu, "Information regarding former sites within the present limits of Honolulu must come entirely from literary sources." He mentions Pākākā Heiau, once the main royal temple in Honolulu. This *heiau* would have been located around the foot (*makai* end) of Fort Street. He does not list Pu‘ukea Heiau (discussed in Section 2.2), which Kamakau (1991:24-25) placed in Kukuluāe‘o, but he does note that Peter Corney, a visitor to the island in 1819, saw several *heiau* (*morai*) along the Honolulu shore:

> There are several *morais*, or churches in the village, and at new moon the priests, chiefs and *hikanees* (*aikane)* [counselors] enter them with offerings of hogs, plantains, and cocoanuts, which they set before the wooden images. The place is fenced in, and have pieces of white flags flying on the fences. [Corney 1896:101]

Although no previous archaeological investigations have been conducted within the Block C West project area prior to the recent Block C West AIS, several archaeological studies have been conducted in parcels and on road alignments within the vicinity; the most relevant investigations are summarized in Table 1 and the following text. Figure 35 shows the locations of previous archaeological investigations and recorded profiles. Figure 36 shows the location of documented historic properties and burials.

3.1.3 K aka‘ako Improvement District 6 (ID-6)

The Kaka‘ako Improvement District 6 (ID-6) was an area bounded by Ala Moana Boulevard (*mauka*), ‘Āhui Street, Kewalo Basin, and extending approximately 200 ft seaward of Ilalo Street. The project completed an extension of Ward Avenue *makai* of Ala Moana Boulevard, connecting to ‘Āhui Street. The street extension was accompanied by improvements to drainage, water, sewer, and utility systems, as well as the construction of a parking lot and landscaping involving relocation of existing trees and the addition of new vegetation.

The project area lay seaward of the pre-Contact and early historic shoreline; therefore, it was highly unlikely that intact or in situ cultural materials or burials were present. It was considered

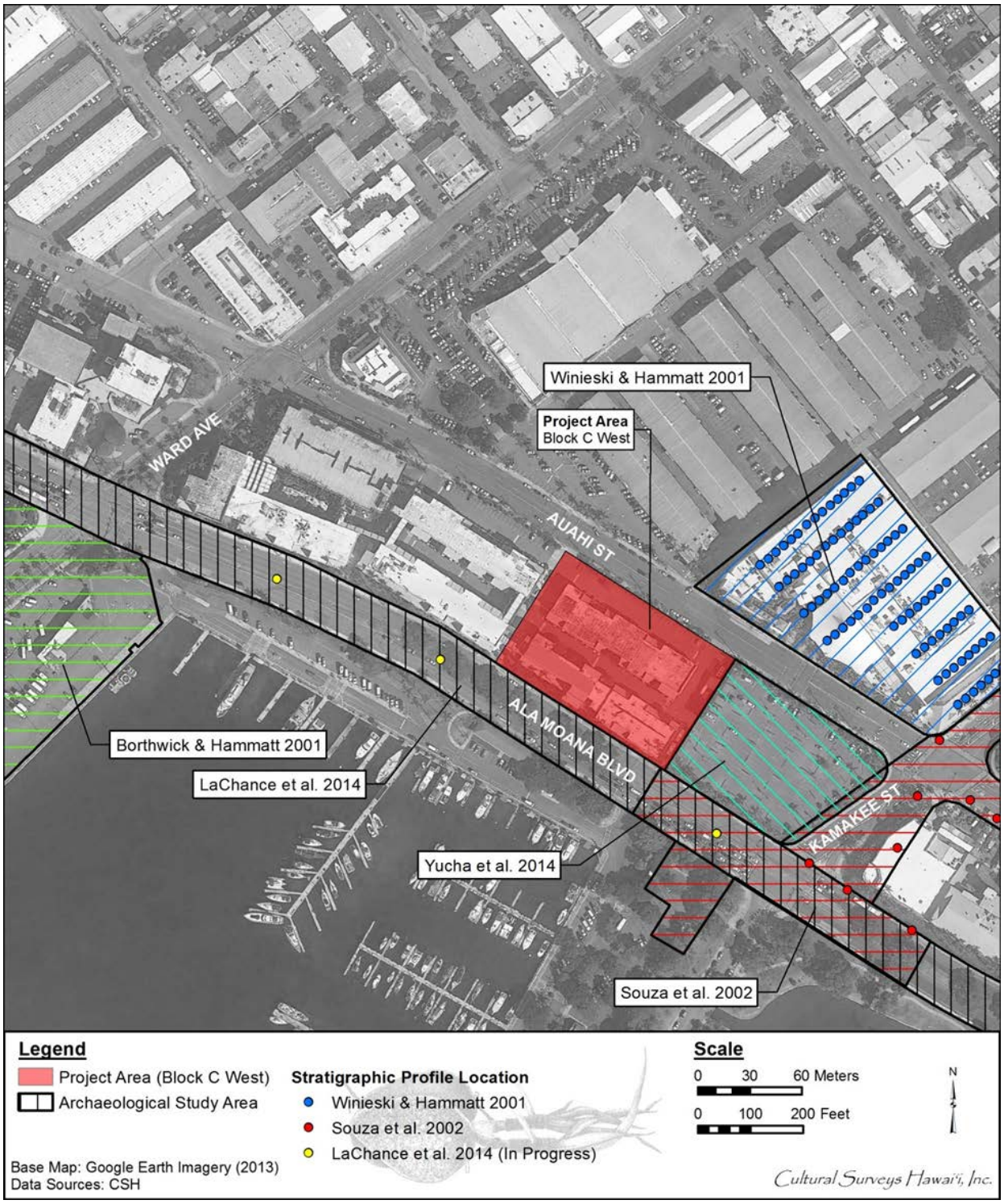

Figure 35. Previous archaeological studies within the vicinity the project area, showing the location of recorded profiles (base map: Google Earth 2013)

Figure 36. Aerial photograph showing the location of documented historic properties and burials within the vicinity of the project area (base map: Google Earth 2013)

Table 1. Previous Archaeological Studies within the Vicinity of the Block C West Project Area

Reference	Project Name	Type of Study	Results
Borthwick and Hammatt 2001	Kaka‘ako ID-6	Archaeological monitoring	No cultural materials found during monitoring; fill material found over old tidal flats
Winieski and Hammatt 2001	Ward Theaters	Archaeological monitoring	No burials or cultural deposits found; buried A horizon found in pile caps in NW and SE corners
Souza et al. 2002	Kaka‘ako ID-7	Archaeological monitoring	Three disturbed pre-Contact burials recorded (SIHP #s -6376, -6377); buried A horizon found in seven of ten profiles
Yucha et al. 2013	Ward Neighborhood Block C	Archaeological inventory survey	Burned trash layer (SIHP # -7422) identified; majority of project area contained sand or peat A horizon and Jaucas sand beneath reclamation fill layers; no cultural material or features observed
LaChance et al. 2013	Ala Moana Blvd/Nimitz Hwy Resurfacing and Hwy Lighting Replacement	Archaeological monitoring	No finds within the vicinity of the current project area; Jaucas sand found in profiles just *makai* of current project area

possible that scattered cultural materials, partial burials, and historic trash could have been transported to the area during the period when fill materials were placed in this area. No burials, traditional Hawaiian or early historic cultural layers, or large historic to modern trash pits were observed.

3.1.4 Ward Village Phase II (Ward Theaters)

In 2000, CSH performed archaeological monitoring for Victoria Ward, Ltd. at the site of the Ward Village Phase II (Ward Theaters) construction project in Kaka‘ako (Winieski and Hammatt 2001). This project area is bound by Auahi Street on the southwest and Kamake‘e Street to the southeast. The commercial building does not have extensive footing or any subsurface structures (e.g., underground parking, businesses, storage, etc.); instead, the structure is supported by numerous drive piles (see Figure 35). The open cut excavation component of the pile installation involved excavation of typically 4 by 4 m trenches, 130 cm deep, to accommodate pile caps. Open cut trenching was also required for installation of underground utilities. These were typically less than a meter in depth. No pre-Contact materials, historic cultural materials, or human burials were encountered.

Approximately 90% of the pile cap excavations exhibited nearly identical stratigraphic sequences. Beneath what had previously been asphalt parking surfaces or building slabs was a 40-cm thick crushed coral fill layer. Beneath this layer was hydraulic (i.e., pumped dredged material) clay fill, usually light gray. However, in some instances a brownish yellow clay hydraulic fill overlay the gray layer, evidence of different hydraulic fill episodes. Beneath the hydraulic fill layers, decomposing coral shelf occurred.

At the northwest corner of the building’s footprint, a few of the pile cap excavations exposed an old A horizon beneath fill materials, shown in a profile and a photograph (Figure 37 and Figure 38). Underlying the silty sand A horizon was light brownish gray sandy clay, which was interpreted as old pond sediments. A buried A horizon was also present above a sterile calcareous sand layer in a 50-m long shallow trench dug for telephone cable conduits behind Nordstrom Rack, just *mauka* of the project area. In this trench the old A horizon and sand layer were continuous, apparently not disturbed by previous construction.

At the southeast corner of the project area, near the intersection of Auahi and Kamake‘e streets, the old A horizon and sand layer were present, however, they were discontinuous, having been disturbed by previous construction activities and replaced with backfill. It is near this area that a human burial (SIHP # -6377) was encountered within the sand matrix during the adjacent Kaka‘ako Improvement District 7 Project.

3.1.5 Kaka‘ako Improvement District 7 (ID-7)

The Kaka‘ako Improvement District 7 (ID-7) project constructed improvements to drainage, water, sewer, and utility systems on Kamake‘e Street between Queen Street and Ala Moana Boulevard, and also extended the drain system from Ala Moana Boulevard to Kewalo Basin (Souza et al. 2002). The project also included realignment of the existing Kamake‘e Street between Auahi Street and Ala Moana Boulevard.

During excavation activities associated with the Kaka‘ako Improvement District 7 construction project, three human burials were encountered. Burial 1 (SIHP # -6376), a single cranium, was inadvertently discovered by construction personnel in the base yard back dirt pile. The back dirt

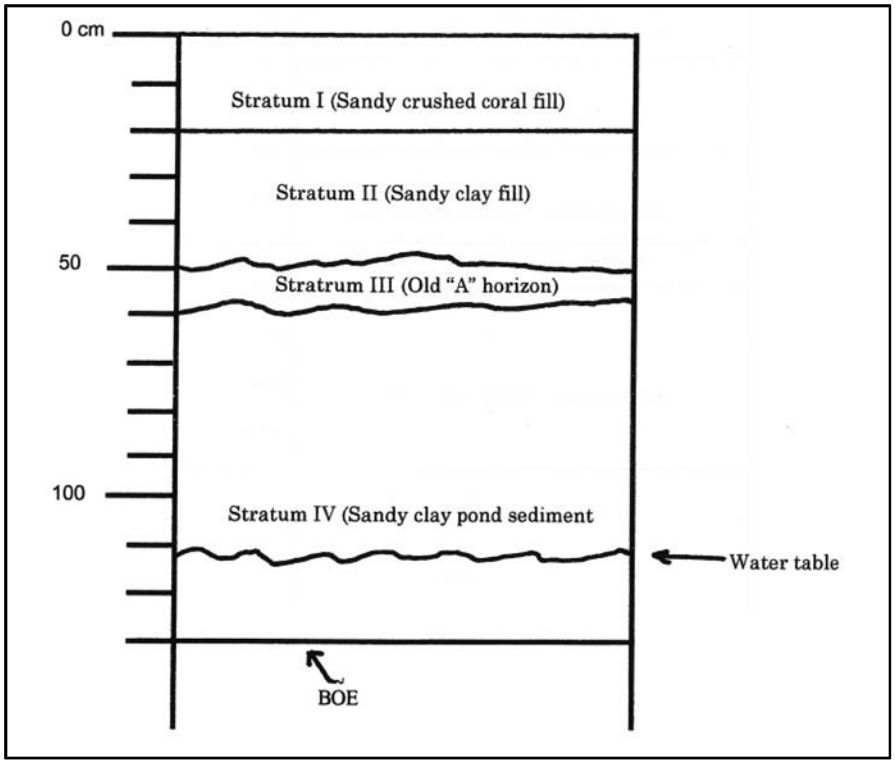

Figure 37. Profile of pile cap excavation in northeast corner of Ward Village Phase II footprint (Ward Theaters) showing old A horizon and pond sediment (Winieski and Hammatt 2001)

Figure 38. Photograph of pile cap trench showing old A horizon (dark stratum) capping sandy clay pond sediments (Winieski and Hammatt 2001)

pile was derived from a trench on Ala Moana Boulevard and Kamake‘e Street. Burial 2 (SIHP # -6377), an adult individual, was encountered by an archaeologist during backhoe excavations for a box drain on Kamake‘e Street. The burial was within an undisturbed sand deposit (see Figure 36). Burial 3 (SIHP # -6378), consisting of a femur and several rib fragments, was recovered in the construction base yard. The original location of the burial could not be determined.

Ten profiles were described and drawn along along Kamake‘e Street between Queen Street and Ala Moana Boulevard. Most of the excavations occurred in previously disturbed fill material. As expected, the land comprising Ala Moana Beach Park and the Kewalo Basin consists totally of fill material, since the areas were seaward of the shoreline in the pre-Contact and early historic periods. Natural discontinuous deposits were exposed most frequently along the ‘Ewa (west) and Diamond Head (southeast) sides of Kamake‘e Street extending down to Ala Moana Boulevard. A buried A horizon was observed in seven profiles.

3.1.6 Ward Neighborhood Block C Project

In December 2012 and January 2013, CSH conducted an archaeological inventory survey of the Ward Neighborhood Block C project, a component of the Ward Neighborhood Master Plan area, located just south of the current project area within a parking lot at the intersection of Ala Moana Boulevard and Kamake‘e Street (Yucha et al. 2013). Forty-one test excavations were distributed across the project area. Only one historic property was identified, a burned trash layer located near the corner of Kamake‘e and Auahi Streets (SIHP # -7422). Stratigraphy within the project area was largely consistent. A deposit of hydraulic fill associated with the reclamation infilling of Kaka‘ako during the 1913–1930 period was found within the north, west, and south portions of the project area (Figure 39). Beneath the fill layers, a coarse sand A horizon was documented within 25 test excavations throughout the project area, while a peat A horizon was found within three excavations within the northern portion of the project area (Figure 40). A majority of the project area (35 test excavations) contained Jaucas sand (Figure 41). No cultural material or features were observed within the test excavations or within screened and bulk sediment samples. A representative profile of stratigraphy containing a sand A horizon is shown in Figure 42.

3.1.7 Ala Moana Boulevard/Nimitz Highway Resurfacing and Highway Lighting Replacement Project

From March 2011 through the present, CSH has performed archaeological monitoring for the Ala Moana Boulevard/Nimitz Highway Resurfacing and Highway Lighting Replacement project, located between Fort Street and Kalākaua Avenue (LaChance et al. 2013). The majority of the project-related subsurface impacts were due to the installation of subsurface utilities. The project was divided into five phases, with Phase 3 located in the immediate vicinity of the current project area.

Within Phase 3, two representative profiles (Profiles 7 and 8) were drawn of stratigraphy just *makai* of the Block C West project area along Ala Moana Boulevard (see Figure 37). The stratigraphy of Profile 7 consisted of the asphalt roadway and basalt gravel base course overlying natural Jaucas sand and the coral shelf. Profile 8 contained similar stratigraphy with an additional layer of crushed coral fill beneath the base course. Within the two profiles, the upper boundary

Figure 39. Aerial photograph depicting the Ward Neighborhood Block C project, showing where hydraulic fill deposits were encountered (Google Earth 2008)

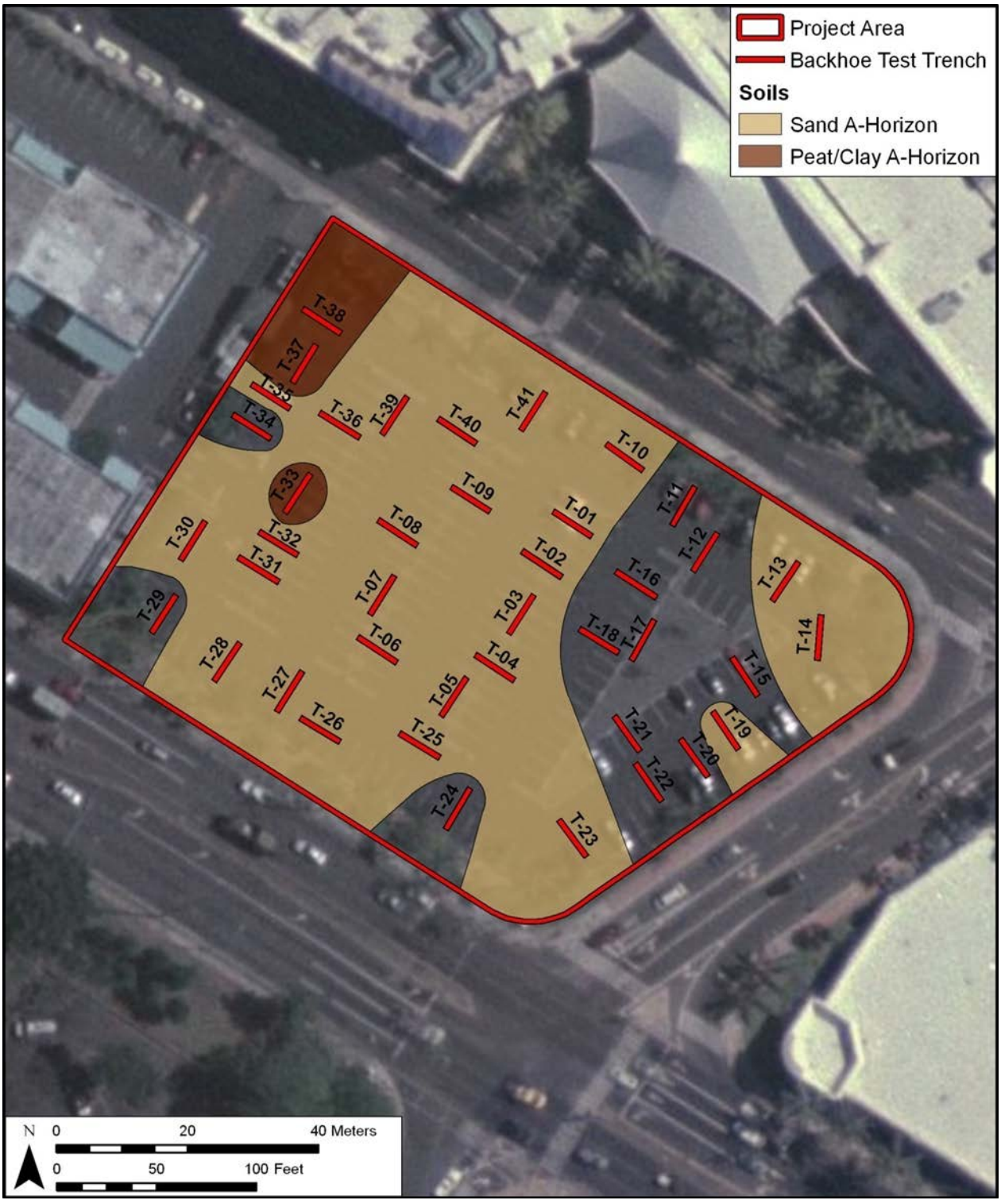

Figure 40. Aerial photograph depicting the Ward Neighborhood Block C project, showing where a buried A horizon was encountered (Google Earth 2008)

Figure 41. Aerial photograph depicting the Ward Neighborhood Block C project, showing where Jaucas sand deposits were encountered (Google Earth 2008)

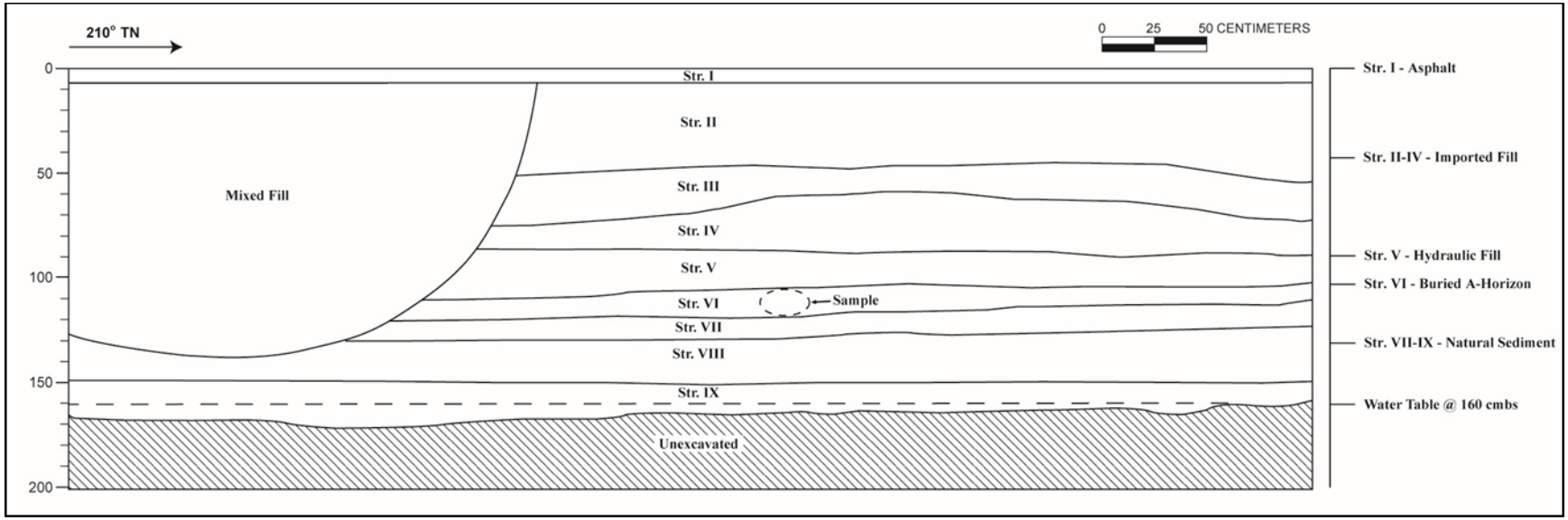

Figure 42. Ward Neighborhood Block C project AIS, Trench 30, profile of southeast sidewall (Yucha et al. 2013)

Stratigraphic Description

I Asphalt

II Fill; 10YR 3/4 (dark yellowish brown); very gravelly loamy sand

III Fill; 10YR 3/4 (dark yellowish brown mottled with 30% medium 2.5YR 4/6 red); gravelly clay loam

IV Fill; 10YR 7/2 (light gray); coarse sand; crushed coral

V Hydraulic Fill; 10YR 8/2 (very pale brown); very fine sandy clay; land-reclamation fill

VI A horizon; 10YR 5/1 (gray); medium sand; truncated and compacted former land surface

VII Natural; 10YR 8/3 (very pale brown); medium sand; natural marine sand

VIII Natural; 10YR 7/2 (light gray); sandy clay

IX Natural; 5BG 6/1 (greenish gray); sandy clay; natural lagoon sediment

of the Jaucas sand was located between 40–80 cm below surface. No historic properties or burials have been identified within the vicinity of Block C West. Burial 3 (SIHP # -6378), consisting of a femur and several rib fragments, was recovered in the construction base yard. The original location of the burial could not be determined.

Ten profiles were described and drawn along along Kamake‘e Street between Queen Street and Ala Moana Boulevard. Most of the excavations occurred in previously disturbed fill material. As expected, the land comprising Ala Moana Beach Park and the Kewalo Basin consists totally of fill material, since the areas were seaward of the shoreline in the pre-Contact and early historic periods. Natural discontinuous deposits were exposed most frequently along the ‘Ewa (west) and Diamond Head (southeast) sides of Kamake‘e Street extending down to Ala Moana Boulevard. A buried A horizon was observed in seven profiles.

3.2 Ward Gateway Project AIS Results (Blocks B East and C West)

Between 14 April and 9 June 2014, CSH conducted AIS investigations of Block C West (Sroat et al. 2014) and Block B East (Pammer et al. 2014), contiguous project areas which together comprise the proposed Ward Gateway project. A total of 36 test excavations were completed within Block C West and 38 test excavations within Block B East (Figure 43). The stratigraphy within the adjacent project areas was consistent, evidencing similar natural stratigraphy and historic development (Figure 44).

The modern developed land surface consisted of asphalt parking lot surfaces and concrete commercial floors associated with the present Ward Warehouse commercial complex, as well as various layers of fill. Beneath these modern layers, within 38 test excavations (20 in Block C West and 18 in Block B East), were located previous twentieth century development land surfaces (SIHP # -7658) consisting of asphalt, concrete, coral and tar pavement, and oil-rolled surfaces (Figure 45). These buried surfaces were documented 20–105 cm below surface, with an average depth of 49 cm below surface.

Underlying the modern and historic surfaces and fill layers were extensive reclamation fill deposits, utilized to in-fill low-lying wetland areas and create a dry, level land surface (Figure 46). The reclamation fill deposits consisted of crushed coral and hydraulic-dredged marine clays and were documented 23-116 cm below surface, with an average depth of 68 cm below surface. A total of 59 test excavations contained reclamation fill, located almost ubiquitously throughout the project area, with the exception of the *makai* landscaped edge of the property.

Background research indicated land reclamation activity within the Block C West and B East project areas occurred sometime between 1919 and 1927, following allocation of territorial funds for the dredging of Kewalo Basin in 1919. The narrow date range of these reclamation fill deposits provided a clear dating tool, indicating the strata underlying the reclamation fill could be considered older than 1919, and conversely, that the overlying strata could be considered older than 1927.

Underlying the reclamation fill deposits, and corresponding in extent, historic salt pan remnants were documented (SIHP # -7655) (Figure 47). This was consistent with the location of the historic salt pan remnants within areas of natural low-lying wetlands, which had been converted to salt pan basins enclosed by man-made berm structures. The berm structures were comprised of archaeosediments, likely marine sandy clay deposits previously located within or in the immediate

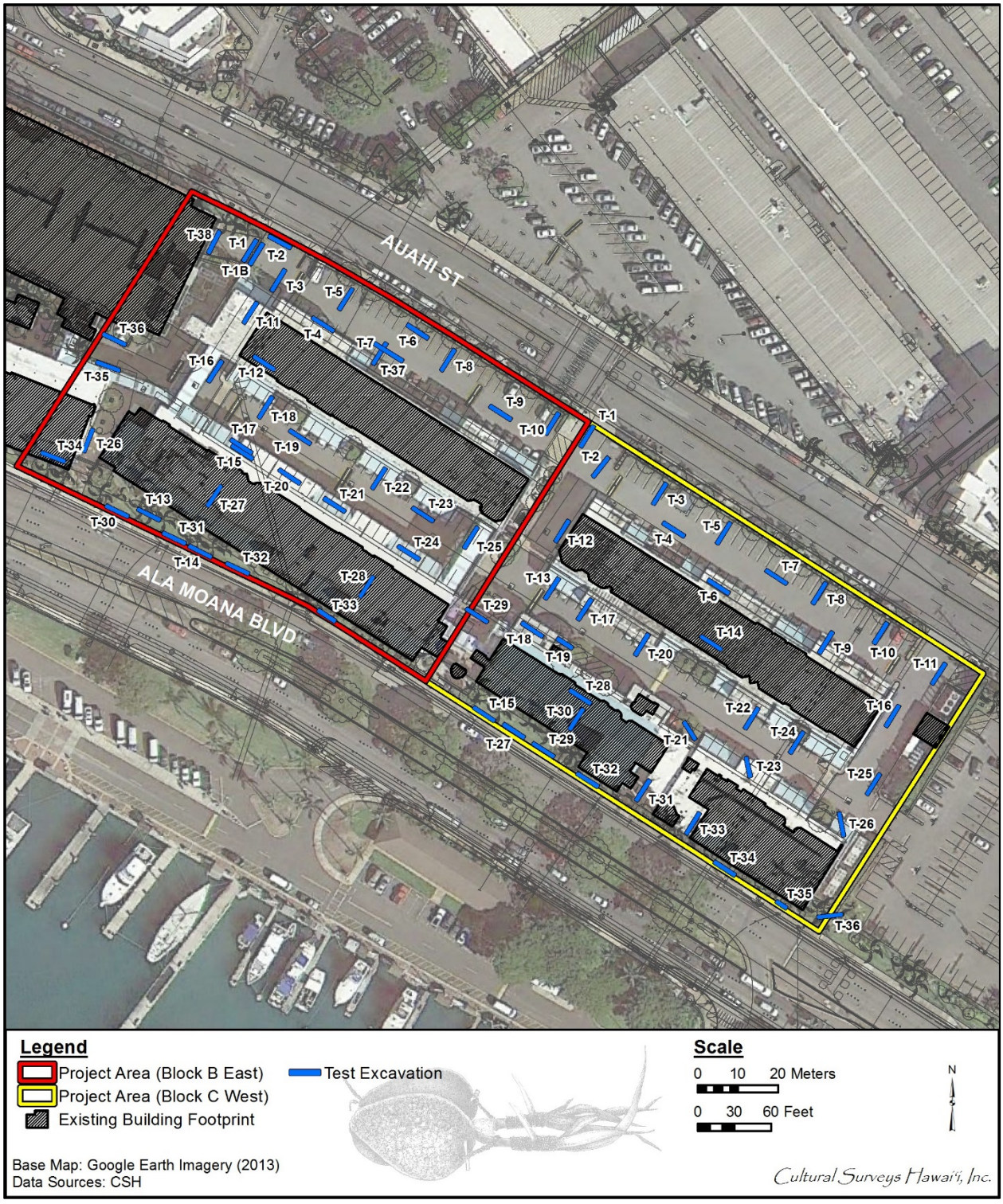

Figure 43. 2013 aerial photograph showing the location of AIS test excavations within the Block C West and B East project areas (Ward Gateway)

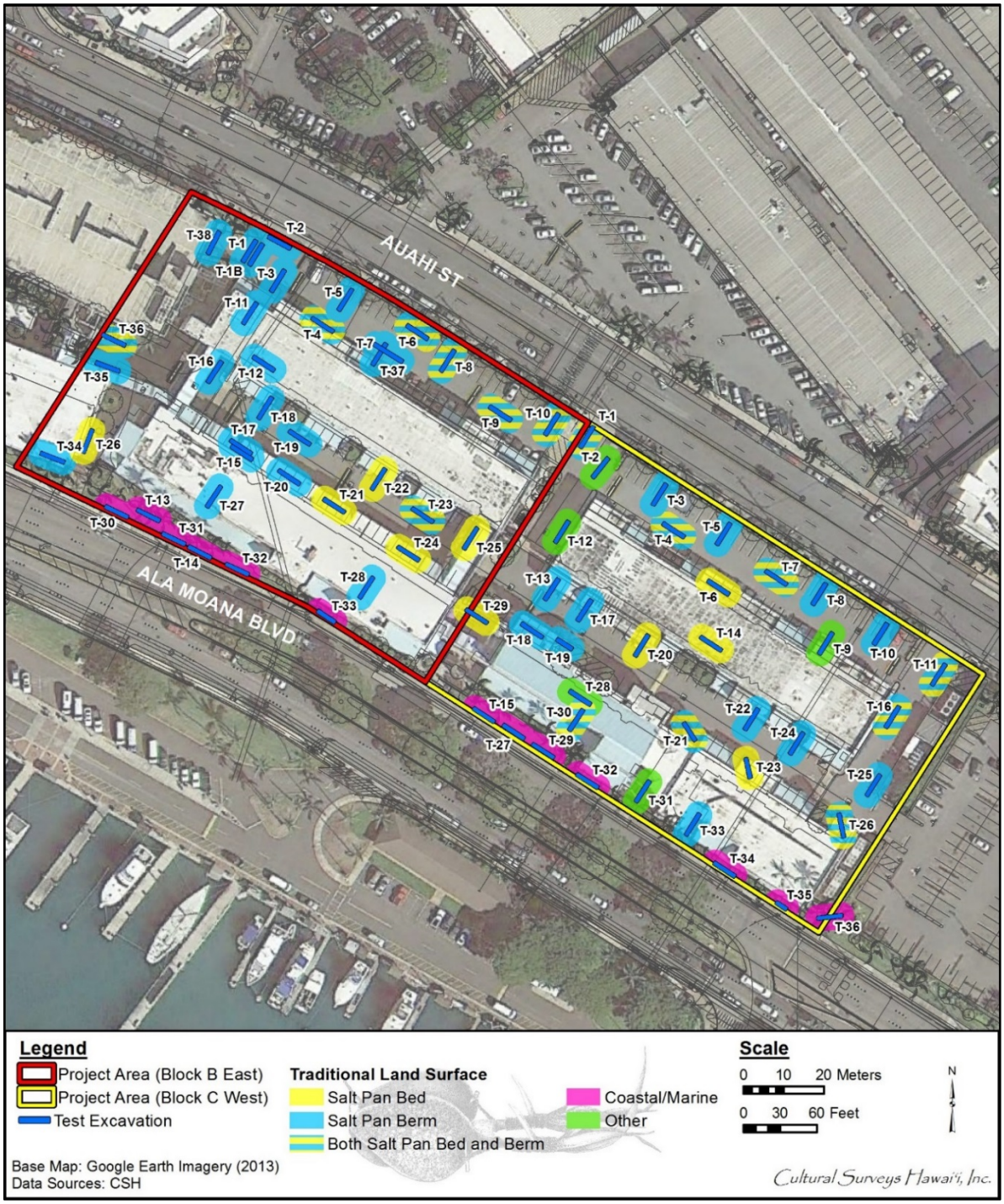

Figure 44. Aerial photograph showing the distribution of natural surfaces documented within the Block C West and B East (Ward Gateway) project areas, including the salt pan beds and salt pan berms associated with SIHP # -7655 and the disturbed and reworked marine sand (source: Google Earth 2013)

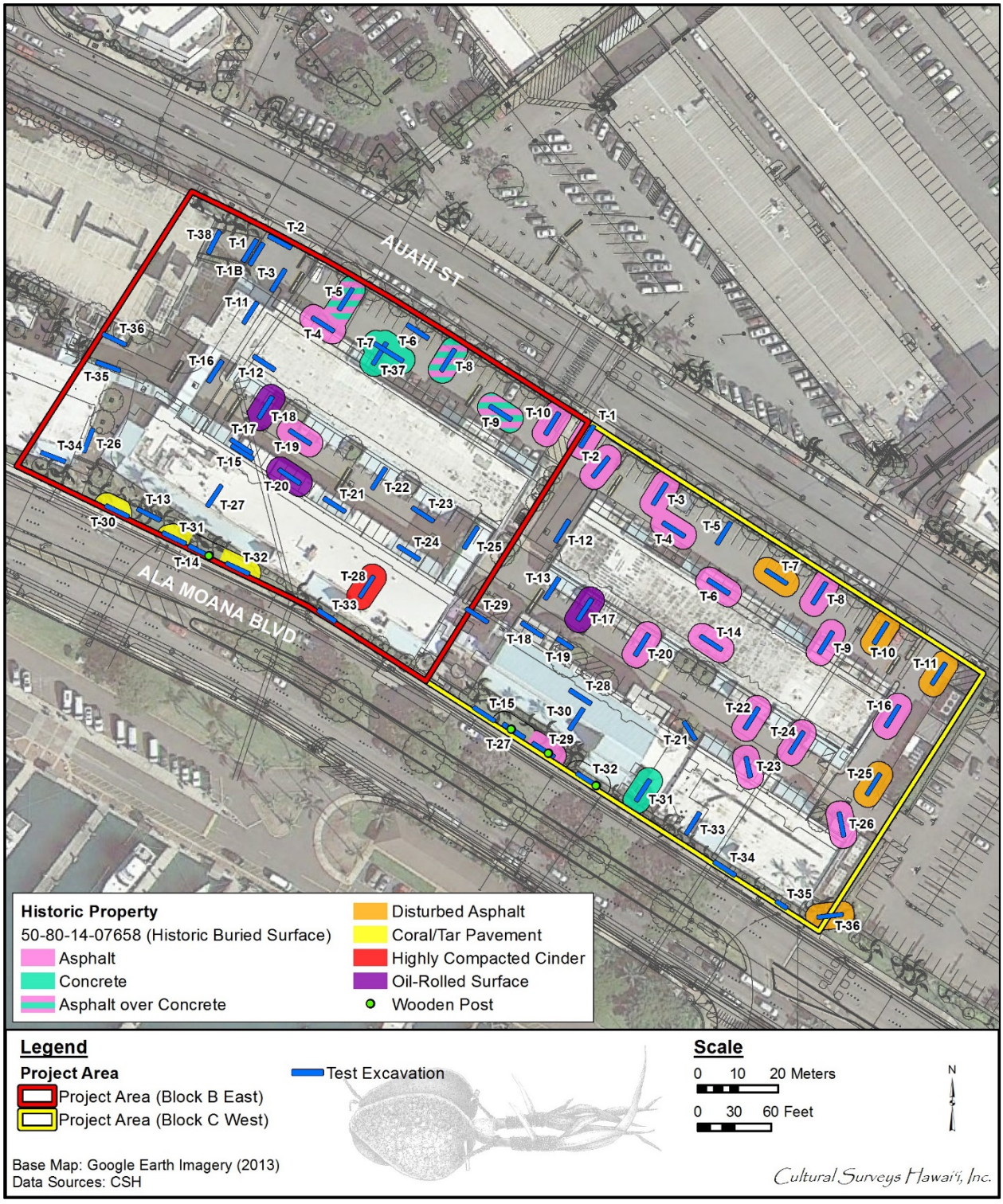

Figure 45. Aerial photograph showing the extent of the historic buried surfaces (SIHP # -7658) documented within the Block C West and B East project areas (source: Google Earth 2013)

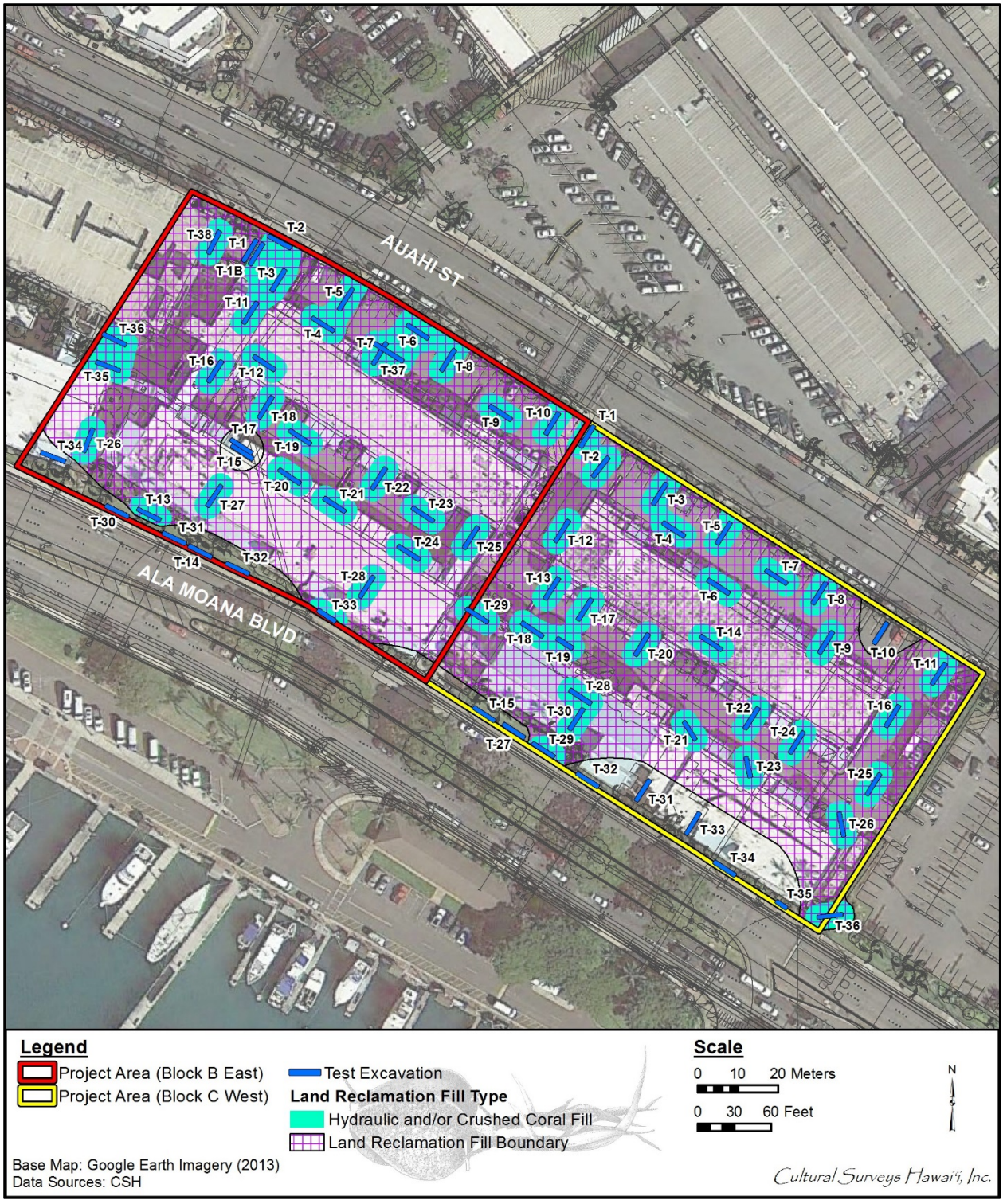

Figure 46. Aerial photograph showing the extent of the land reclamation fill, including both hydraulic fill and crushed coral fill, documented within the Block C West and B East project areas (source: Google Earth 2013)

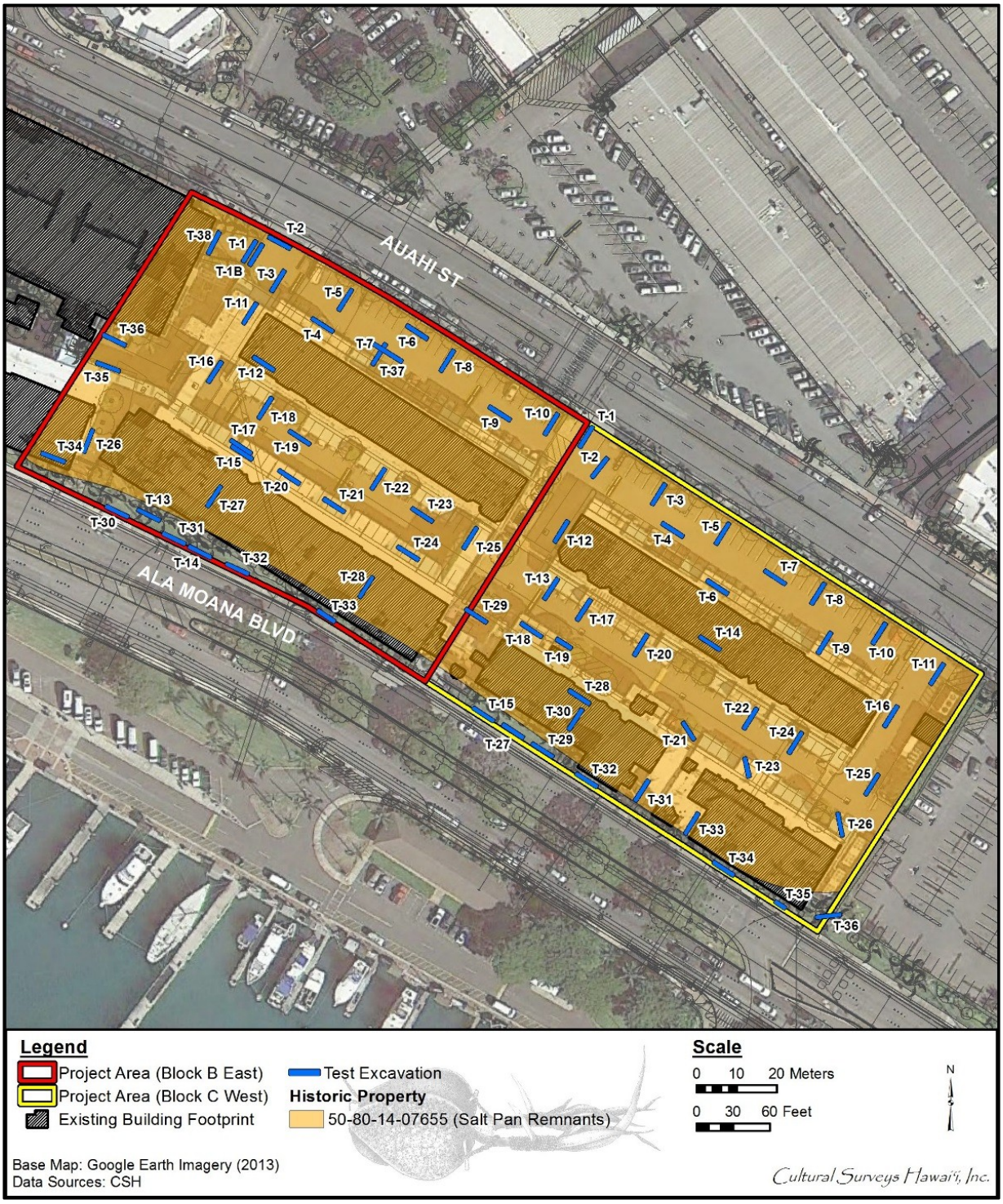

Figure 47. Aerial photograph showing the extent of historic salt pan remnants (SIHP # -7655) documented within the Block C West and B East project areas (source: Google Earth 2013)

vicinity of the project areas. The salt pan beds consisted of the natural underlying wetland sediments covered with very thin organic laminations, likely associated with salt production methods.

Within the Block B East project area, two features associated with the historic salt pans (SIHP # -7655 Features 1 and 2) were identified. Feature 1, identified within Test Excavations 15 and 17, consisted of naturally tabular limestone boulders, placed to create a relatively level surface over the natural marine sandy clay. The limestone boulders were determined to be associated with the land altering events associated with the historic salt pans. Feature 2, identified within Test Excavation 38, consisted of limestone boulders integrated into a man-made berm adjacent to a small section of peaty pond sediments. For a full description of SIHP # 50-80-14-7655, see Appendix A.

Along the *makai* edge of the Block B project area, the stratigraphy changed to disturbed and reworked Jaucas sand and coastal marine sandy clay sediments, overlain by various fill deposits and crisscrossed by utility lines. Much of the disturbance to the natural sediments in this area appeared to be due to the surrounding urban development including landscaping, roadway improvements, and various stages of building infrastructure. The natural sandy clay marine deposits appeared very similar to the historic salt pan berm sediments (SIHP # -7655) and was determined to likely represent the source of these archaeosediments. Within the Block C West project area, Jaucas sands were largely absent, the stratigraphy instead consisting of fill deposits overlying disturbed and in situ marine sandy clay deposits.

Block B East contained three additional historic properties. SIHP # -7656 consisted of a single human cranial fragment encountered within disturbed sand along the *makai* boundary of the project area (Test Excavation 31). SIHP # -7659 consisted of the concretized and rerouted Ward Estate *‘auwai*, encountered in Test Excavations 15 and 17 (see Appendix A.2). SIHP # -7660 consisted of a historic trash fill deposit located within an abandoned storm drain box along the *makai* boundary of the project area (Test Excavation 32). The historic trash included bottles, ceramic, metal fragments, and boat trash likely related to the nearby fishing and tuna cannery industry.

Section 4 Data Recovery Research Objectives and Methods

4.1 Research Objectives and Methods for SIHP # 50-80-14-7655

Data recovery efforts for SIHP # -7655, historic salt pan remnants, will focus on further documentation and identification of the structural and functional characteristics of the salt pan berms and salt pan beds as well as how the Ward Estate salt production enterprise fit into the wider context of historic salt production on O‘ahu. Data recovery for SIHP # -7655 within Block C West is intended to work in tandem with data recovery efforts for historic salt pan remnants (SIHP # -7655) within the adjacent Block B East; data recovery test excavations for each project area have been placed so as to work in concert to answer the historic property research objectives. The research questions are presented below, followed by the data requirements, the sampling strategy, and laboratory methods to address these questions. Research Objectives

Research Objective 1:

To better determine the form, characteristics, and function of the salt pan berm structures

The Block C West AIS excavations documented a system of man-made berms which structured and enclosed the salt pan beds. The berms did not appear to be uniform, but rather evidenced structural variation in width, height, slope, and orientation. Can this apparent structural variation of the salt pan berms be further characterized and does this variation correspond to functional differences? For instance, do wider and/or steeper berm structures indicate a large salt pan grid (e.g. the boundaries of a large set of ponds) and/or do they indicate other functions, for example causeways utilized for access to/from the pans? Can lower, narrower berms be identified, and if so, what function did they serve; for example, do smaller berms indicate “inner” grids within a large pond set? Can the orientation of the salt pan grids be confirmed to conform to a *mauka-makai* and ‘Ewa-Diamond Head grid pattern?

Research Objective 2:

To better determine the characteristics and function of the salt pan beds

The Block C West AIS excavations documented low-lying wetland sediments overlain by thin organic laminations, identified as salt pan bed remnants, and bounded by the man-made salt pan berms. The laminations varied in thickness from 1 to 4 cm and were observable as variations of color and texture, often containing leaf-like and grass-like organic structures. Pollen analysis indicated an unusual concentration of *Myrsine* (the native *kolea* tree). As the *kolea* tree is most likely insect-pollinated, its pollen would normally be underrepresented in comparison to wind-borne pollen. The relative abundance of *kolea* was interpreted as potential indication of its utilization in historic salt production as a salt pan leaf liner (as referenced in early historic accounts—see Appendix A.1). Data recovery investigations within these salt pan sediments will attempt to verify these initial pollen results and to further characterize the organic content of the laminations in order to better characterize salt production methodology and to differentiate potential salt pan deposits from natural organic deposits and wetland sediments.

Research Objective 3

To further characterize the Ward Estate salt production commercial enterprise in the wider context of historic salt production on O‘ahu and salt production methodologies

During the mid-eighteenth to early twentieth centuries, a number of historic salt production enterprises flourished on the island of O‘ahu, including the Pu‘uloa Salt Works, the Kaka‘ako Salt Works, and others. Data recovery efforts will attempt to understand how the Ward Estate salt works fit into this thriving international and domestic salt trade, and in particular, during what time period the Ward Estate was engaged in salt production and how the Ward Estate salt production land use developed during this time period—for instance, whether salt production began as a small family enterprise that was later was modified into a large-scale enterprise? Additionally, how did the Ward Estate salt production architecture (structural organization) and methodologies (production procedures) compare to other contemporaneous salt production enterprises, as evidenced by the archaeological record and background research?

4.1.1 Data Requirements

1. Further background research into the history of the Ward Estate commercial salt enterprise in addition to other mid- to late eighteenth century salt production works on the island of O‘ahu, including research on historic salt works construction and methodology.
2. Collection of new archaeological data for SIHP # -7655, including: 1. stratigraphic sequence; 2. characterization of the sediments, including integrity; and 3. samples for palynology and phytolith analyses.
3. Collection of additional data on the structural characteristics of the salt pan architecture, including orientation, dimensions, and vertical extent.
4. Collection of controlled hand-excavated data from the natural strata below the salt pan berms and beds that may be used to characterize these deposits.

4.1.2 Sampling Strategy

1. Backhoe excavation of four “cross-stitched” test excavations (Figure 48), consisting of the following:
    i. Two 6-m long by 2-m wide (2 by 20 ft) test excavations (DR-1 and DR-2) placed in linear alignment and spaced approximately 5 m (16 ft) between each test excavation.
    ii. Two 6-m long by 2-m wide (2 by 20 ft) test excavations (DR-3 and DR-4) placed perpendicular to and cross-sectioning the first two test excavations.
2. Test excavation locations are based on the results of the Block C West AIS investigation. The horizontally aligned test excavations will transect the area documented by AIS test excavations TE 1 and TE 3, which appeared to show alternating salt pan berms and salt pan beds and included both a long, tall berm (TE 3) and a potentially smaller berm (TE 1) (Figure 49 through Figure 53).

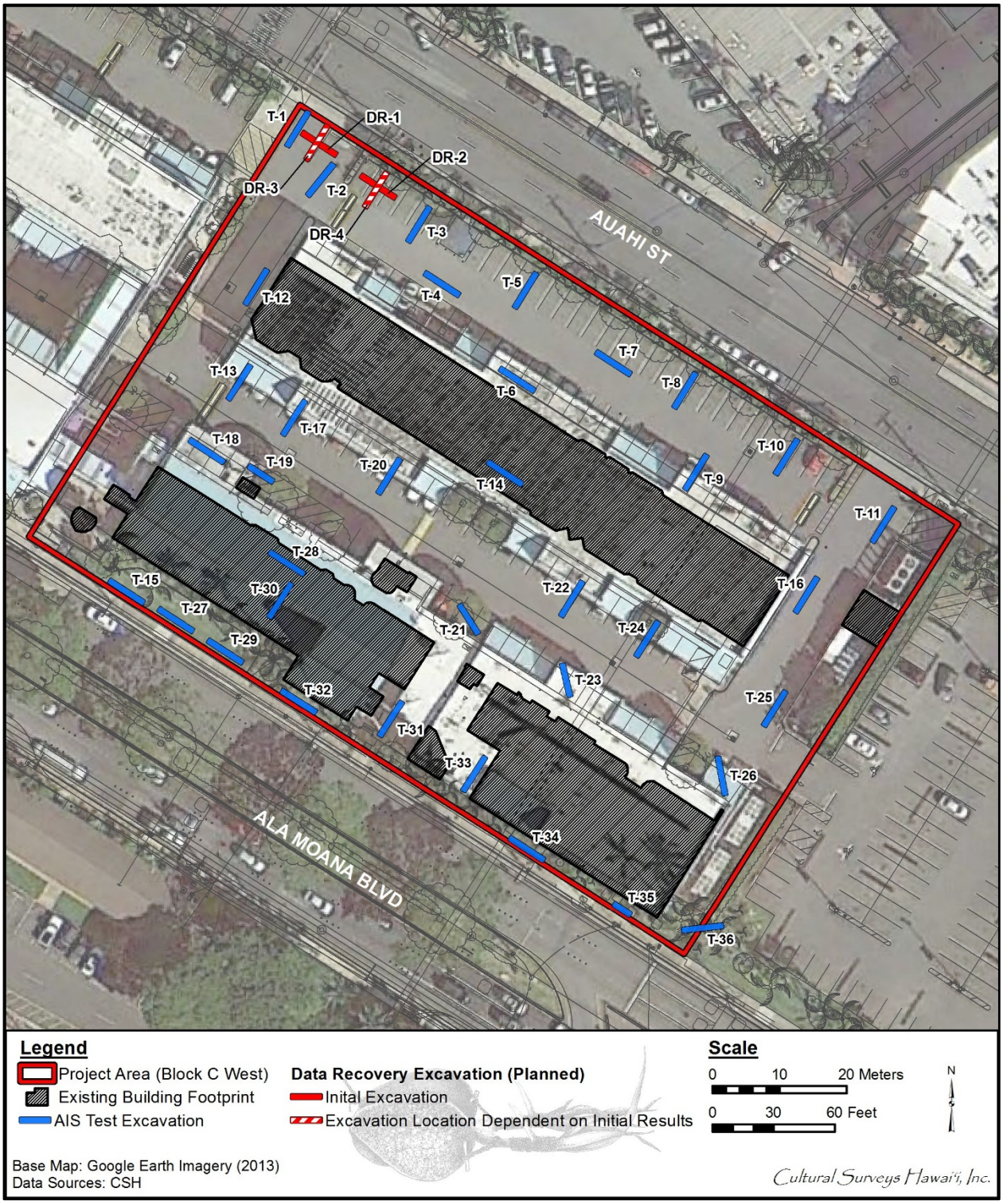

Figure 48. Aerial photograph of the Block C West project area, showing the locations of the proposed data recovery test excavations (DR-1 through DR-4) in relation to the completed AIS test excavations

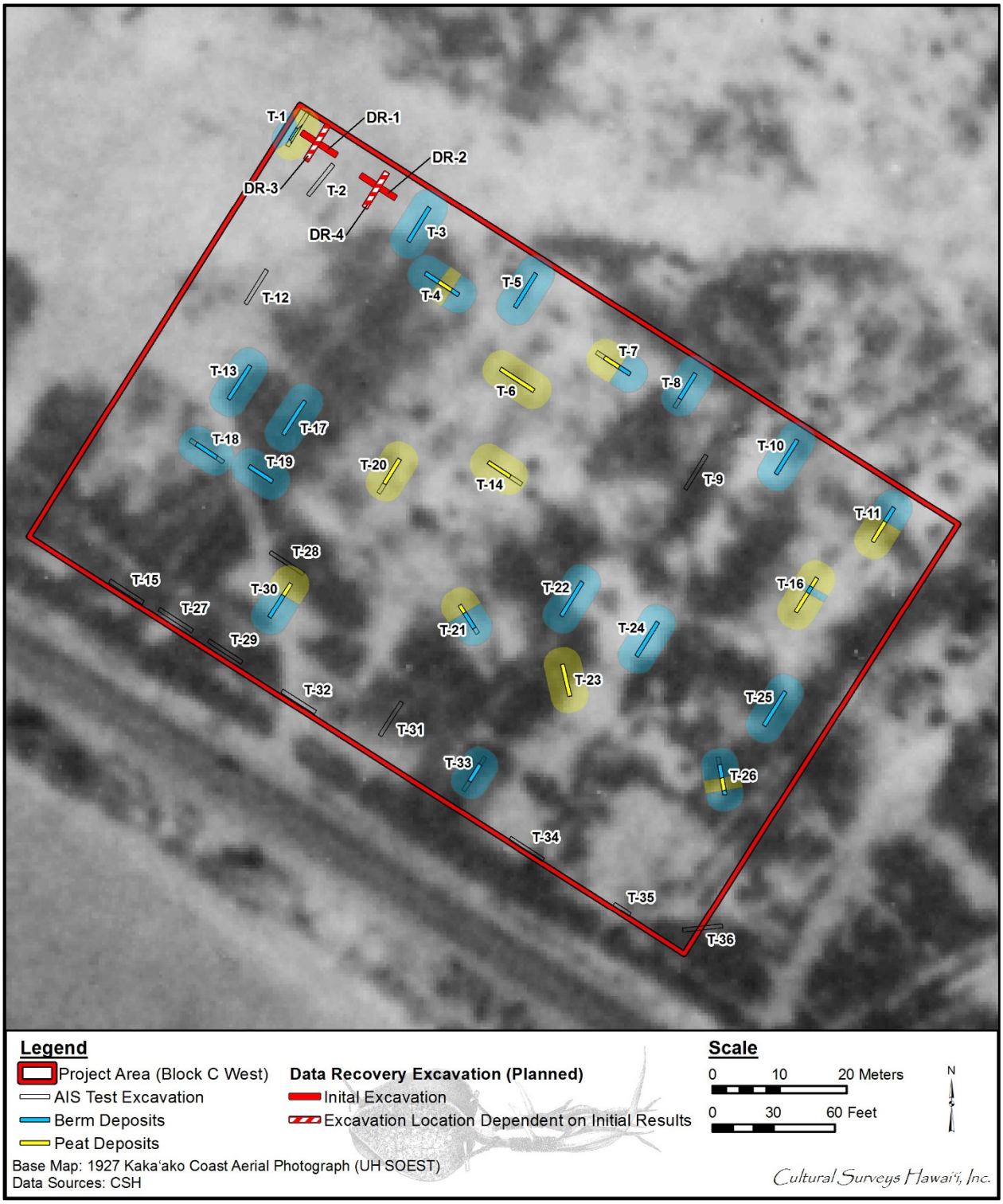

Figure 49. 1927 aerial photograph of the Block C West project area, showing the locations of the proposed data recovery test excavations (DR-1 through DR-4) in relation to salt pan berm and salt pan bed deposits documented by the project AIS. Note: Documentation for AIS TE 2 did not extend to SIHP # -7655 due to the presence of a concrete jacket

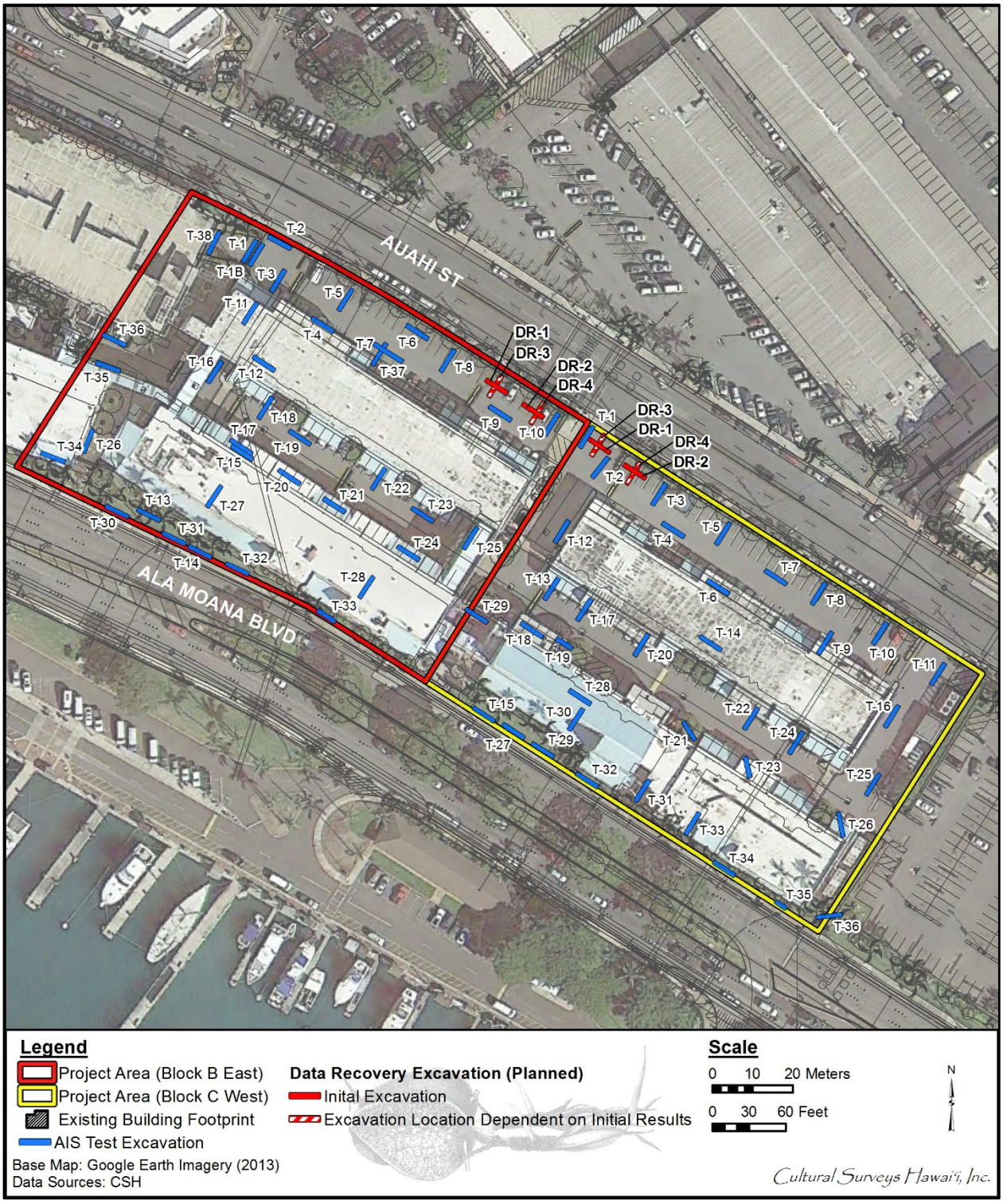

Figure 50. Aerial photograph showing the location of data recovery test excavations within the adjacent Block B East and C West project areas. The data recovery programs for these adjacent project areas is intended to work in tandem to address the SIHP # -7655 data recovery research objectives.

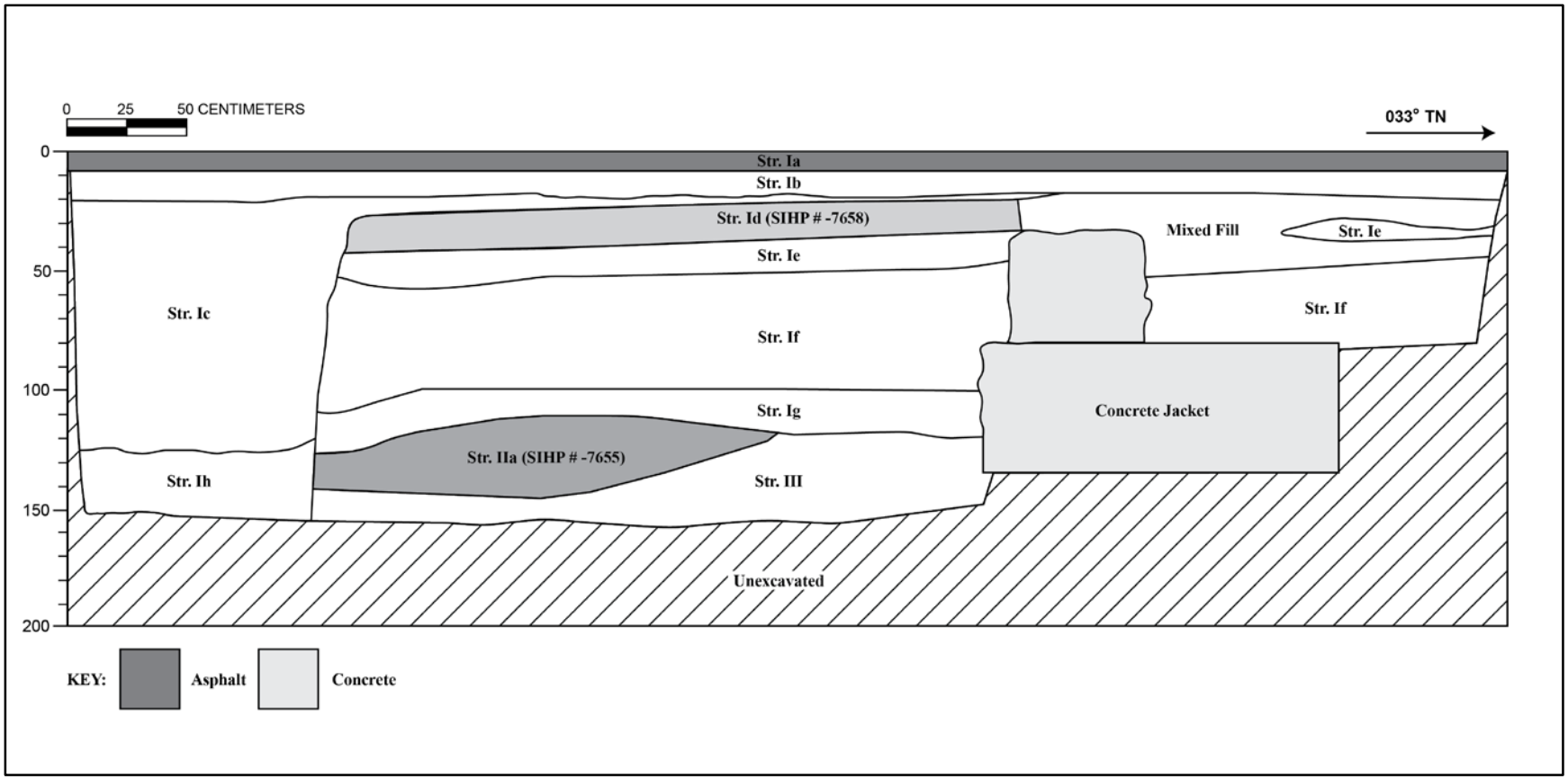

Figure 51. AIS Test Excavation 1 northwest profile, showing a low man-made berm (Stratum IIa)

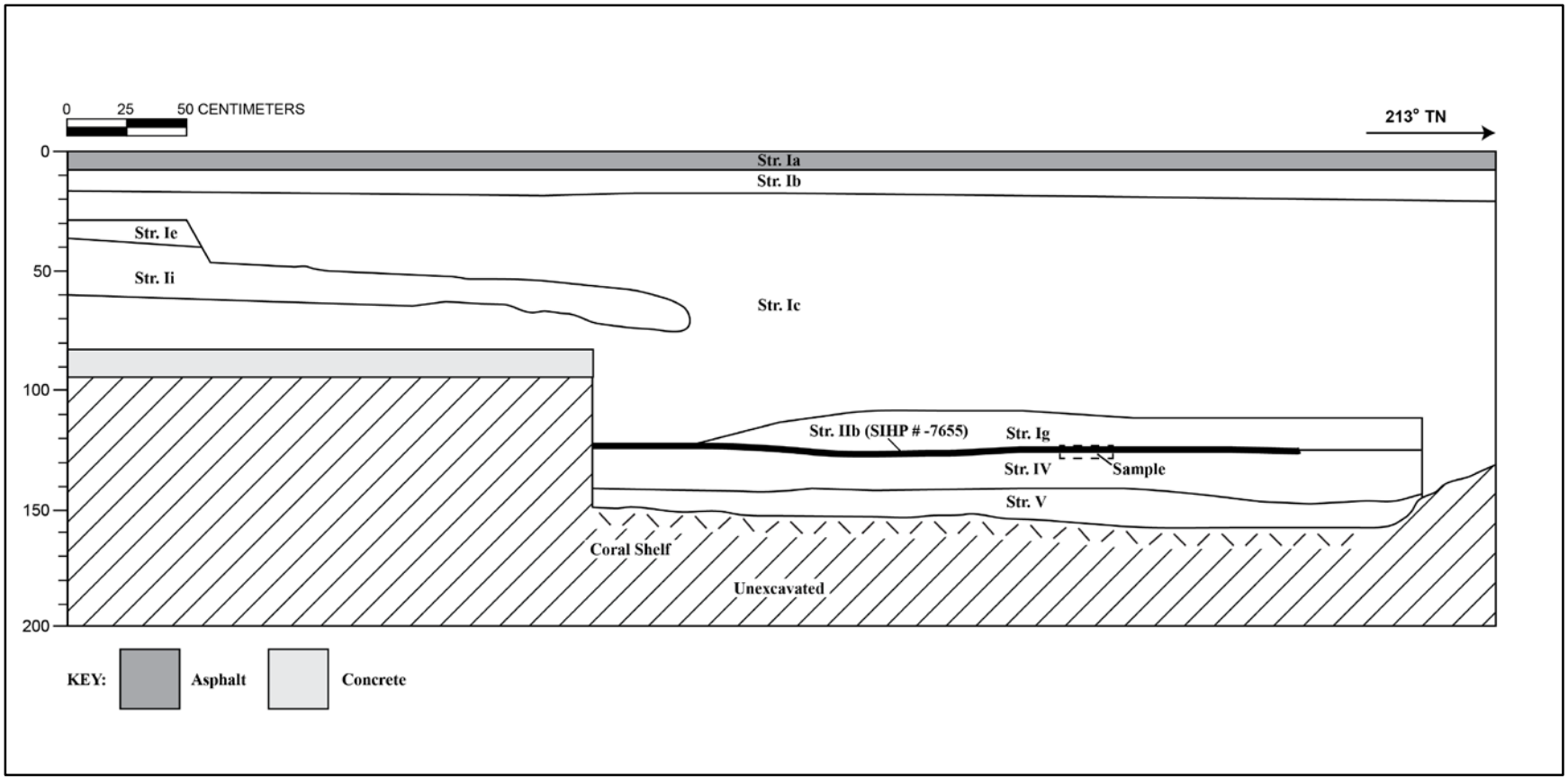

Figure 52. AIS Test Excavation 1 southeast profile, showing transition to a salt pan bed (Stratum IIb)

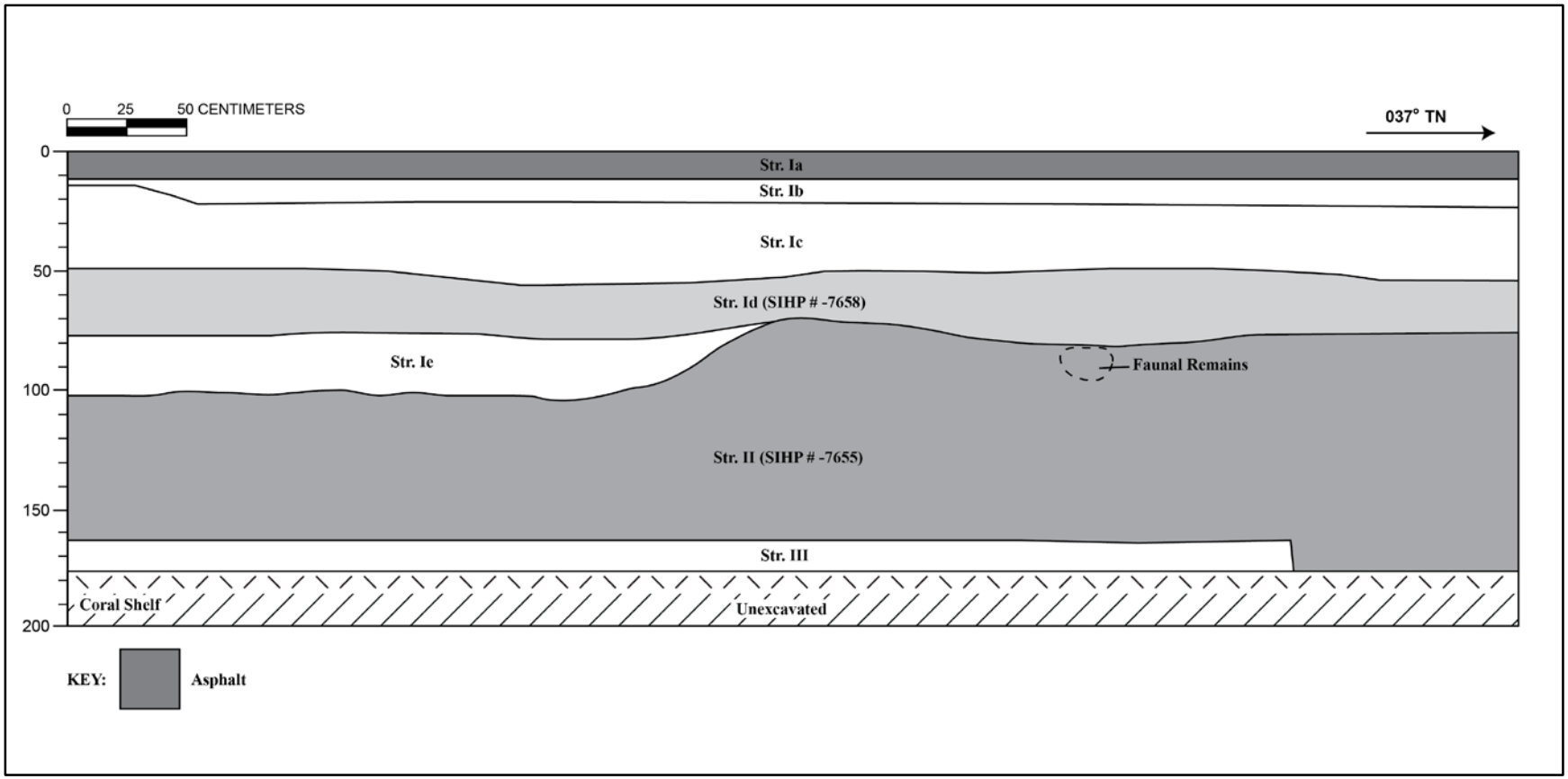

Figure 53. AIS Test Excavation 3 northwest profile, showing a long man-made berm (Stratum II)

3. If for any reason the proposed test excavation locations are required to be shifted (e.g. subsurface obstacles or other considerations), the adjusted locations will allow for the continued integrity of the research objectives and strategy.
4. A minimum of two in situ column samples will be collected from the salt pan bed deposits and underlying natural strata for pollen and phytolith analyses and to determine the extent, if any, of disturbance to the natural strata caused by the construction and/or maintenance of the salt beds. Column subsamples will include the laminated organic deposit associated with SIHP # -7655 (salt pan beds) and each underlying wetland stratum. Subsamples will be taken at 5 cm vertical increments and be 2-4 cm in thickness.
5. Test excavations encountering salt pan berm sediments will be undertaken in 3D in order to fully expose the berm architecture. Once the upper boundary of any berm sediments is identified, the remainder of the berm will be exposed via hand-excavation and/or carefully controlled backhoe scrapes in order to “peel off” the immediate overlying fill (predominantly hydraulic clay) and expose the full dimensions and contours of the berm. The berm will be photographed and mapped in plan-view prior to full excavation and exposure of the profile wall to base of excavation.

4.1.3 Laboratory Analyses

Laboratory analyses for SIHP # -7655 will include palynological and phytolith analyses of sediments collected via column samples from the salt pan bed laminations and underlying wetland strata.

4.1.3.1 Palynological Analysis

Palynology is the branch of science concerned with the study of pollen, spores, and other palynomorphs. Palynomorphs are often preserved in sediment samples and, following physical and chemical extraction, can be identified using light microscopy. This information can potentially identify the types of plants that made up the local environment, or the local watershed, at the time the sediment was deposited. A large amount of palynological research has been conducted on O‘ahu to examine human impacts on native vegetation. The majority of this research has been focused on wetland environments and pond sediments. Data recovery research for SIHP # -7655 will attempt to provide paleoenviromental data using palynological analysis of samples collected from identified salt pan bed sediments and the underlying wetland strata. Sediment samples collected during fieldwork will be handled as little as possible in the laboratory before submission for palynological analysis.

4.1.3.2 Phytolith Analysis

Phytolith analysis is the branch of science concerned with the study of silica concretions produced by plants when soluble silica is absorbed and precipitated around the cellular walls. These silica concretions remain well-preserved for long periods of time after the decay of the original plant matter. Because different species of plants produce different silica particle forms (morphology, size, color, etc.), phytoliths can be used to identify plants species found within a cultural or paleoenvironmental context. Data recovery research for SIHP # -7655 will attempt to identify any plants potentially utilized as salt pan bed liners. Phytolith analysis of the underlying natural wetland strata will serve as a comparative dataset to the targeted salt pan beds.

4.2 Data Recovery Report Production

In compliance with HAR § 13-278-4 (a), the final data recovery report will contain the following:

1. An in-depth management summary that presents concise information including information about the site(s) studied and general findings relevant to research objectives;
2. An introduction, including reasons for conducting research and the location of the project area. A standard topographic map, as produced by the U.S. Geological Survey, shall be used to delineate the project area and the site(s) investigated. The introduction will include text that specifies the *ahupua‘a*, district, island, and Tax Map Key (TMK) of the project parcel;
3. An in-depth presentation of the research questions incorporating prior archaeological and historic studies in the project area vicinity and research at other identified potential historic salt pan sites;
4. An archaeological field methods section which identifies the date the work was performed and the number of personnel assigned to the investigation, with names and qualifications of the principal investigator and field director. The field methods will also specify any deviations from the data recovery plan, including sampling strategies and techniques used;
5. Archaeological fieldwork findings, including scale maps of sediment profiles and any other features exposed by trench excavations;
6. A section on laboratory findings, including palynology and phytolith analyses methodology and reported results;
7. Historical research findings;
8. A summary chapter which re-evaluates the findings relative to each research question and reviews and analyzes earlier data collected during the inventory survey;
9. References; and
10. Appendices

An end of field work letter will be submitted within 30 days of the fieldwork’s completion to the SHPD. A draft of the data recovery reports will be submitted to the SHPD for their formal review and as documentation of the successful implementation of this data recovery program. Following SHPD review, final reports shall then be produced, incorporating any recommended revisions.

With SHPD’s approval of the end of fieldwork report for the Block C West project data recovery work, the start of construction at the Block C West location will not need to await SHPD’s review and approval of the complete data recovery report. The end of field work letter can provide documentation to SHPD that the data recovery fieldwork has been successfully completed in that area and may accompany a request for SHPD’s concurrence that, with the understanding that the

complete data recovery report is forthcoming, construction can start at the Block B East location data recovery site.

4.3 Disposition of Collections

Upon conclusion of the project, all collected materials and associated records will be temporarily curated at the CSH office in Waimānalo, O‘ahu until a permanent curation facility is determined.

In the event that human remains are encountered, the temporary disposition of human skeletal remains and associated burial goods will be determined by the SHPD Burials Program. Final disposition will be determined per the procedures of HAR §13-300 through the actions and decisions of the SHPD Burials Program.

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Appendix A Historic Property Description

The full text of the historic property description for SIHP # 50-80-14-7655 contained within the Block C West archaeological inventory survey report (Sroat et al. 2014) is provided below.

SIHP # 50-80-14-7655

FORMAL TYPE:	Subsurface salt pan remnants
FUNCTION:	Salt production
NUMBER OF FEATURES:	2
AGE:	Post-Contact
DIMENSIONS:	Approximately 4.4 acres (within the Blocks B East and C West contiguous project areas)
TAX MAP KEY:	[1]1 2-3-001:005 por.
LAND JURISDICTION:	Howard Hughes Corporation
PREVIOUS DOCUMENTATION:	N/A

SIHP # -7655 consists of a large complex of buried historic salt pan remnants located within the Ward Warehouse commercial center. SIHP # -7655 extends across two contiguous project areas, Block B East and Block C West (refer to Sroat et al. 2014), and extends from Auahi Street to the *makai* edge of the Ward Warehouse commercial buildings, encompassing the majority of both project areas (Figure 1).

The buried salt pan remnants are comprised of an interconnected system of man-made linear structural features (berms) and low-lying, level wetland sediments overlain by thin organic laminations (salt pan beds). Based on the magnitude of this structural complex and the significant earth-moving activity that would have been required to construct the berms, these buried structural features and sediments represent historic commercial salt production activity.

Background research indicates the area of Kaka‘ako has a long history of salt production activity, spanning the pre-Contact period to the early twentieth century. Māhele land claims within the Kaka‘ako coastal area document a cluster of traditional Hawaiian salt lands, including Land Commission Awards 387, 1903, 10463, and 9549. LCA 387, awarded to the American Board of Commissioners for Foreign Missions, contained “fishing grounds, coral flats & salt beds” (see Appendix A). Within LCA 1903, the boundaries of which extended slightly into the *mauka* portion of the Block B East project area, various traditional salt-making features were described by the land claimant, consisting of near-shore ponds that fill with salt water at high tide (*ālia*), the drains (*ho‘oliu*) through which salt water is transferred, the natural depressions (or modified depressions) in the rocks along the shore where salt formed naturally (*poho kai*), and the salt *kula*, or salt fields.

Traditional Hawaiian salt production was accomplished by diverse methods. The Native Hawaiian historian, David Malo, described one salt making method:

> Salt was manufactured in certain places. The women brought sea-water in calabashes, or conducted it in ditches to natural holes, hollows and shallow ponds (*kekaha*) on the sea-coast, where it soon became strong brine from evaporation. Thence it was transferred to another hollow or shallow vat, where crystallization into salt was completed. [Malo 1951:123]

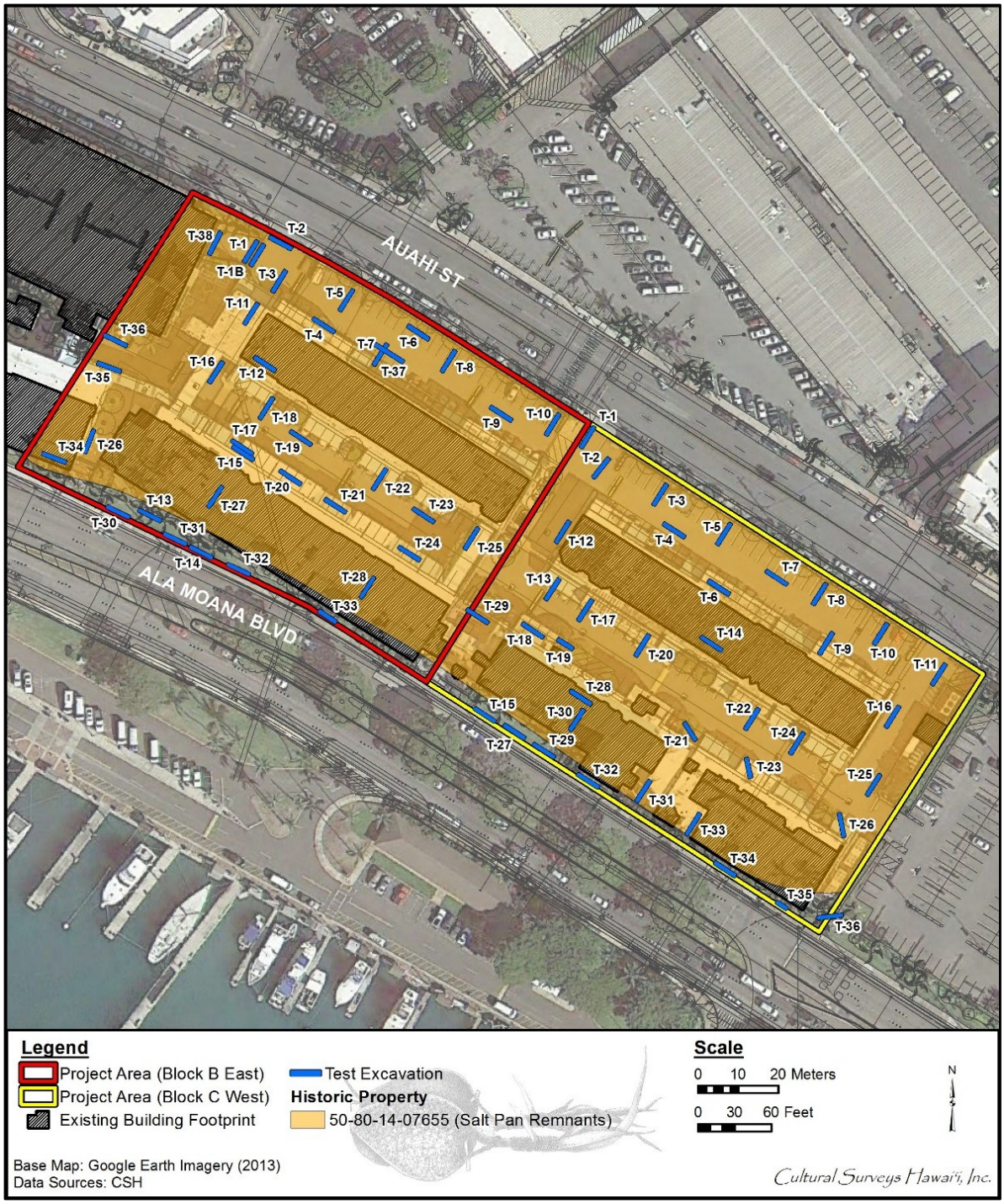

Figure 1. Aerial photograph showing the extent of historic salt pan remnants (SIHP # -7655) documented within the Block B East and Block C West project areas (source: Google Earth Imagery 2013)

Captain Cook was the first to note the method of making salt in prepared salt pans.

> Their salt pans are made of earth, lined with clay; being generally six or eight feet square, and about eight inches deep. They are raised upon a bank of stones near the high-water mark, from whence the salt water is conducted to the foot of them, in small trenches, out of which they are filled, and the sun quickly performs the necessary process of evaporation. . . Besides the quantity we used in salting pork, we filled our empty casks, amounting to sixteen puncheons, in the Resolution only. [Cook 1784:151]

The missionary William Ellis, on a tour of the Hawaiian Islands in 1822 and 1823, also noted these salt pans and recorded the final step of crystallization.

> The natives of this district (Kawaihae) manufacture large quantities of salt, by evaporating sea water. We saw a number of their pans, in the disposition of which they display great ingenuity. They have generally one large pond near the sea, into which the water flows by a channel cut through the rocks, or is carried thither by the natives in large calabashes. After remaining there for some time, it is conducted into a number of smaller pans about six or eight inches in depth, which are made with great care, and frequently lined with large evergreen leaves, in order to prevent absorption. Along the narrow banks or partitions between the different pans, we saw a number of large evergreen leaves placed. They were tied up at each end, so as to resemble a narrow dish, and filled with salt water, in which the crystals of salt were abundant. [Ellis 1827:403-404]

Following Western Contact in 1778, commercial trading vessels began to frequent Hawaiian waters at an increasing rate; one important reason for their visit was to trade for salt. In order to supply this demand, commercial salt production works began to multiply throughout the early to late 1800s, including within the Kaka‘ako area. The 1883 Baldwin map shows a large grid-like area of historic salt pans which extends across a large portion of Kaka‘ako. The Block B East and C West project areas are located at the southern fringe of this zone (Figure 2).

While no specific descriptions of salt production methods and architecture have been located for the current project areas, illustrations and accounts exist for nearby commercial salt works. An 1838 sketch by Auguste Borget titled “Honolulu Salt Pan, near Kaka‘ako” likely illustrates large salt works slightly to the west, closer to Honolulu. The sketch depicts long, linear salt pans adjacent to habitation structures (Figure 3). Of particular note are the long length of the inundated salt pan beds and the low, wide earthworks dividing the beds. To the south of the current project areas, was the Kaka‘ako Salt Works, managed by E.O. Hall & Sons. A description of these salt works within the January 1892 *Planters’ Monthly* illustrates the complexity of this commercial industry.

> These salt works are laid out systematically and beautifully and one is surprised with the regularity and evident perfection of every arrangement and of every process in connection with it. One would suppose that a skilled mason with a trowel, stones and cement, had been used in constructing these works, and still nothing of the kind was used. The soil here is of a clay or loamy substance, and can be worked into any shape or form, and seems to be formed by nature for this very

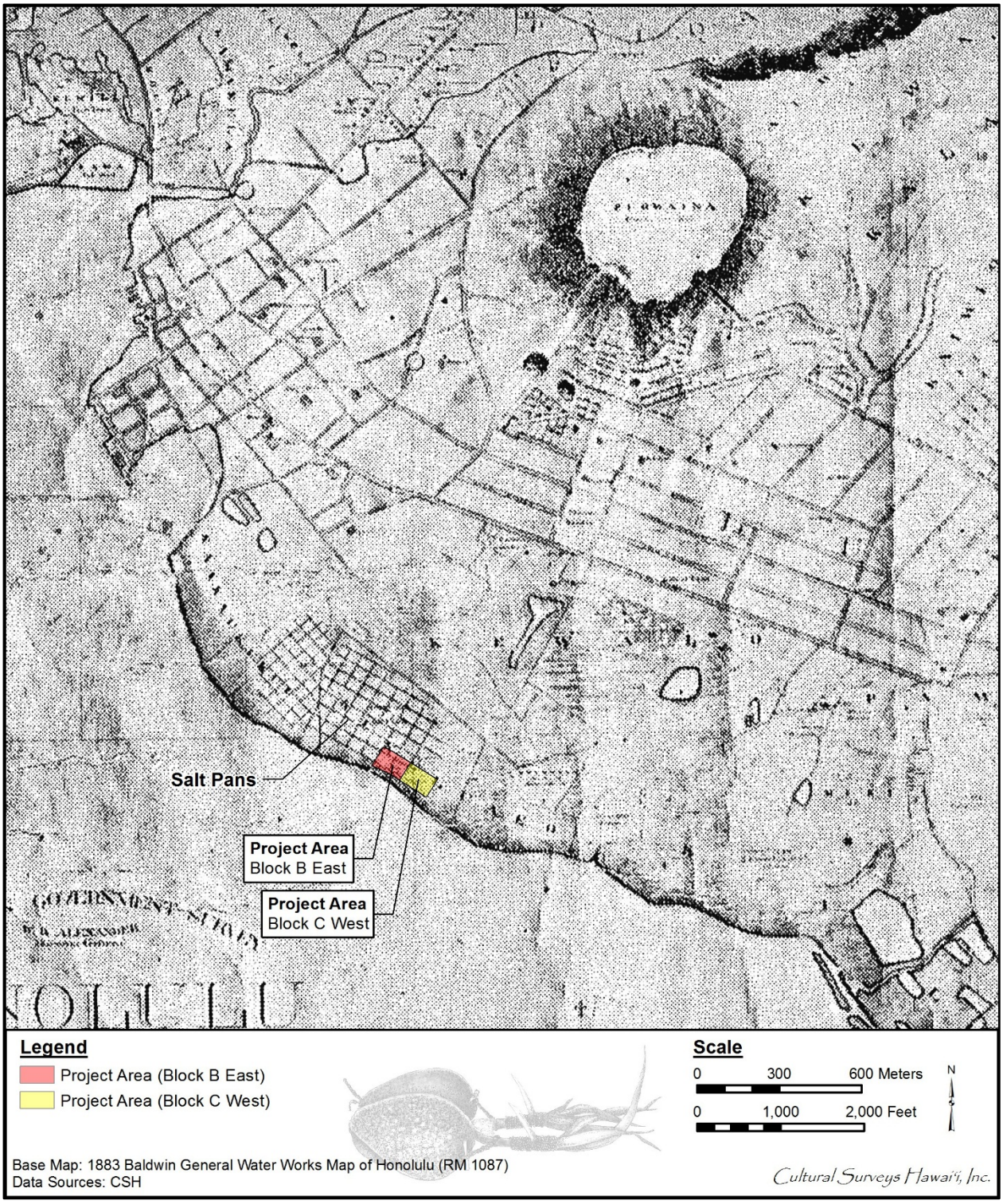

Figure 2. 1883 map of the Honolulu Water Works System by E.D. Baldwin (1883) (Hawai‘i Land Survey Division, Registered Map 1087), showing a grid symbol representing salt pans. Blocks B East and C West are located at the southern fringe of this area

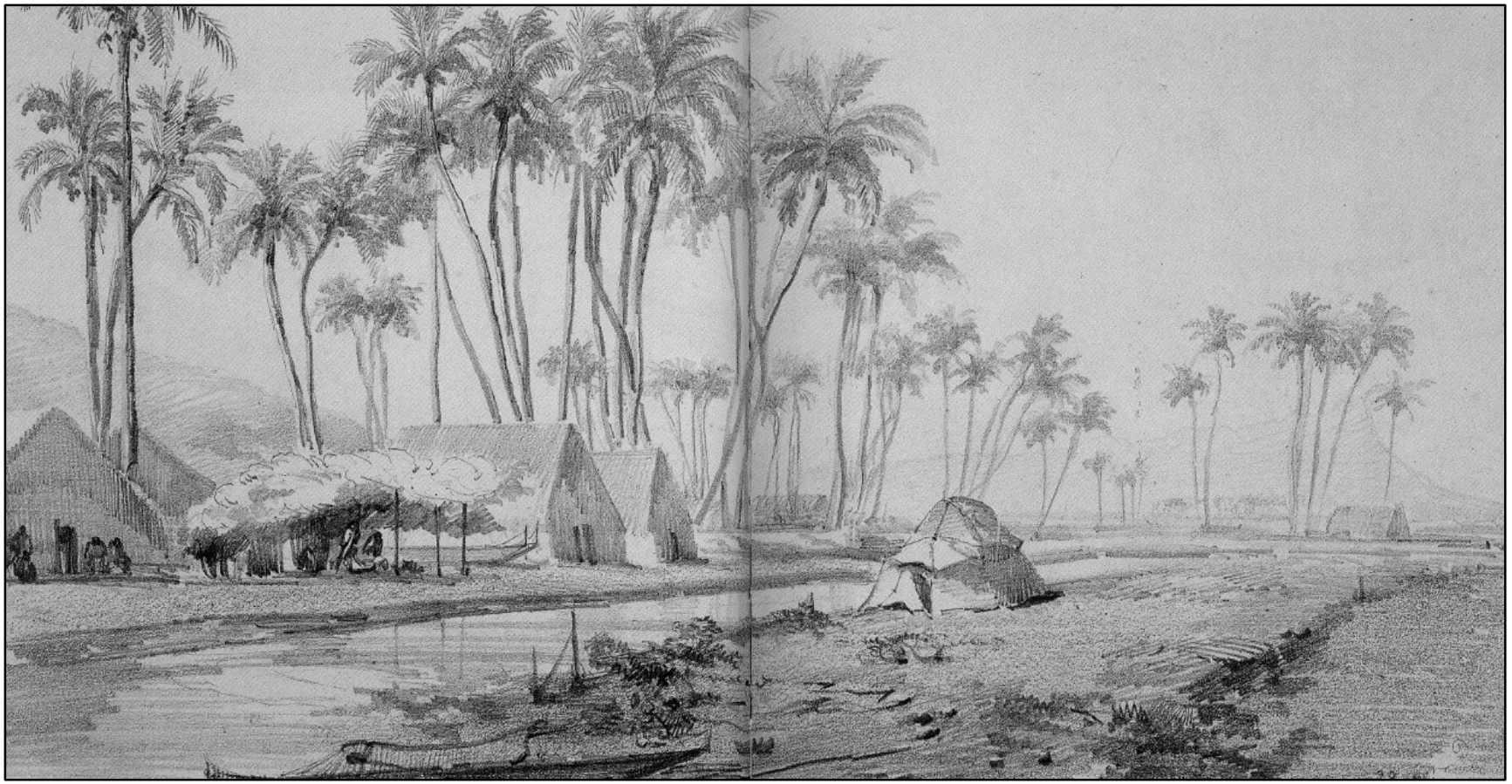

Figure 3. “Honolulu Salt Pan, near Kaka‘ako,” 1838 sketch drawn by a French visitor, Auguste Borget (original sketch at Peabody Essex Museum, Salem, Massachusetts; reprinted in Grant 2000:64-65)

> purpose. These works are quite extensive covering about eight acres, and comprising at present fifty-six sets of ponds, seven ponds to a set.
>
> On each side of the works there are canals which extend to the ocean. These canals supply the storage ponds, which latter again supply the evaporating ponds, which the water runs into the strike ponds, where the crystals are formed. The salt water passes along gradually from pond to pond, and takes usually a week to reach the strike pond. In this way the water gets denser and denser until it is saturated with a very dense of solution of salt, when it crystalizes rapidly. The water in the strike ponds is not more than 1½ inches deep, the two adjoining ponds, a little deeper the next a little deeper and so on.
>
> These ponds are connected with each other by troughs and wooden pipes. These troughs are well made and twice tarred before being put in place. The strike ponds are also protected from the wind with good substantial fences, the object of this is to keep the water as still as possible.
>
> In the process of crystallization the sun does all the work, the water however has to be agitated at intervals to settle the crystals which have formed on the top of the water, like a thin crust of ice.
>
> There are nearly sixty strike ponds and they each take off a strike every seven to fourteen days, according to the weather, the amount of salt per strike is on an average 850 pounds for each pond. The strike ponds are arranged parallel with each other with their tributary or auxiliary ponds between. These are convenient roads, paths, etc., for the transportation of the salt, and good substantial store-houses for storing the same.
>
> The water used is pure and clean and comes always from the direction of Waikiki. The salt manufactured here is fine grain, white and clean, and looks as good as any of the best salt imported.
>
> The salt is handled with care, and thoroughly dried before being put on the market. The only piece of machinery noticed here is a genuine Chinese pump, made by hand, and is very simple in construction, but at the same time will throw more water than any other pump devised by white men.
>
> The labor on the Salt Farm is all done by Chinese, as no other class of labor has ever given satisfaction, though Hawaiians and Portugese have been employed. The evaporating season commences about April of each year, and lasts six or seven months. No salt can be made in rainy weather. [*Planters' Monthly* 1892:446-448]

Historic salt production within the current project areas was associated with the Ward Estate. Shortly after 1873, the Ward family purchased the coastal lands of Kukukuāeʻo, which included the Ward Warehouse center area, and had the old *kāheka* (salt pans) restored. The Ward salt operation became quite productive and helped to supply the maritime trade (Hustace 2000:41). In 1882 however, Curtis Ward passed away and his widow, Victoria Ward, eventually leased out the family's salt lands. Income from the leased salt lands was noted in the Ward business ledgers through the 1880s (Hustace 2000:50). A page in Victoria Ward's ledger for 1883 noted a yearly income of $651.50, which decreased to $487.40 in 1886.

Thrum (1924:116) states that the apex of the salt export trade in the Hawaiian Islands was in 1870 and that by 1883 “pulu, salt and oil have disappeared entirely” from the list of yearly exports (Thrum 1884:68). However, salt continued to be manufactured for local use, as evidenced by the Ward business ledgers and the continued existence of the Kaka‘ako Salt Works until at least 1891. Thrum (1924:116) noted that the only salt producer on O‘ahu in 1916 was the Honolulu Salt Company. This is substantiated by a 1916 Commerce Report that in its discussion regarding salt production only mentioned the Honolulu Salt Company., which operated “salt beds at Puuloa, Kalihi, and Waikiki” (Taylor 1916:723). Based on these documents, salt production within the current project areas ceased sometime between 1887 and the early 1900s.

The historic salt pan remnants observed within the Block B East and Block C West project areas consist of an extensive complex. While this historic property description addresses only those finds documented within these two contiguous project areas, it should be noted that the adjacent Block I, located just *mauka*, and for which an AIS is still in progress, also contains a large area of associated salt pan remnants. This indicates the Ward Estate salt production was a large scale commercial enterprise.

Salt Pan Berms Description

Structural Form

The interlacing complex of berm structures was observed extensively throughout the contiguous project areas. Within the Block B East project area, 26 of the 38 test excavations contained berms; within the Block C West project area, 20 of the 36 test excavations contained berms. The observed berms varied widely in height, calculated as absolute height above the coral shelf. The maximum height of the berms was documented at 130 and 125 cm above the coral shelf (TE 9 in Block B East and TE 10 in Block C West, respectively), while the minimum height measured 40 and 32 cm above the coral shelf (TE 12 in Block B East and TE 5 in Block C West, respectively) (Figure 4 through Figure 9). The average height of the berms above the coral shelf was 71 and 84 cm, respectively. In general, the relative height of the berms was significantly above the level of the salt pan beds, indicating considerable earth-moving activity.

Many of the berm structures appeared markedly wide and/or long in extent. While observations were necessarily limited by the 2 by 20 ft dimensions of the test excavations, in many of the trenches the berms extended across the entire length of the test excavation, indicating continuance (TE 3, 5, 10, 13, 19, 22, 24, and 25 within Block C West; TE 5, 7, 11, 12, 15-20, 27, and 28 within Block B East) (see Figure 6, Figure 8). In a few cases, the apex of a berm structure was identifiable, allowing a better estimation of actual berm form and width. Within Block B East, TE 5 documented a berm apex near the center of the trench, measuring 90 cm above the coral shelf with the berm sloping gently down to either side and continuing into the sidewalls. This cross section shows a moderately mounded berm which slopes gently down to a level expanse on either side of the berm, indicating a wide berm extending well over 20 ft in width and oriented northwest-southeast (Figure 9, Figure 10). TE 17 within Block C West shows similar structural characteristics with the berm apex measuring 97 cm above the coral shelf and gently sloping to either side, and again oriented northwest-southeast (Figure 11, Figure 12).

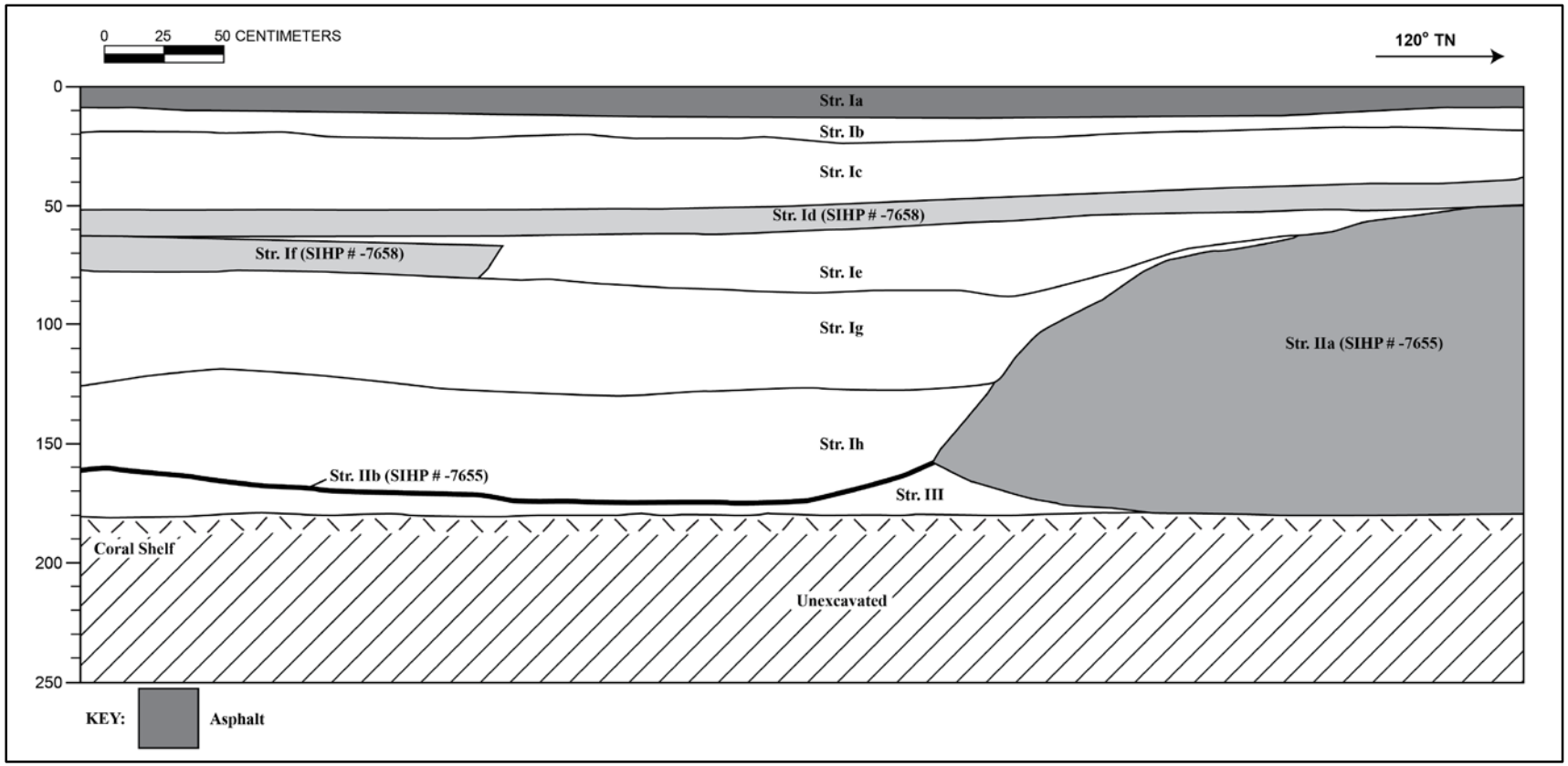

Figure 4. Profile of TE 9 (Block B East) north wall, showing a high berm structure (Stratum IIa/SIHP # -7655), measuring 130 cm above the coral shelf

Figure 5. Photograph of TE 9 north wall, showing a high berm structure sloping down to a low-lying salt pan bed, SIHP # -7655

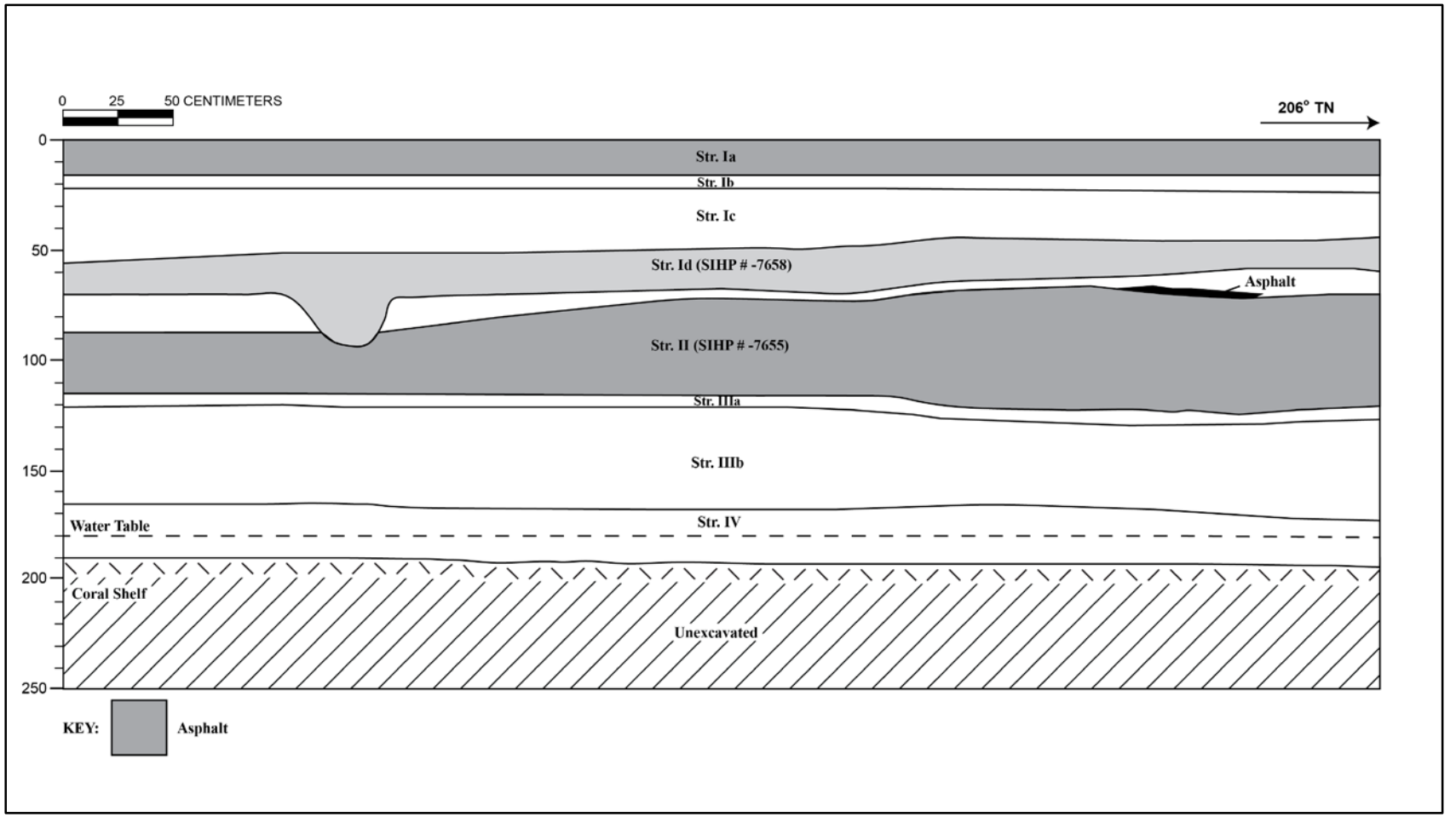

Figure 6. Profile of TE 10 (Block C West) southeast wall, showing a high berm (Stratum II/SIHP # -7655), constructed 125 cm above the coral shelf

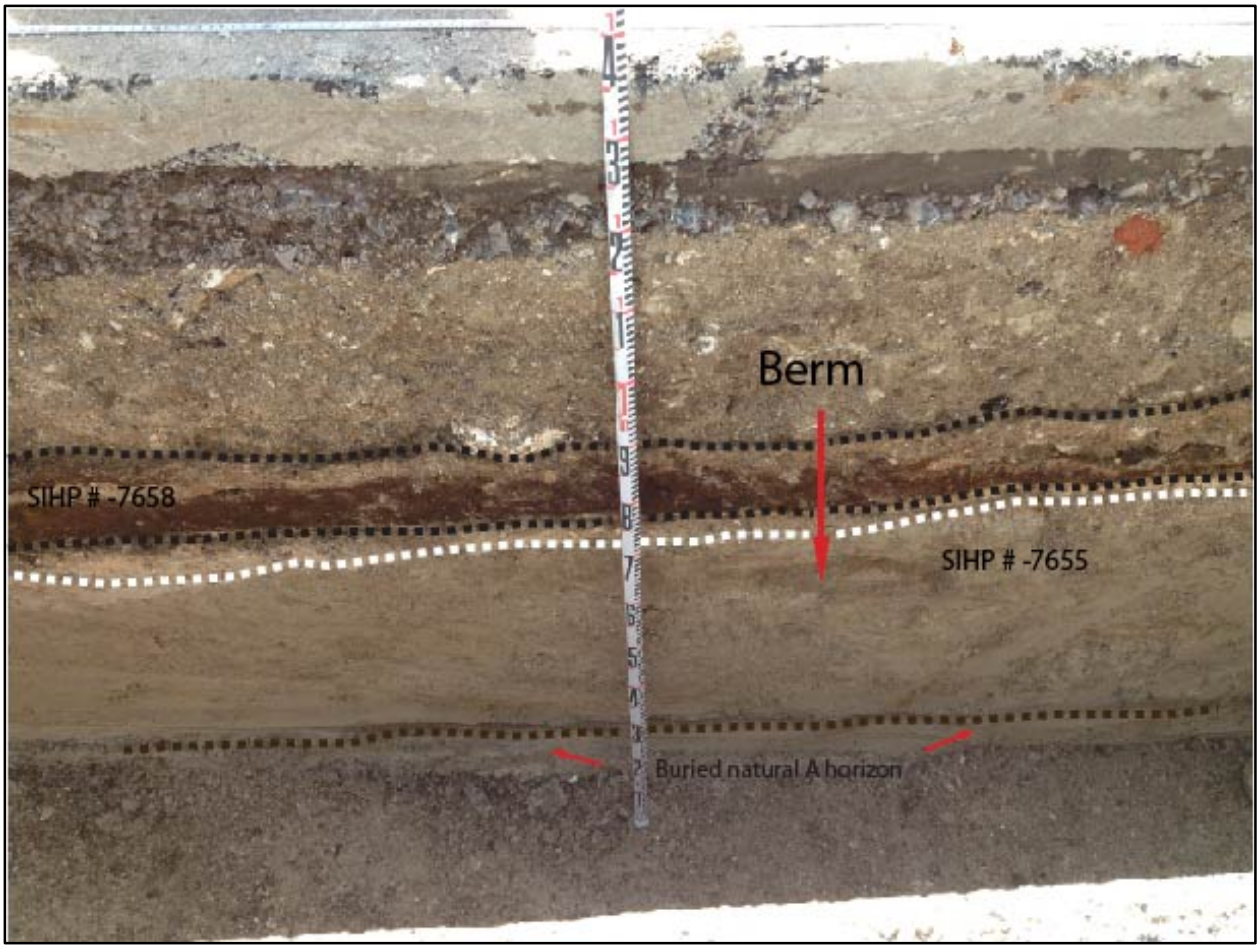

Figure 7. Photograph of TE 10 (Block C West) southeast sidewall, showing a man-made berm structure, SIHP # -7655, overlying a natural A horizon and wetland sediments

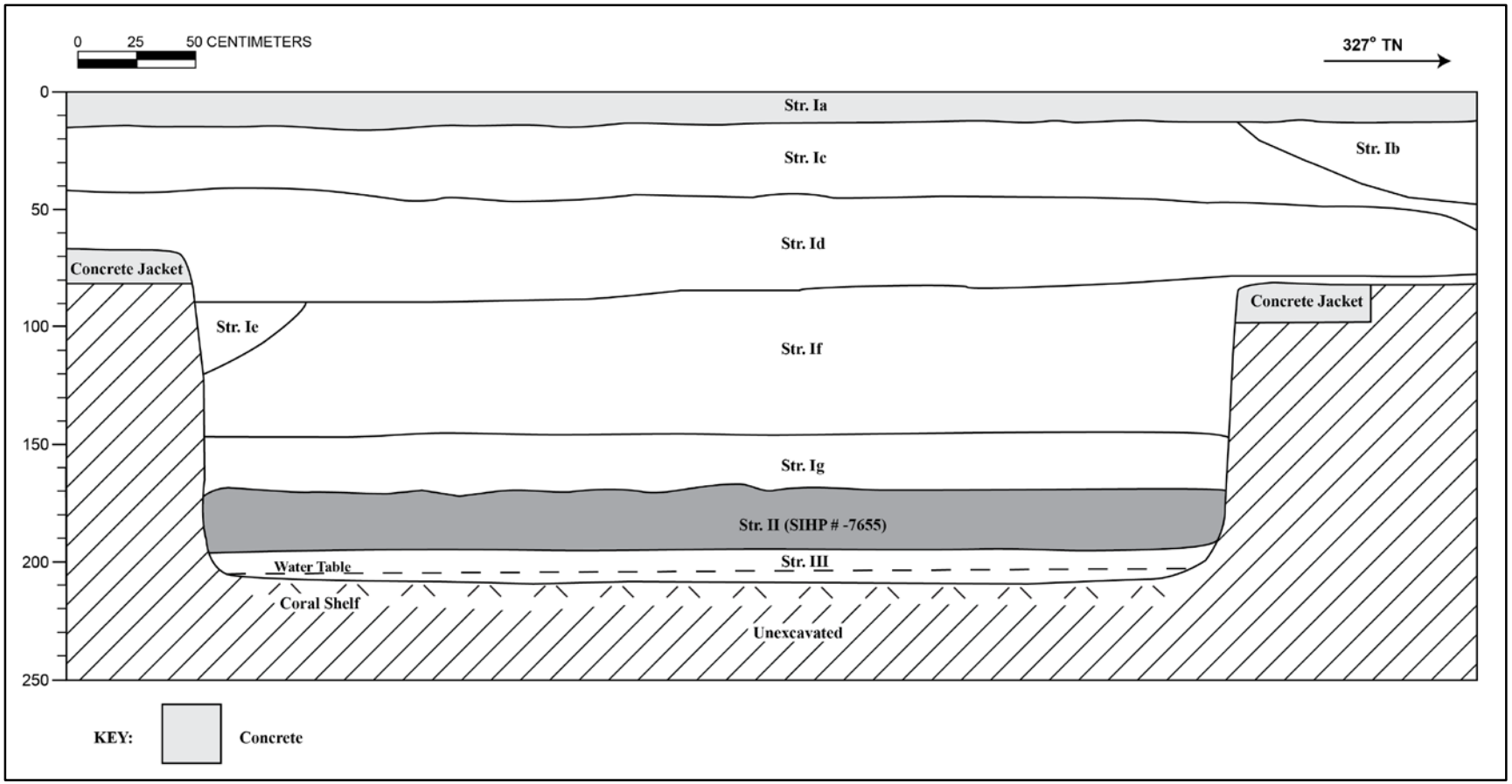

Figure 8. Profile of TE 12 (Block B East) southwest wall, showing a low berm structure (Stratum II/SIHP # -7655), measuring only 40 cm above the coral shelf

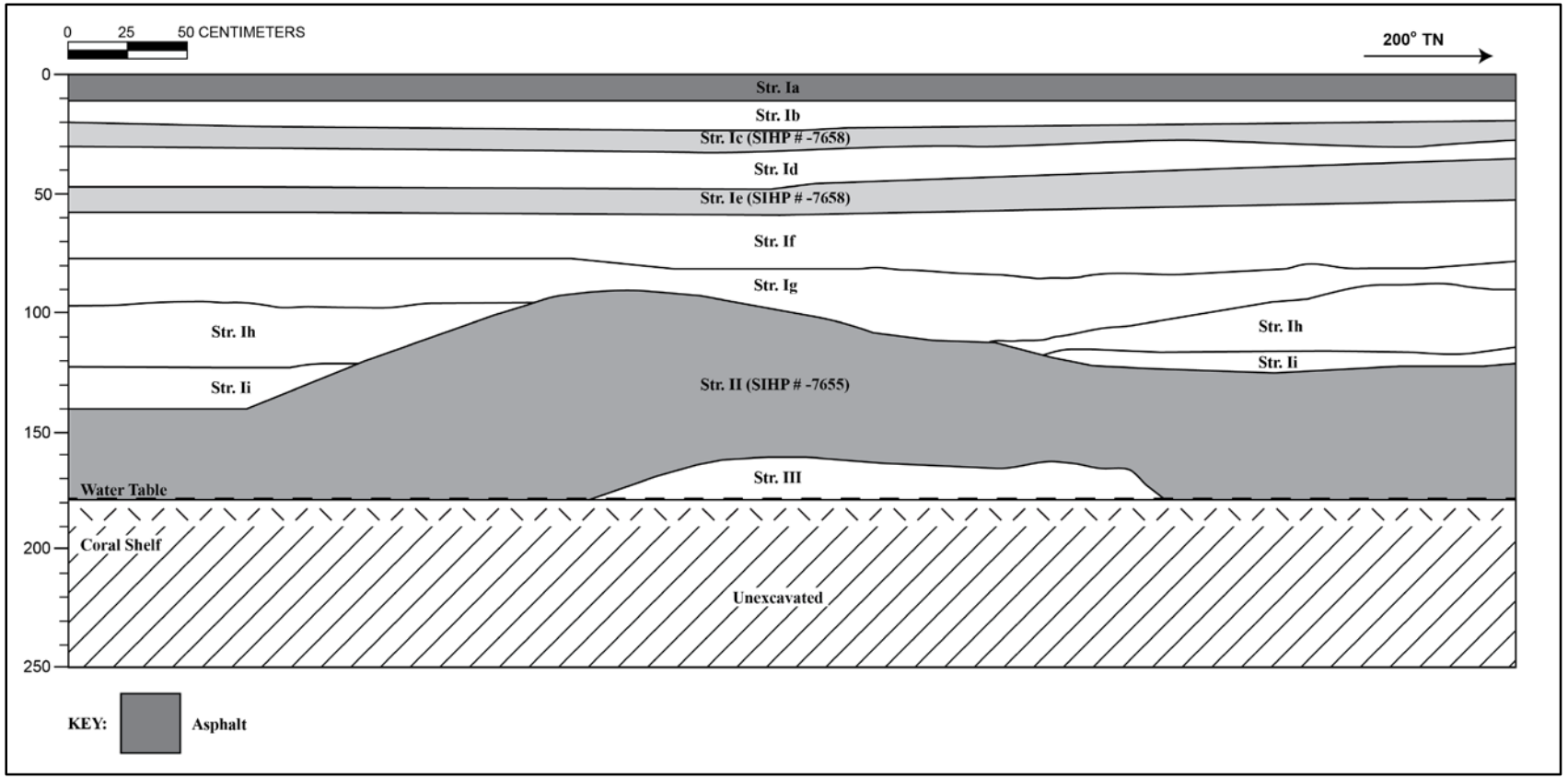

Figure 9. Profile of TE 5 (Block B East) southeast wall, showing a berm apex (Stratum II/SIHP # -7655), measuring 90 cm above the coral shelf, with the berm sloping gently down to either side and continuing into the sidewalls

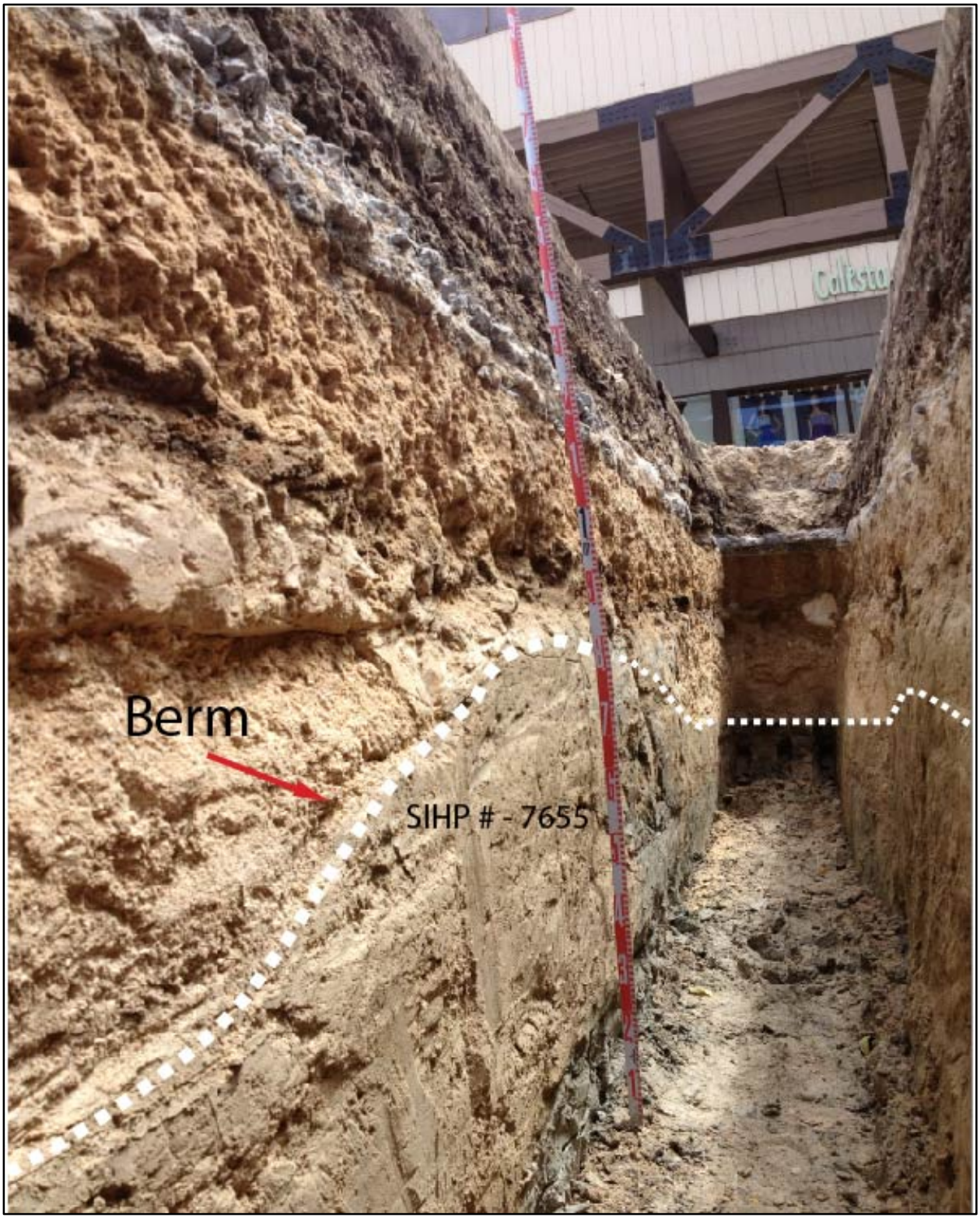

Figure 10. Photograph of the TE 5 southeast sidewall, showing a mounded berm structure, SIHP # -7655

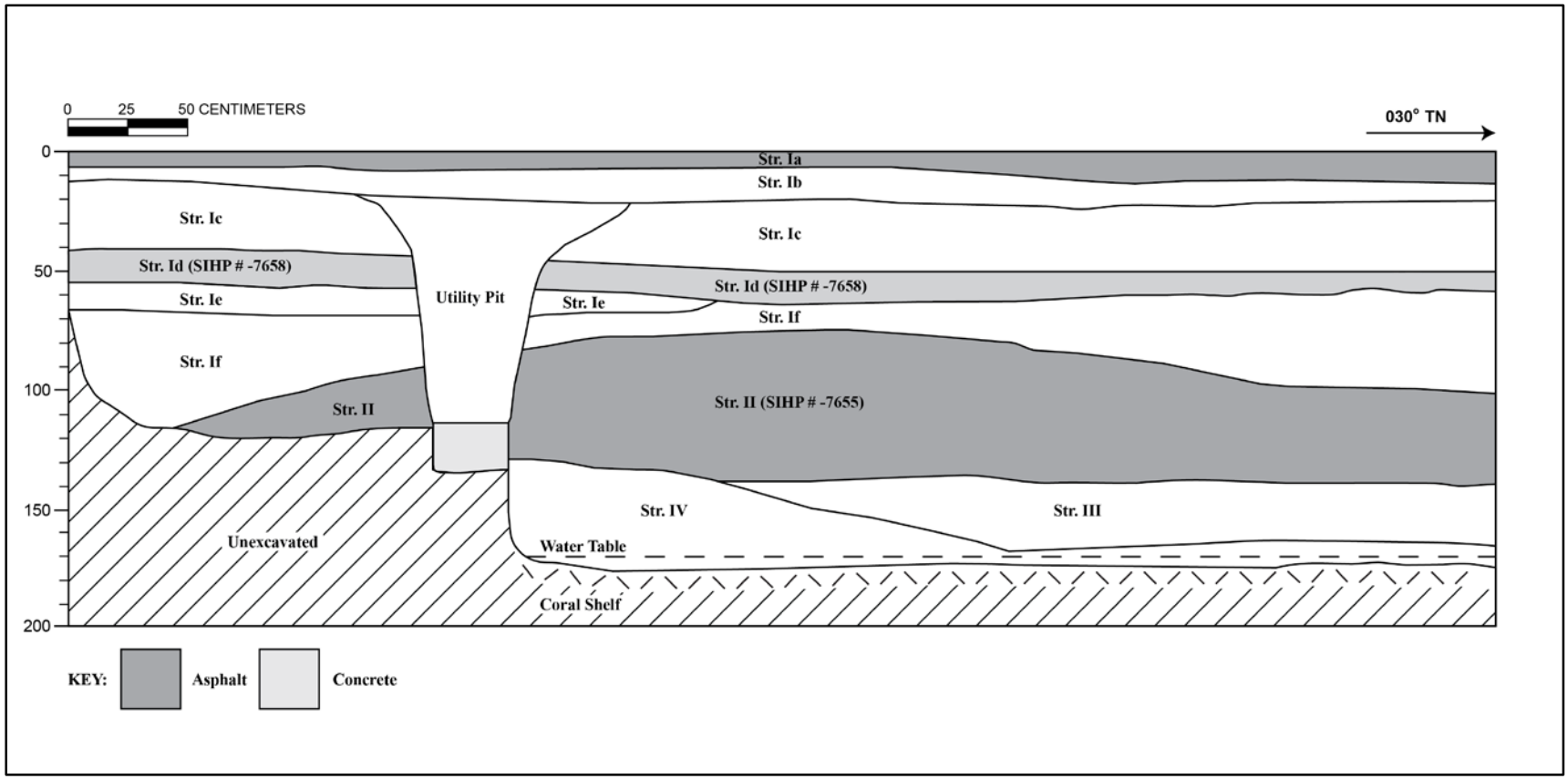

Figure 11. Profile of TE 17 (Block C West) northwest wall, showing a berm apex (Stratum II/SIHP # -7655), measuring 97 cm above the coral shelf, with the berm sloping gently down to either side and continuing into the sidewalls

Figure 12. Photograph of the TE 17 northwest sidewall, showing a mounded berm structure, SIHP # -7655

In order to better understand the structural characteristics of the salt pan berms, an elongated 8.0 m long test excavation (TE 37 within Block B East) was placed to cross section a previously excavated trench (TE 7) which showed a continuous, level berm extending through the test excavation. An inherent interpretive difficulty encountered during the AIS investigations arose from the inability to discern, in those excavations in which the berm was visible running the extent of the sidewall, whether the berm was being observed in cross section or lengthwise. TE 37 documented a cross section of the berm, indicating that TE 7 had exposed the length of the berm, which was oriented *mauka-makai*. Within TE 37, the berm rose relatively steeply from the edge of the salt pan bed, then sloped very gently down towards the southern end and continued into the sidewall (Figure 13, Figure 14). TE 37 documented a wide berm, over 6 m in length, which remained relatively level with a very gentle slope on one side and a steeper slope at the edge of the salt pan bed.

Based on the documented orientation of the above test excavations (as well as several others), the berm complex was oriented *mauka-makai* with perpendicular cross berms, indicating a grid-like system. Many of the berms also appeared to be relatively wide. Interestingly, wide earthen divisions between salt pan beds are also visible in the Borget sketch of Honolulu salt pans (see Figure 3).

While the majority of the berms observed appeared to slope gently, several exceptions were also observed in which the berms rose quite steeply from the edge of the salt pan beds. The most prominent examples were documented within TE 9 and TE 36 (Block B East), as well as the above-mentioned TE 37, and TE 18 and TE 30 (Block C West). In these cases, the salt pan beds were unusually low, located just above the coral shelf with the berms rising at a 45–55° angle (see Figure 4, Figure 15).

While the majority of the documented berms were quite wide and/or long, several smaller berms were also observed. In some cases, the test excavations likely caught the tip of a berm; however, it may also be the case that some berms were smaller in scale. The *Planters' Monthly* description of the Kaka‘ako Salt Works mentioned a total of 56 sets of ponds, each containing seven ponds. It may be that the inner set of ponds contained smaller berm divisions than the overall "pond set" boundary. Differences between ponds is also implied in the description of the "strike" ponds (*Planters' Monthly*: 1892), which stated, "The strike ponds are arranged parallel with each other with their tributary or auxiliary ponds between." TE 4 (within both project areas) contained examples of smaller berm structures (Figure 16, Figure 17, and Figure 18).

In general, the salt pan berm structures were encountered throughout the project area. However, a notable concentration of berm archaeosediments was documented within the western portion of the Block B East project area. An overlay of the trench locations on a 1927 aerial photograph shows the test excavations within an area of dense vegetation along the path of the Ward *‘auwai* (both the original *‘auwai* which ran through the vicinity of TE 20 and the modern concretized channel visible running through TE 15 and TE 17 in the figure) (Figure 19, Figure 20, and Figure 21). Given the extent of the archaeosediments in this area, and the fact that they extend evenly across the full extent of each of the test excavations (TE 11, 12, 15-20, and 27), this area likely contained a wide causeway. In addition to including the Ward Estate *‘auwai*, foot trails and/or transport ways were likely present.

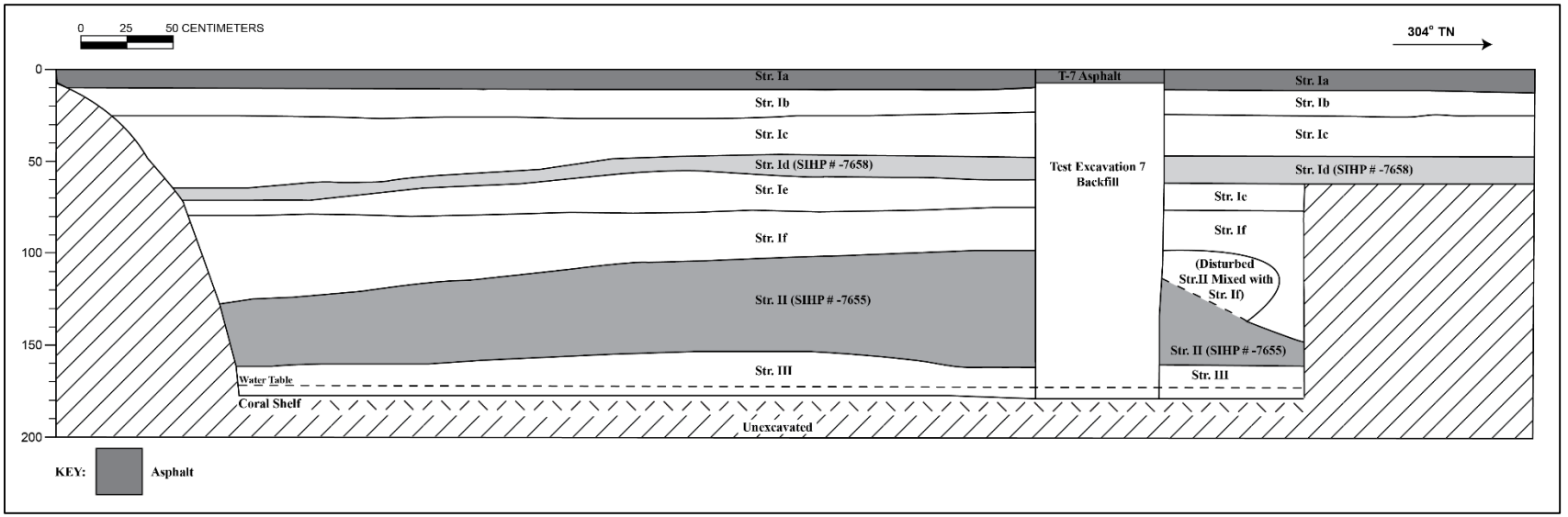

Figure 13. Profile of TE 37 (Block B East) southwest sidewall, showing the cross section of a wide berm (Stratum II/SIHP # -7655), running *mauka-makai* through the project area

Figure 14. Photograph of the TE 37 southwest sidewall, showing a wide berm, SIHP # -7655, which descends steeply to low-lying wetlands at the northwest (far) wall

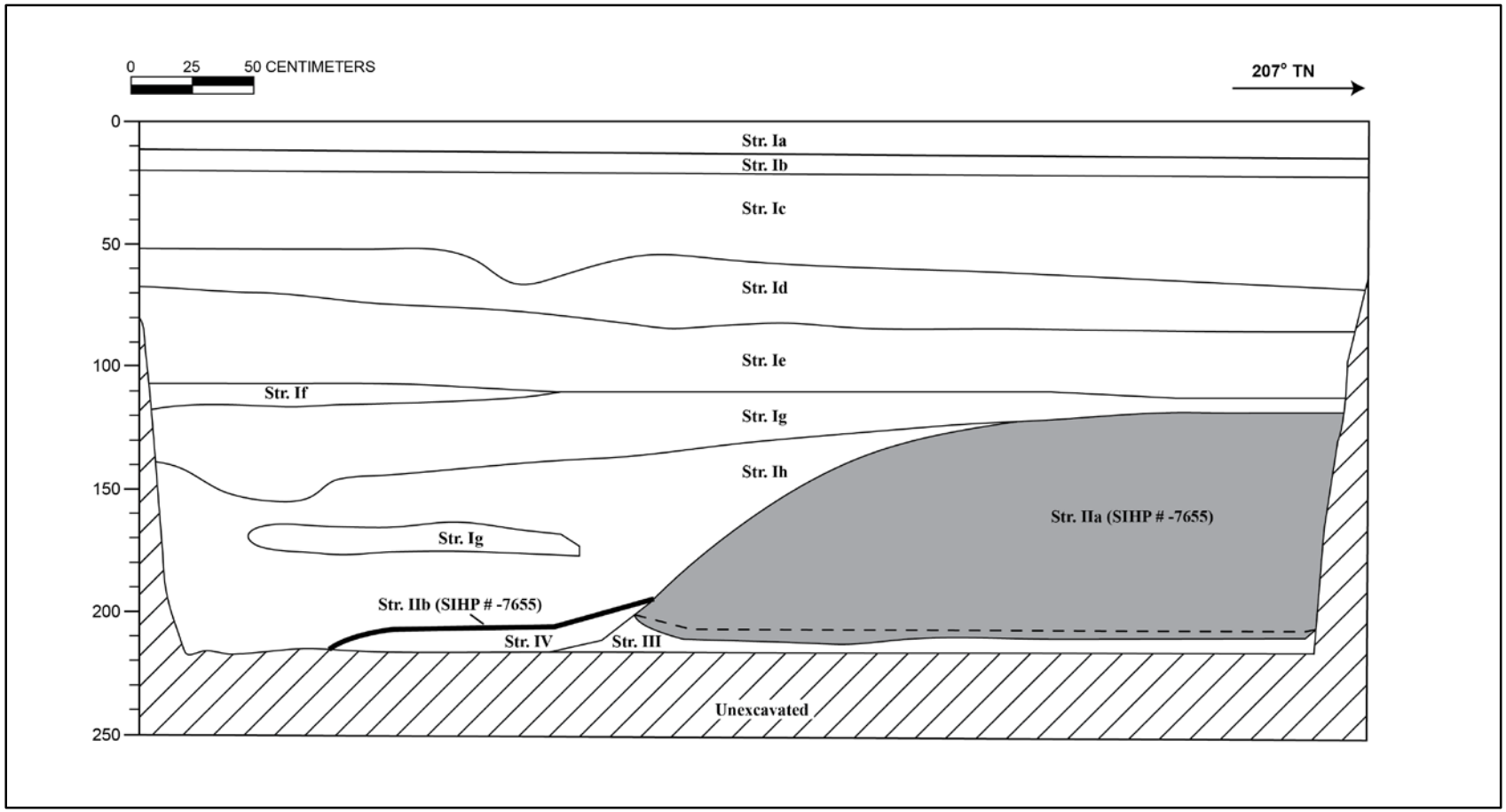

Figure 15. Profile of TE 30 southeast sidewall (Block C West), showing a steep berm (Stratum IIa/SIHP # -7655) transitioning a very low salt pan bed

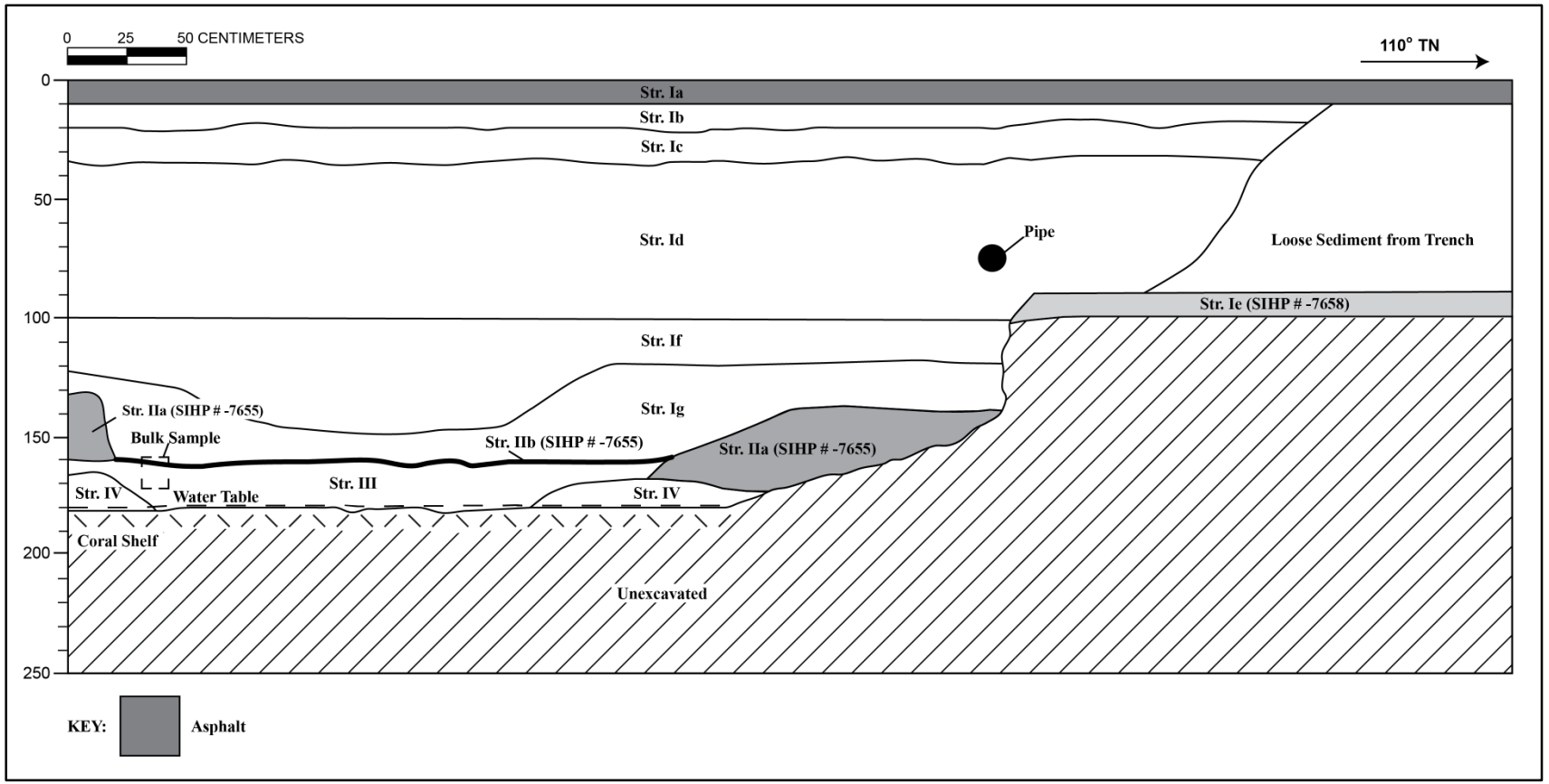

Figure 16. Profile of TE 4 (Block B East) northeast sidewall, showing two low berm structures (Stratum IIa/SIHP # -7655)

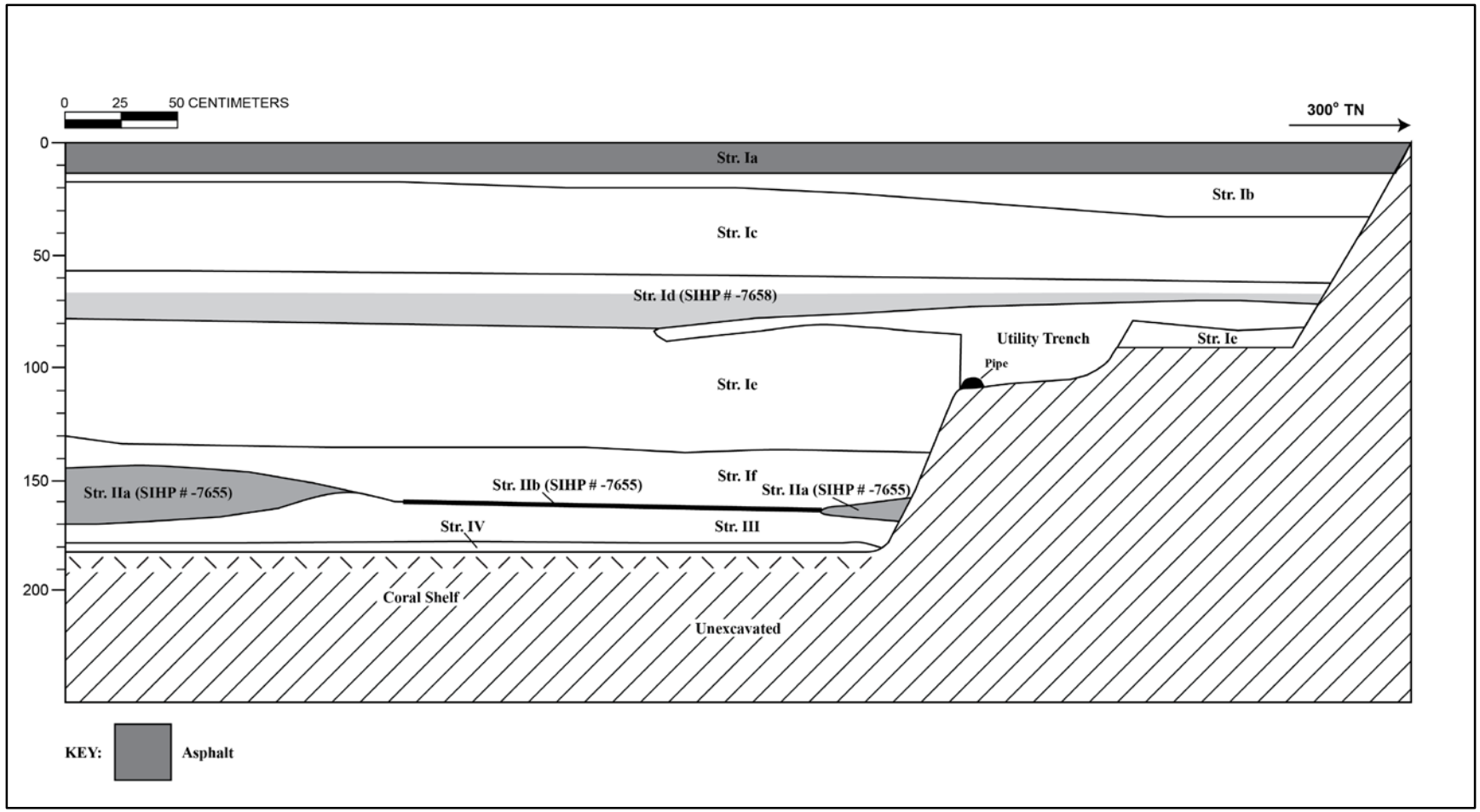

Figure 17. Profile of TE 4 (Block C West), similarly showing low berm structures (Stratum IIa/SIHP # -7655)

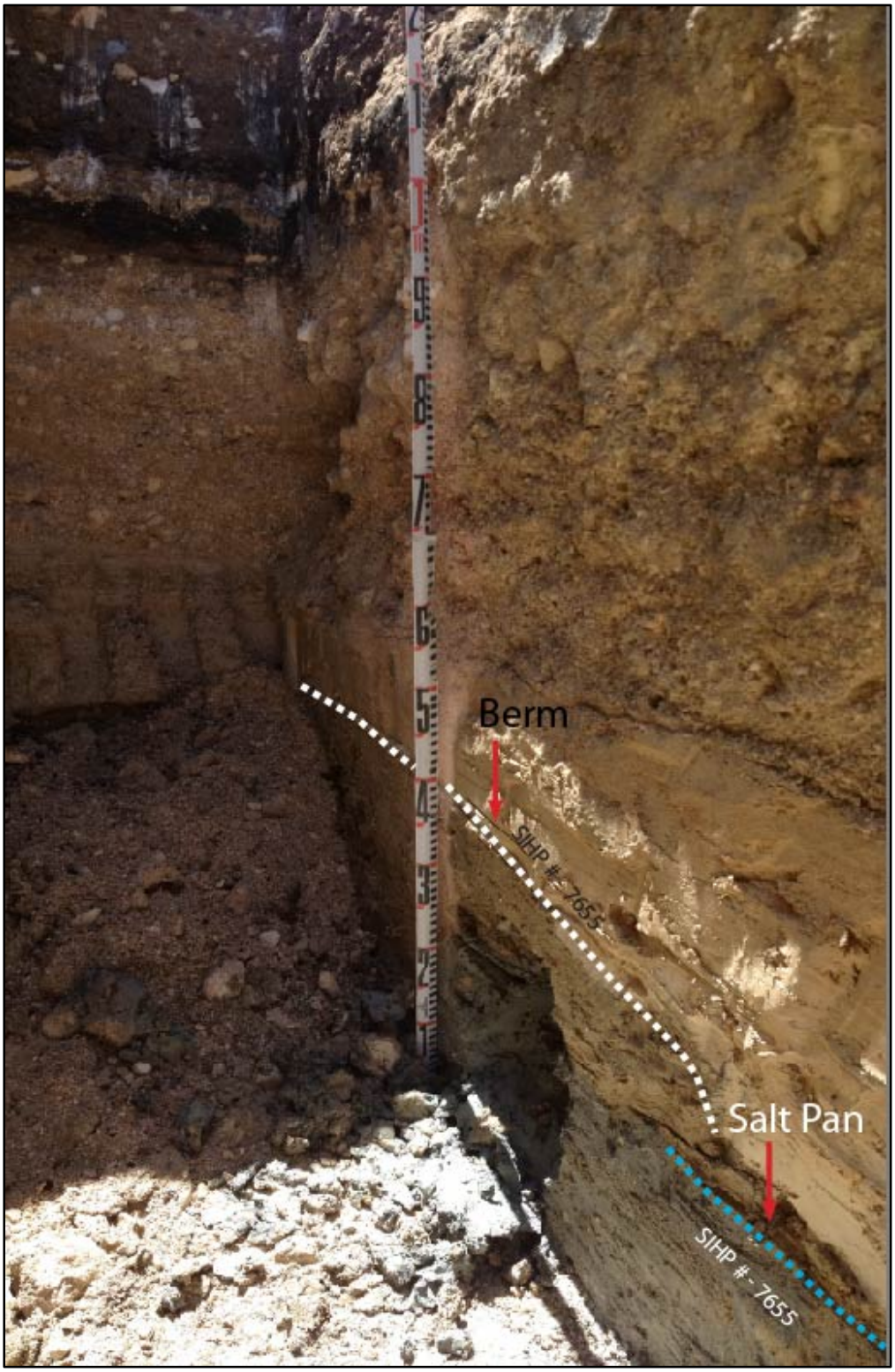

Figure 18. Close-up photo of low berm within TE 4 (Block C West), SIHP # -7655

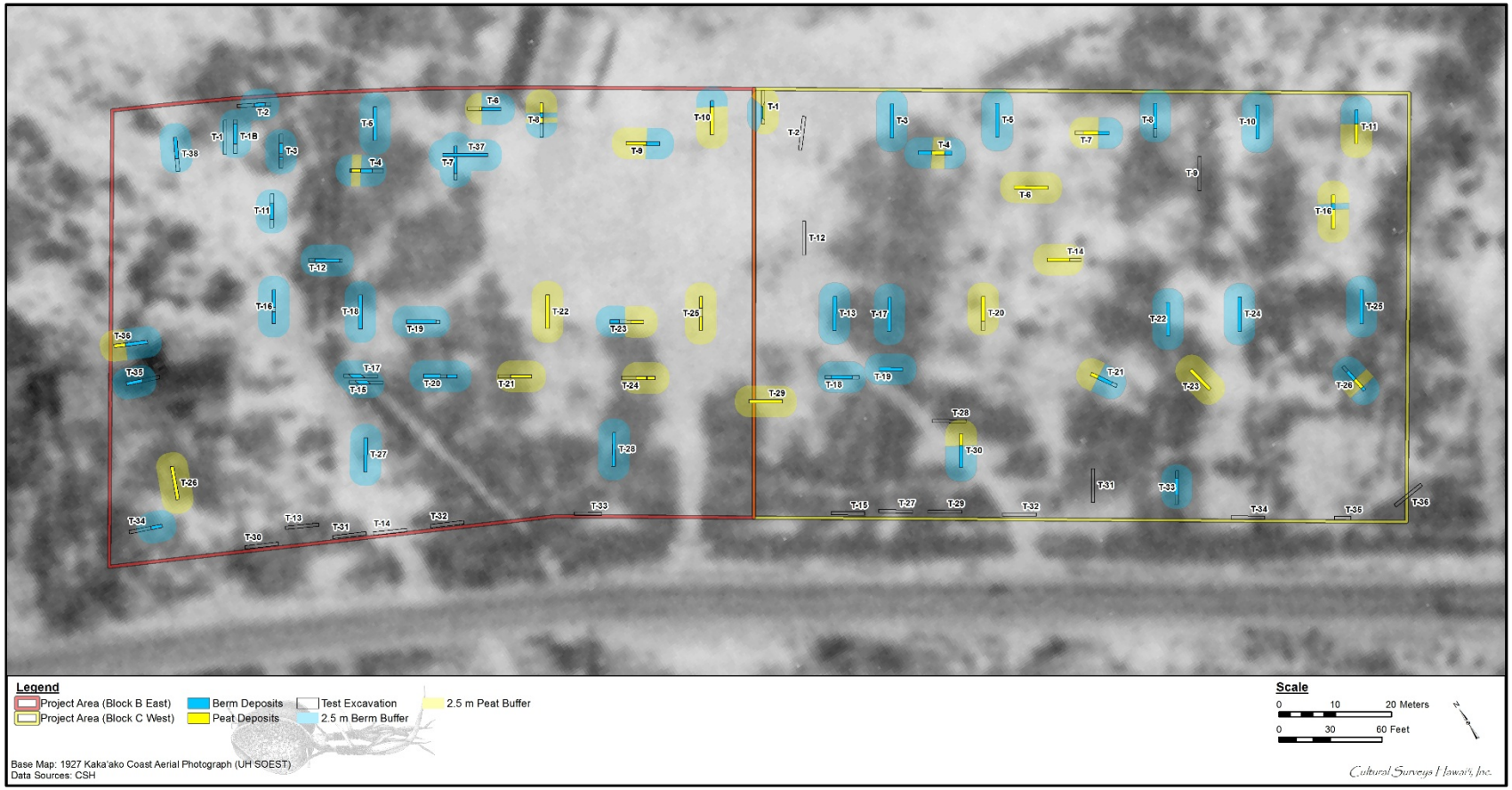

Figure 19. 1927 aerial photograph showing the location of documented salt pan berm remnants (blue) and salt pan bed deposits (yellow) within the Block B East and Block C West project areas

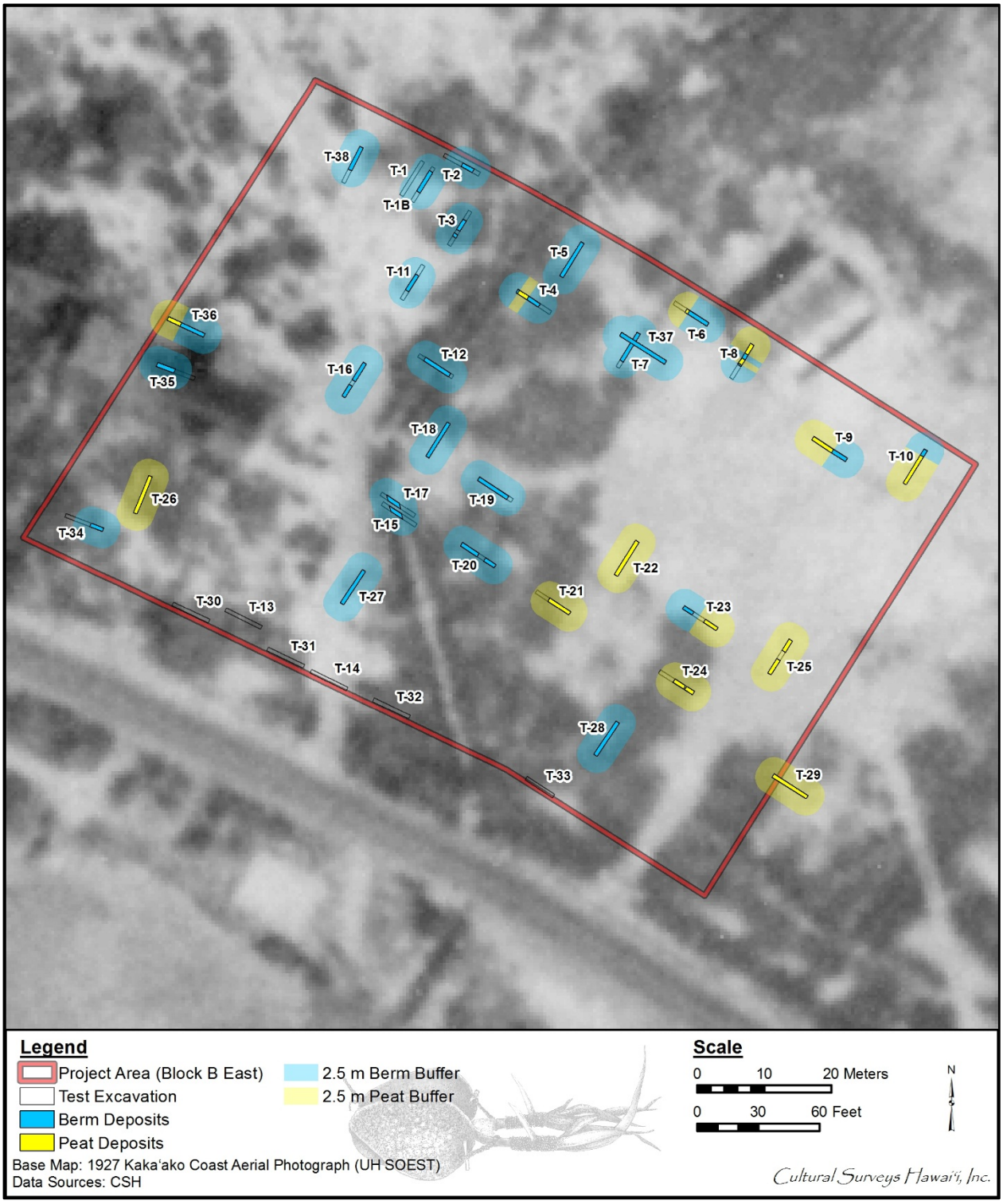

Figure 20. Close-up of Block B East, showing the concentration of berm sediments within a swath of dark vegetation and along the area of the Ward Estate *‘auwai*

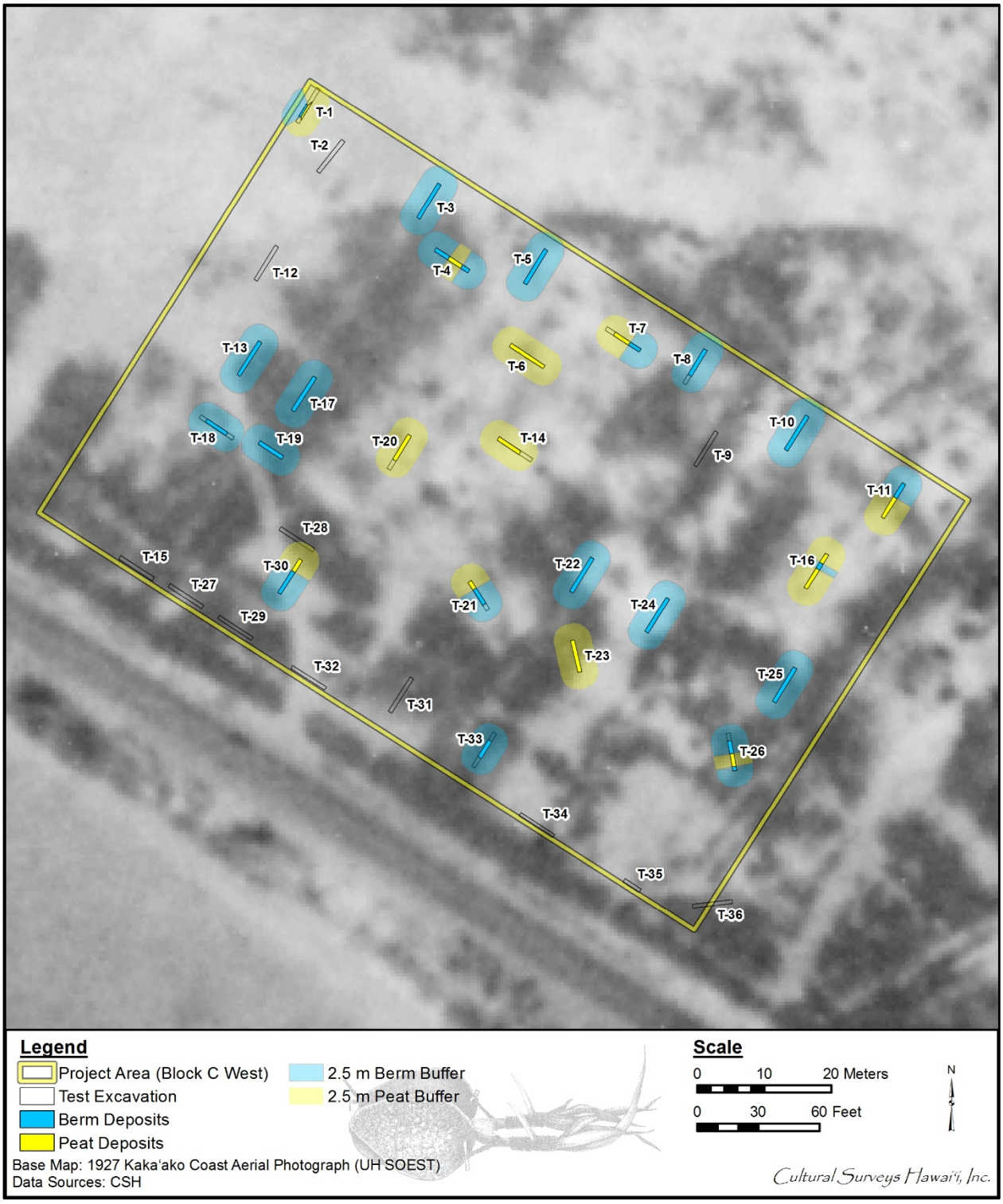

Figure 21. Close-up of Block C West, showing interspersed man-made berm structures and salt pan beds (UH SOEST: 1927 Kaka‘ako Coast Aerial Photograph)

Composition

The composition of the salt pan berms was remarkably uniform throughout the Block B East and Block C West project areas, consisting of medium-grained sandy clay. The color of the berm sediment ranged slightly from pale yellow to very pale brown to light gray. Notably, the color, texture, and consistency of the berm sediments corresponded closely with the natural wetland/marine sediments within the project areas, including the natural marine sandy clays along the coastal boundary. It seems most likely that the berms were constructed from the locally available wetland/marine sandy clays, being anthropogenic modifications of the original surface into mounded structures. This can be seen within Test Excavation 10 (Block C West), which consisted of a berm overlying a buried wetland A horizon and natural sandy clays (see Figure 7). The berm was composed of medium sandy clay, pale yellow in color (2.5Y 7/3) with moderate structure. The natural sediment underlying the A horizon consisted of fine sandy clay, pale yellow in color (2.5Y 7/4) with strong structure and strong plasticity, grading to a more gleyed clay at the water table. The berm archaeosediment was slightly coarser and less structured than the natural sandy clays, as would be expected of reworked deposits.

The effects of disturbance and reworking of the natural sandy clays are similarly visible in the test excavations along the *makai* boundary of the project areas, and provide a parallel example of the change in sediment characteristics caused by human activity, as well as substantiate the idea that the berm sediments are composed of local deposits. Within the test excavations along the coastal edge of the project areas, the in situ marine fine sandy clay was overlain by a disturbed sandy clay (generally caused by the installation of subsurface utility lines). The in situ sandy clay was observed as pale yellow in color (2.5Y 7/3) and consisting of a fine, plastic, well-structured sediment. Like the berm sediments, the overlying disturbed sandy clay was light yellowish brown in color (2.5Y 6/3) and consisted of coarser grained, less structured and less plastic sediment.

In some cases, the berm sediments included patches or swirls of gleyed clay, which was scraped up from the underlying gleyed wetland sediments. This was particularly evident in areas where the berm extended to the coral shelf, indicating significant disturbance to and/or complete removal of the natural sediments during berm construction (see Figure 9, Figure 10).

Evidence of Land Stability

Historic documents suggest the Ward Estate salt lands were in active production from 1873 until the 1890s or early twentieth century. This represents approximately 15 to 30 years of salt production and maintenance of the salt pan berms and beds. Evidence of this passage of time, or period of land stability, was encountered within several test excavations and consisted of layered berm sediments and developing A horizons. Two berm structures, TE 11 (Block C West) and TE 23 (Block B East), exhibited overlying berm layers, representing multiple berm building events. Within TE 11, the overlying berm sediment (Stratum IIa) was distinguished by a distinct color difference (light gray overlying light yellowish brown/Stratum IIb) and had been constructed atop a forming A horizon located at the upper boundary of Stratum IIb (Figure 22, Figure 23). The second berm deposit raised the overall berm height by 20 cm. The A horizon at the interface of the berm deposits consisted of an organic and charcoal stained, coarser sandy clay layer. Within TE 23, the two overlying berm sediments were distinguished by a very slight color difference and slight textural variation (silty clay versus sandy clay) (Figure 24, Figure 25).

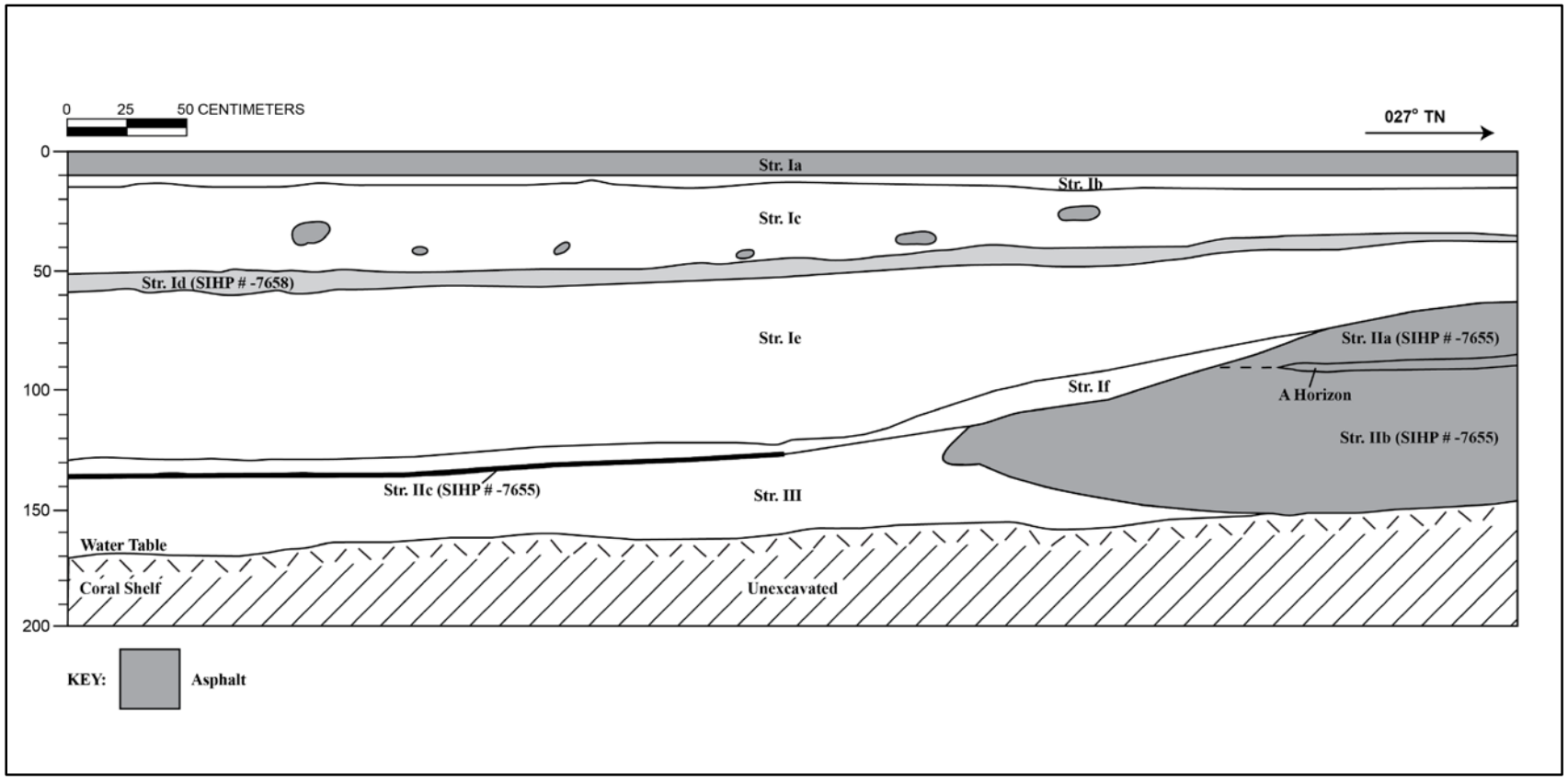

Figure 22. Profile of TE 11 (Block C West) northwest sidewall, showing two berm events (Strata IIa and IIb/SIHP # -7655)), including a forming A horizon at the upper boundary of the earlier (lower) berm deposit

Figure 23. Photograph of TE 11 *mauka* wall (Block C West), showing two berm deposits separated by a dark-stained A horizon, SIHP # -7655

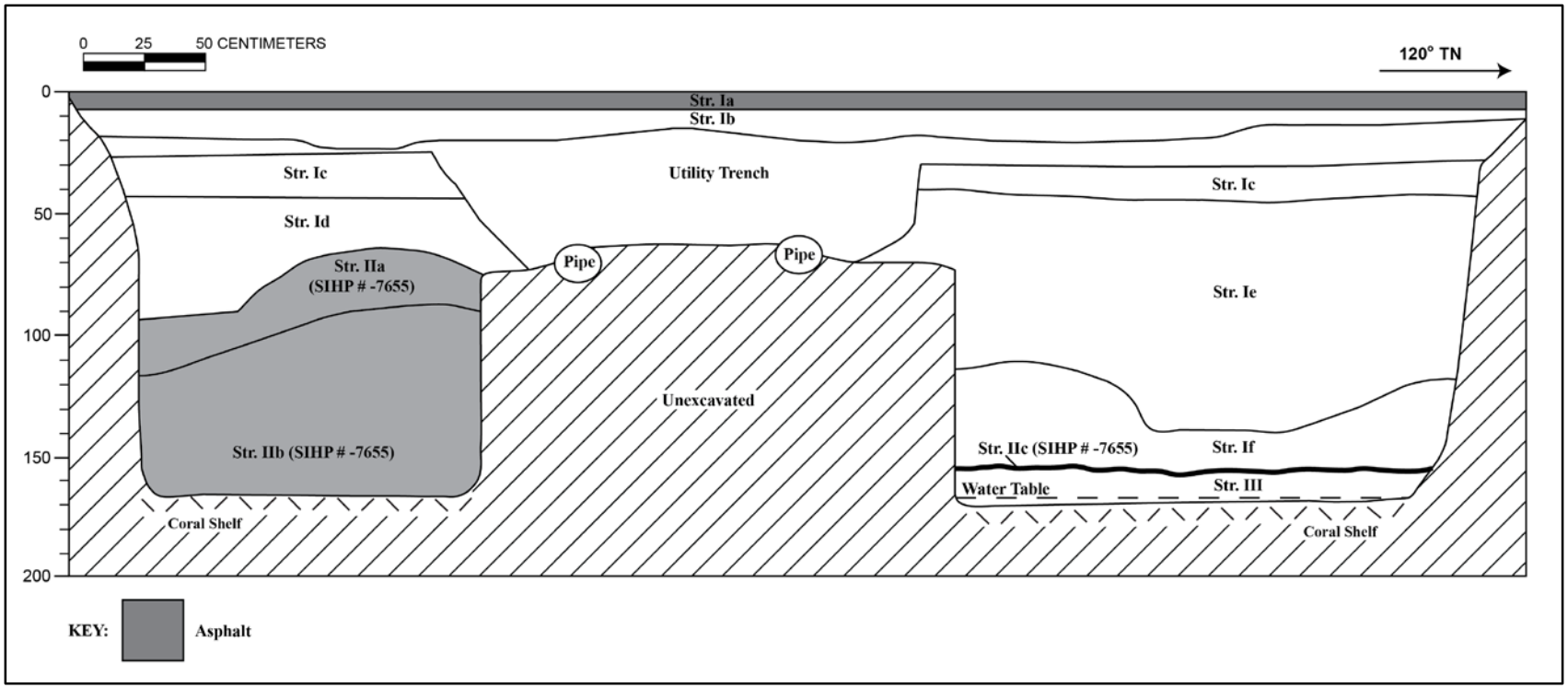

Figure 24. Profile of TE 23 northeast sidewall (Block B East), showing two berm events (Strata IIa and IIb/SIHP # -7655)

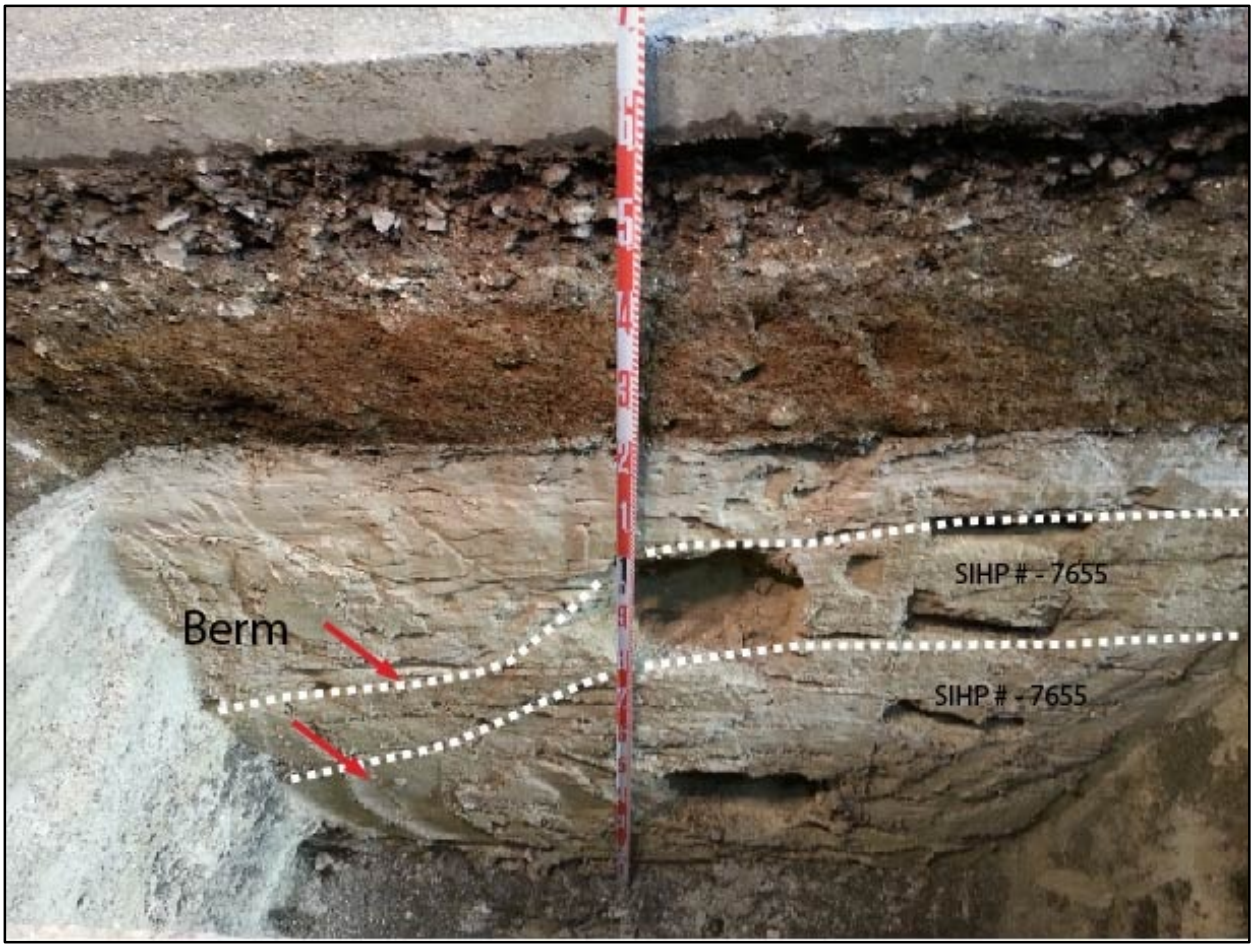

Figure 25. Photograph of the northwest end of the TE 23 northeast sidewall, showing the two berm building events (Strata IIa and IIb), SIHP # -7655

A horizons were also found forming atop berm sediments within TE 7 and TE 37 (Block B East). Within TE 7, the A horizon consisted of an approximately 3 cm thick layer. Within TE 37, a thin dark stained layer was observed at the upper boundary of the berm and included metal fragments. In addition, charcoal from an underground oven or kiln was documented on the steep slope of the berm, which was likely transported to this location and indicative of historic activity.

Features

Two distinct structural features were identified as associated with salt pan berm construction. Both features were located within the Block B East project area and consisted of placed tabular limestone boulders.

SIHP # -7655 Feature 1 was documented within Test Excavations 15 and 17, located within the west-central portion of the project area. Feature 1 consisted of a layer of level, tabular limestone boulders which formed a cohesive surface and appeared to have been placed (Figure 26 through Figure 29). The limestone boulders, measuring approximately 20 cm high and 65 cm long, were located at the interface between natural in situ wetland sediment and the overlying man-made berm. The limestone boulders were primarily found within TE 17, extending between both sidewalls. TE 15, which was specifically relocated adjacent to TE 17 in order to further document this feature, contained the tabular limestone boulders only within the northern corner of the test excavation, thus defining the southern boundary of this structure. The boulders appeared to have a structural function and were determined to be associated with historic land modification activities, and likely associated with the salt pan remnants.

SIHP # -7655 Feature 2 was documented within Test Excavation 38, located within the northern corner of the project area. Feature 2 consisted of a formation of limestone boulders and cobbles located at the edge of a salt pan berm (Figure 30 and Figure 31). The structure appeared man-made, with tabular boulders forming a level top surface, which was supported by large, rounded coral boulders in-filled with coral cobbles. None of the boulders showed evidence of having been cut or modified, but rather appeared to represent an assemblage of naturally available building material. The feature appeared to be integrated into the man-made berm (Stratum IIa) as the low, level berm merged into and slightly over the limestone structure.

Feature 2 was located at the transition between the salt pan berm (Stratum IIa) and natural peaty wetland sediments (Stratum IIc). The peat material appeared to be naturally occurring pond sediments, consisting of marine clays and a large abundance of rootlets. The limestone boulders may have been placed as a lining around the pond to aid in separating the pond from an adjacent salt pan bed; however, the transition between the pond and the limestone boulders was removed by the previous disturbance and unable to be fully analyzed. Additionally, a water line running parallel to the test excavation within the northwest sidewall had removed a portion of the limestone boulders.

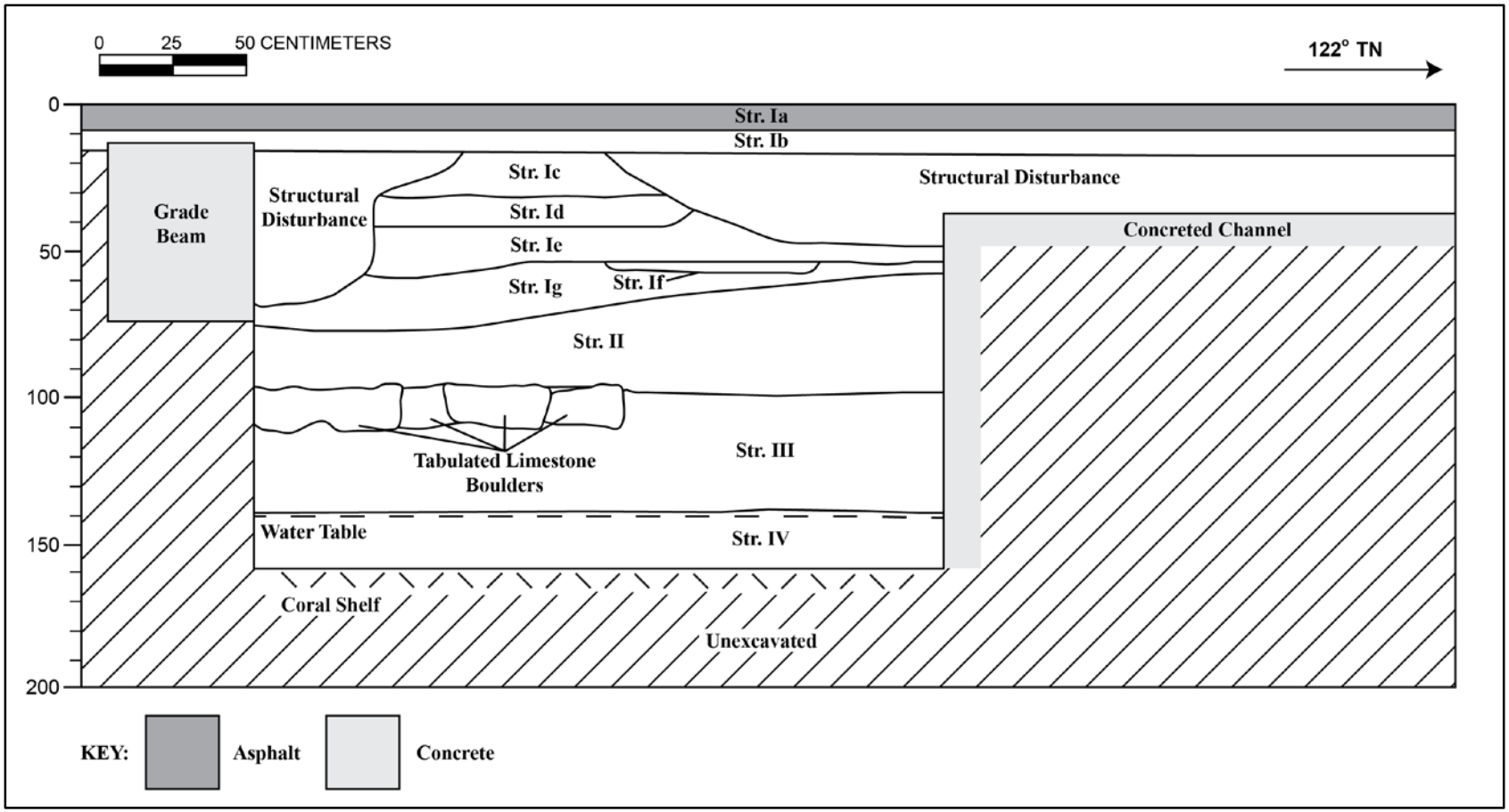

Figure 26. Profile of TE 15 northeast sidewall (Block B East), showing a berm event over tabular limestone from Feature 1(Strata IIa and IIb/SIHP # -7655)

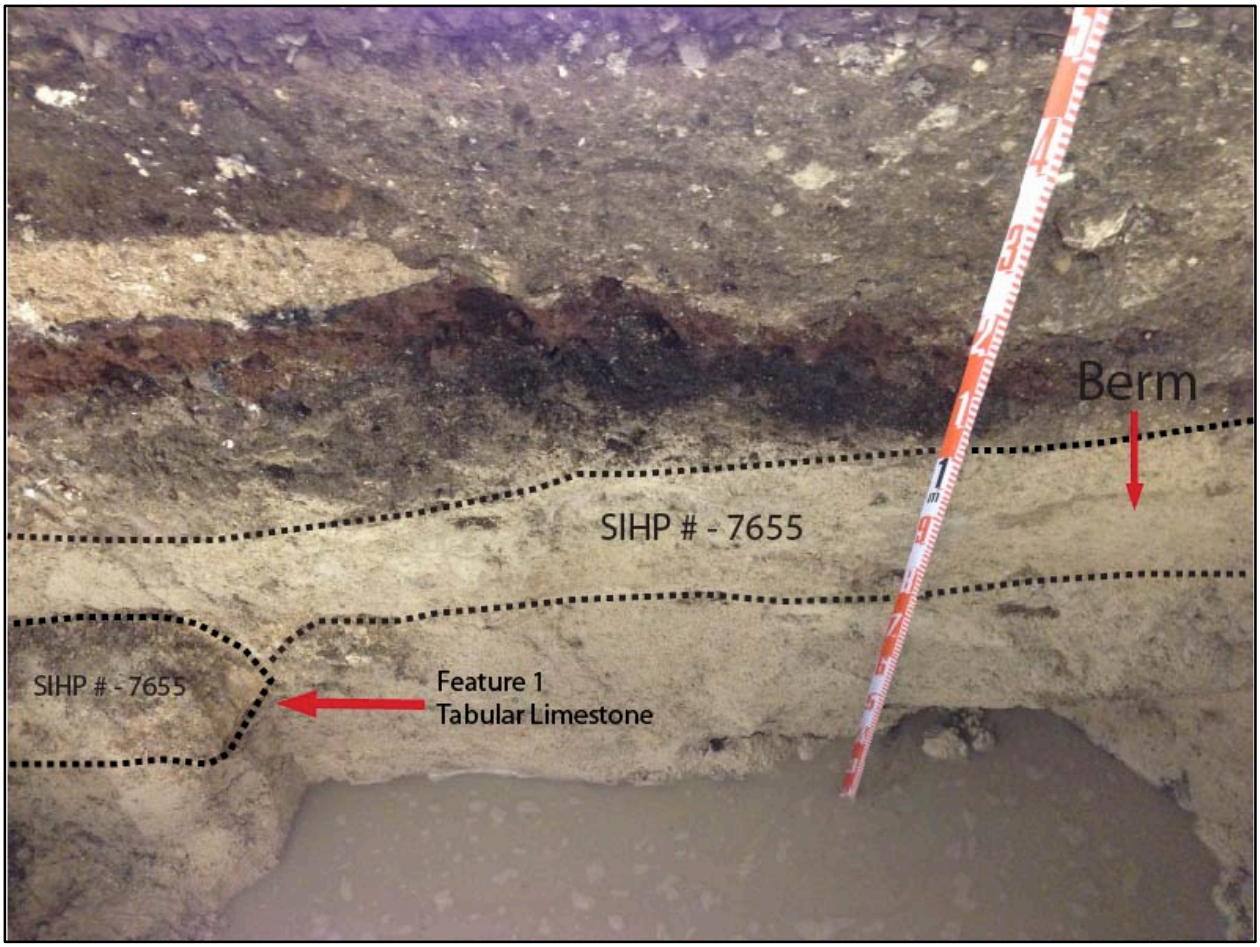

Figure 27. Photograph of TE 15 northeast side wall (Block B East), showing a berm event over tabular limestone from Feature 1(Strata IIa and IIb/SIHP # -7655)

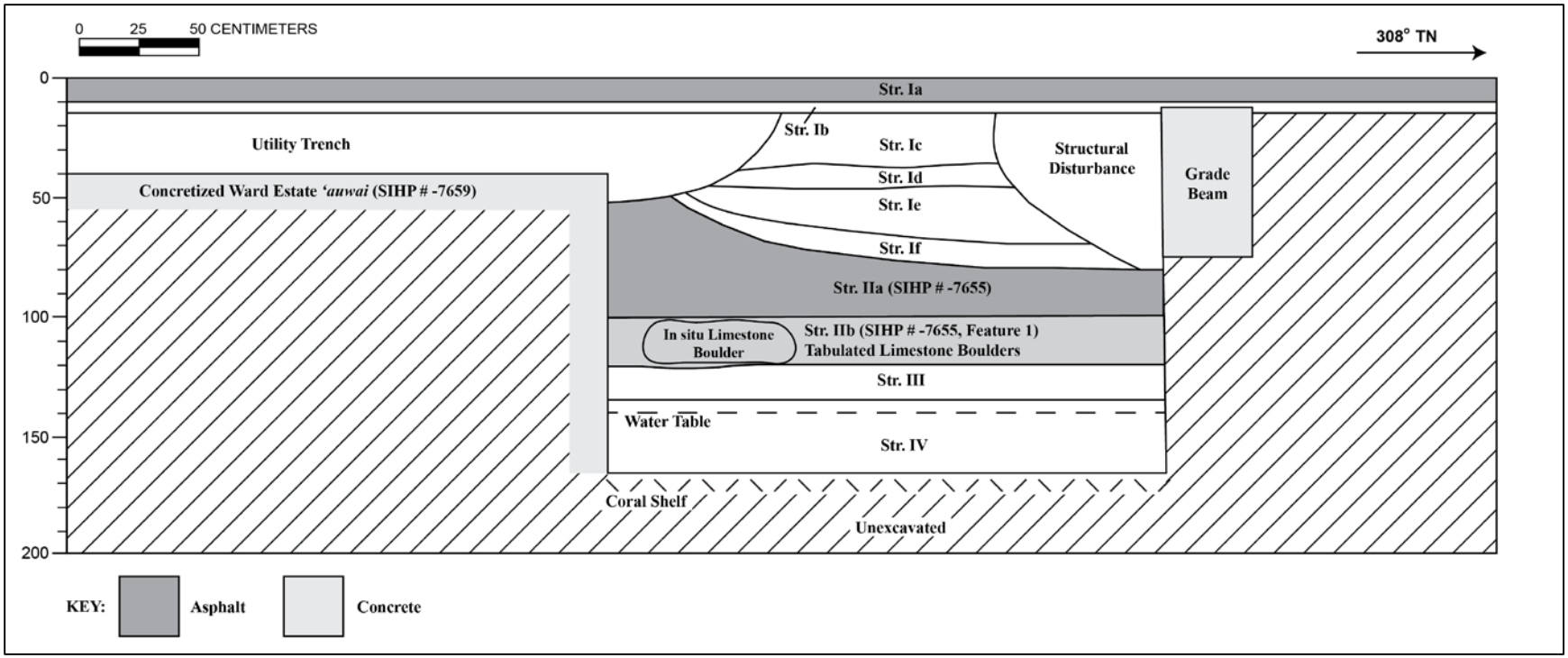

Figure 28. Profile of TE 17 southwest wall (Block B), showing the Ward ‘auwai (SIHP # -7659) laterally associated with a berm event in Stratum IIa (SIHP # - 7655) over tabular limestone boulders in Stratum IIb (SIHP # -7655)

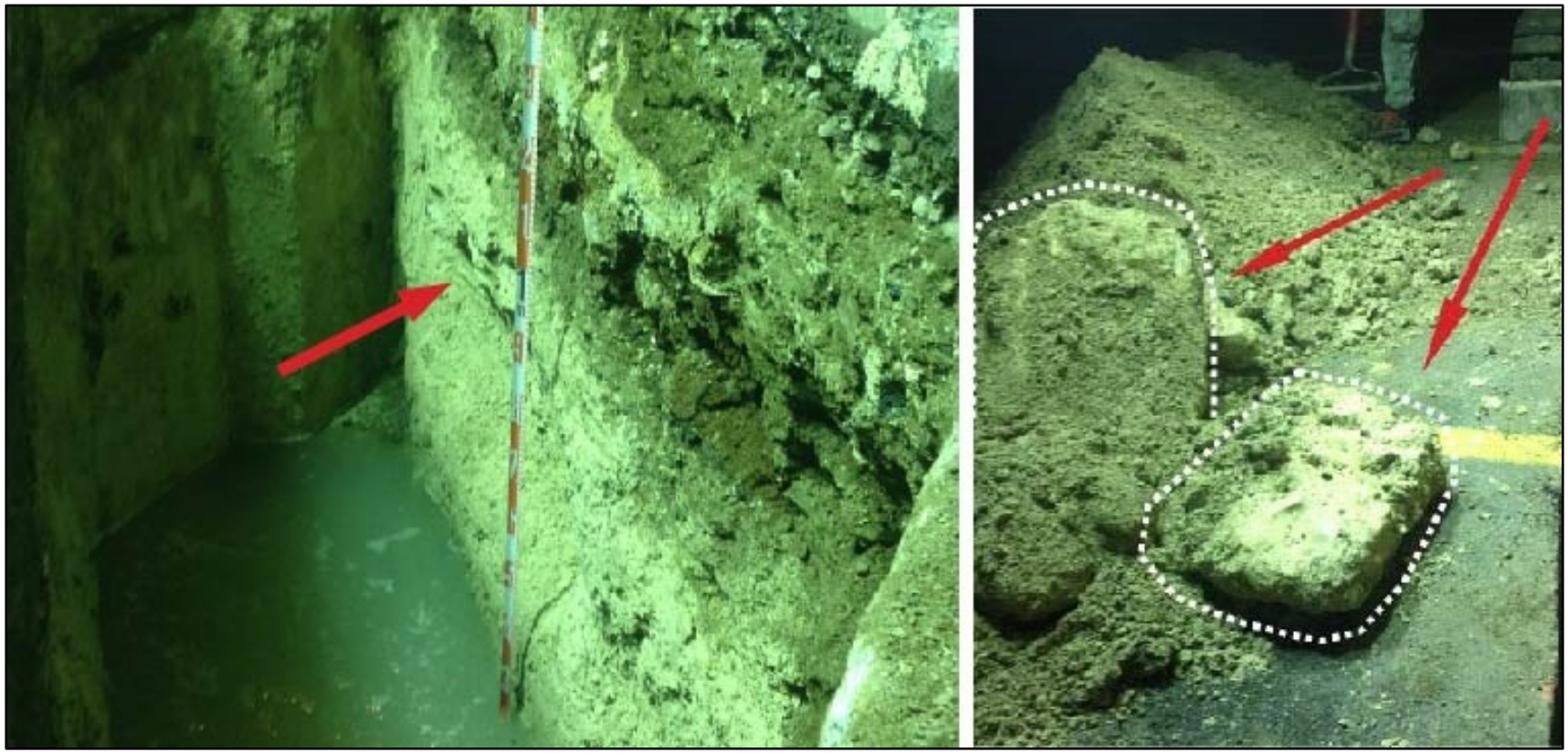

Figure 29. (Left) Photograph of TE 17 southwest wall (Block B), showing the location of tabular limestone boulders in Stratum IIb (SIHP # -7655); (Right) Photograph of tabular limestone after removal from TE 17

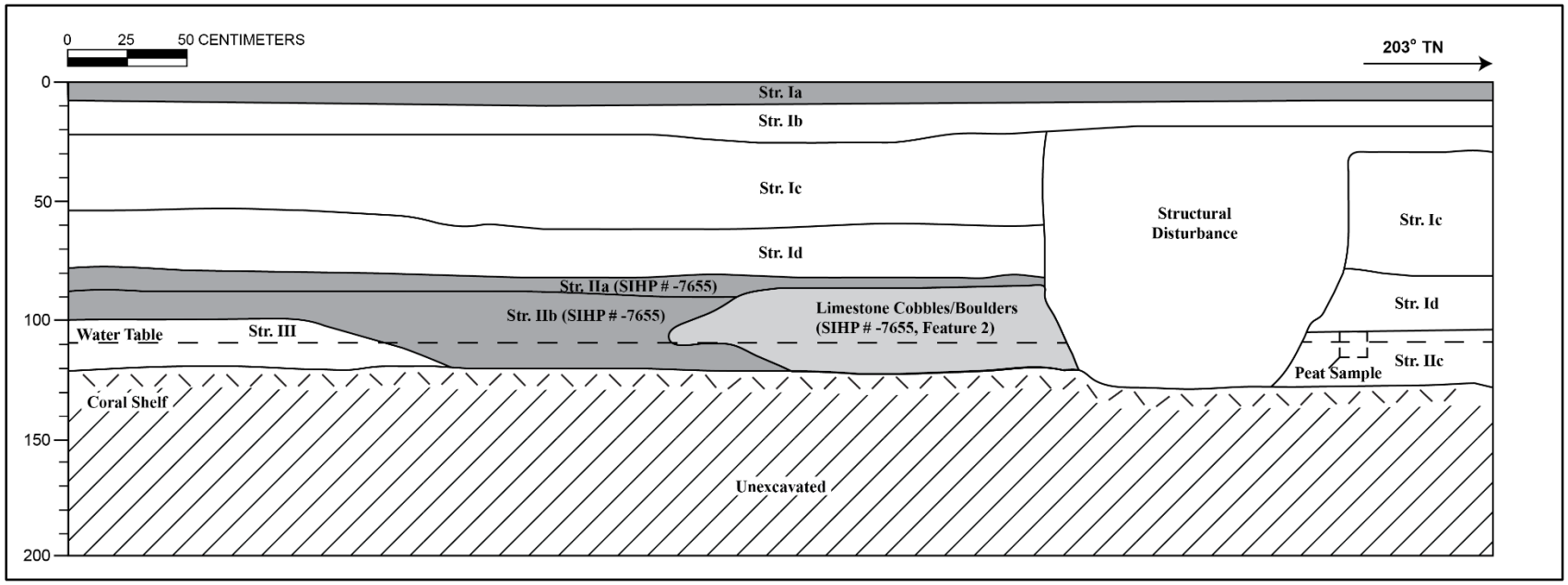

Figure 30. Profile of TE 38 east wall (Block B), showing the limestone boulders and cobbles of Feature 2 (SIHP # -7655) located at the edge of a salt pan berm in Strata IIa and IIb (SIHP # - 7655

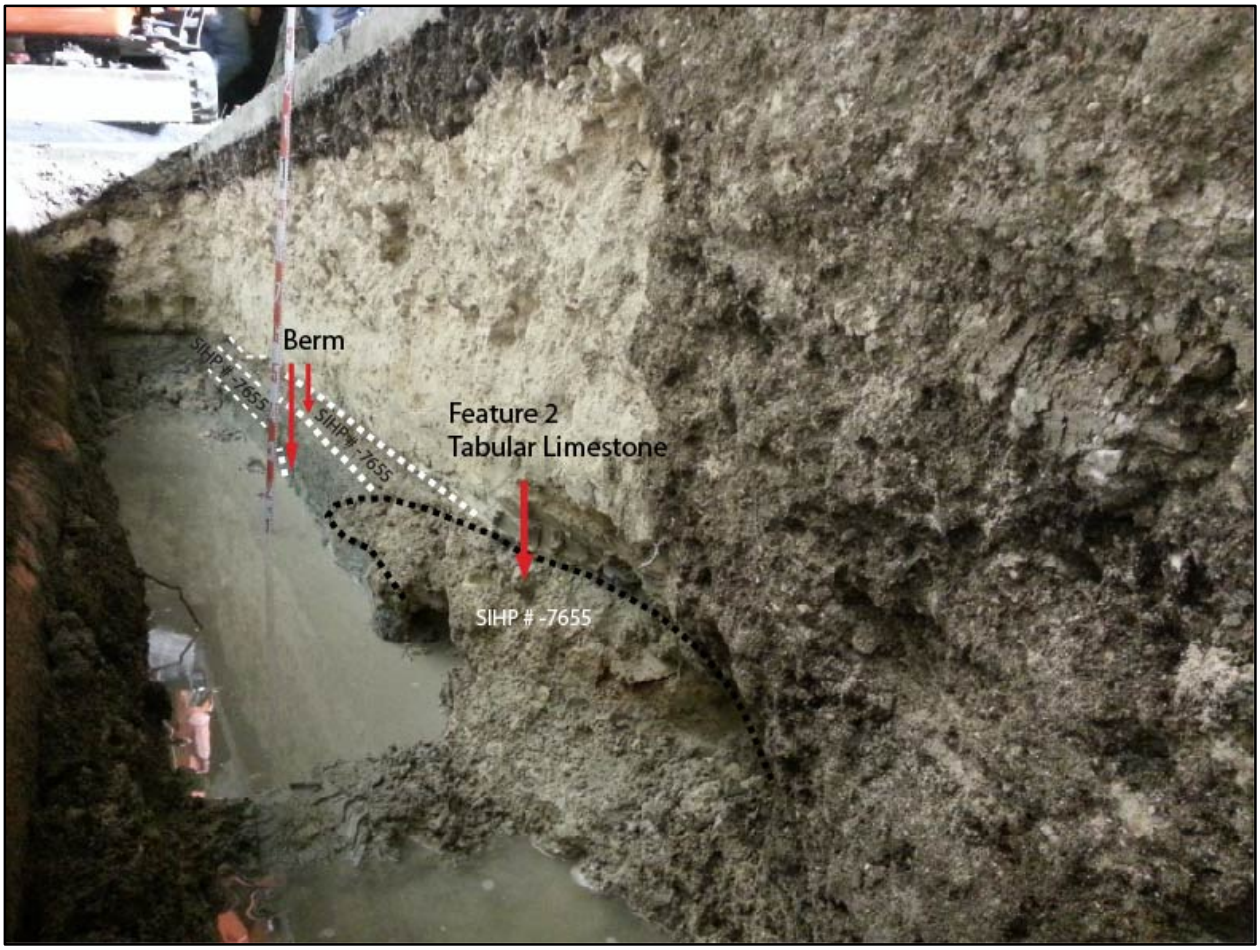

Figure 31. Photograph of TE 38 east wall (Block B), showing the limestone boulders and cobbles of Feature 2 (SIHP # -7655) located at the edge of a salt pan berm in Strata IIa and IIb (SIHP # - 7655).

Salt Pan Beds Description

Structure and Composition

Interspersed among and bounded by the salt pan berms was a large area of low-lying natural wetland sediments overlain by thin laminations of organic material, interpreted as salt pan beds. Within the Block B East project area, 14 of the 38 test excavations contained salt pan bed sediments; within the Block C West project area, 12 of the 36 test excavations contained salt pan bed sediments.

The organic laminations consisted of distinct micro-layers, observable as variations of color and texture (Figure 32 through Figure 37). Some of the layers, in particular along the upper boundary of the deposit, contained flat leaf-like organics and grass-like stalks. In general, these laminated organic deposits ranged from 1 to 4 cm in thickness. During the excavation process, these thin organic layers were identifiable as wetland organic material; however, only upon close inspection were the laminations discernible and able to be differentiated from natural wetland peat deposits. It is believed that the laminations are the result of salt making processes.

In general, the salt pan laminations overlay one to two strata of natural wetland clay sediments. These natural wetlands, located just *mauka* of the coastal sand dunes, appear to have provided a naturally suited landform for the creation of salt pan beds, being composed of fairly impermeable clay sediments located at or near the water table. In many cases, the salt pan creation and/or salt processing methods did not appear to unduly disturb these underlying natural layers. For example, within TE 7 (Block C West), the organic deposit was located 43 cm above the coral shelf, overlying two in situ, natural sandy clay wetland deposits (Figure 38 and Figure 39). However, many of the test excavations evidenced disturbance to these natural layers, likely as a result of the salt production process and the maintenance of the salt beds. In these instances, the laminated salt pan deposit was located much closer to, or just above, the coral shelf, overlying only a thin remnant of the natural wetland sediments. In the most extreme example, within TE 26 (Block B East) the laminated layer was located only 0-4 cm above the coral shelf (Figure 40 and Figure 41). In two instances, the laminated deposit consisted of multiple organic layers interposed with natural clay, perhaps evidencing scraping of the salt beds and intermingling with the underlying clays (TE 22 within Block B East; TE 14 within Block C West) (Figure 42 and Figure 43).

Function

As indicated by the January 1892 *Planters' Monthly* description of the Kaka‘ako Salt Works, historic salt production was a complex, involved process that required the construction of a system of berms and salt pan beds. The salt pan beds varied in function, and likely also in size. The *Planters' Monthly* described several different types of "ponds" consisting of "storage ponds, which latter again supply the evaporating ponds, from which the water runs into the strike ponds, where the crystals are formed" (*Planters' Monthly* 1892:446). Each step of the process slowly transformed the salt water, until a highly concentrated, dense salt water reached the "strike pond." The article also explained that the salt water became shallower and shallower as it progressed through the system until the water was no more than 1 ½ inches deep within the strike pond.

Figure 32. Photograph of laminated organic deposit within TE 21 (Block B East) (Stratum II/ SIHP # -7655), measuring 3 cm thick

Figure 33. Photograph of laminated organic deposit within TE 23 (Block B East) (Stratum II/ SIHP # -7655), measuring 3 cm thick, overlying natural wetland sediment containing brackish-water snails

Figure 34. Close-up of laminated layer within the TE 1 sidewall (Block C West) (Stratum IIb/ SIHP # -7655), overlying natural wetland sediments

Figure 35. Close-up of TE 1 laminated organic material (Stratum IIb SIHP # -7655), showing distinct layering with leaf and organic material visible at the upper boundary

Figure 36. Photograph of laminated organic deposit within TE 23 (Block C West) (Stratum II/ SIHP # -7655), measuring 1 cm thick

Figure 37. Close-up photograph of multiple laminated deposits within TE 14 (Block C West) (Stratum II/ SIHP # -7655)

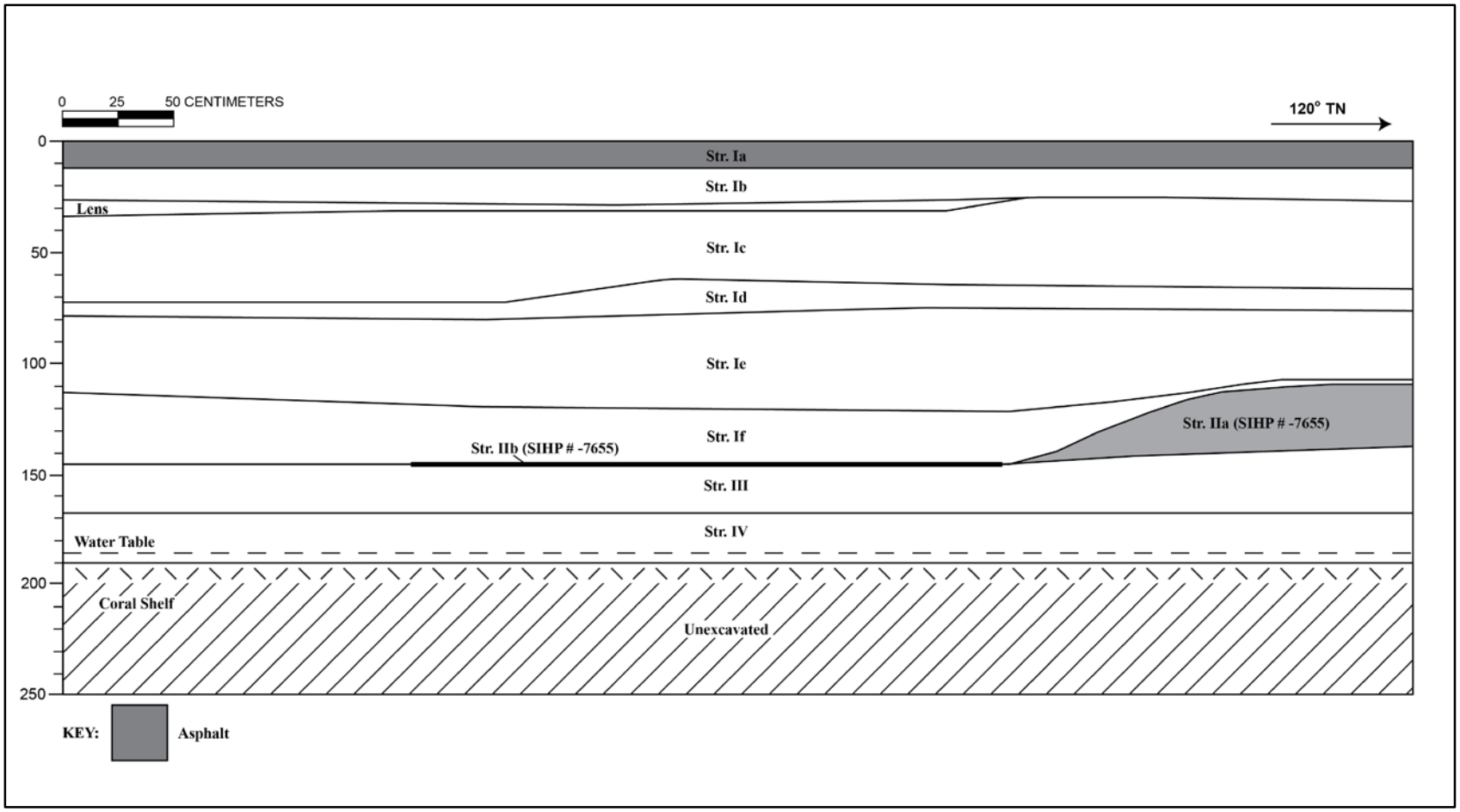

Figure 38. Profile of TE 7 northeast wall (Block C West), the showing the laminated organic deposit (Stratum IIb/SIHP # -7655) located 43 cm above the coral shelf, overlying two in situ, natural sandy clay wetland deposits (Strata III and IV)

Figure 39. Photograph of TE 7 northeast wall (Block C West), the showing the laminated organic deposit (Stratum IIb/SIHP # -7655) located 43 cm above the coral shelf, overlying two in situ, natural sandy clay wetland deposits (Strata III and IV)

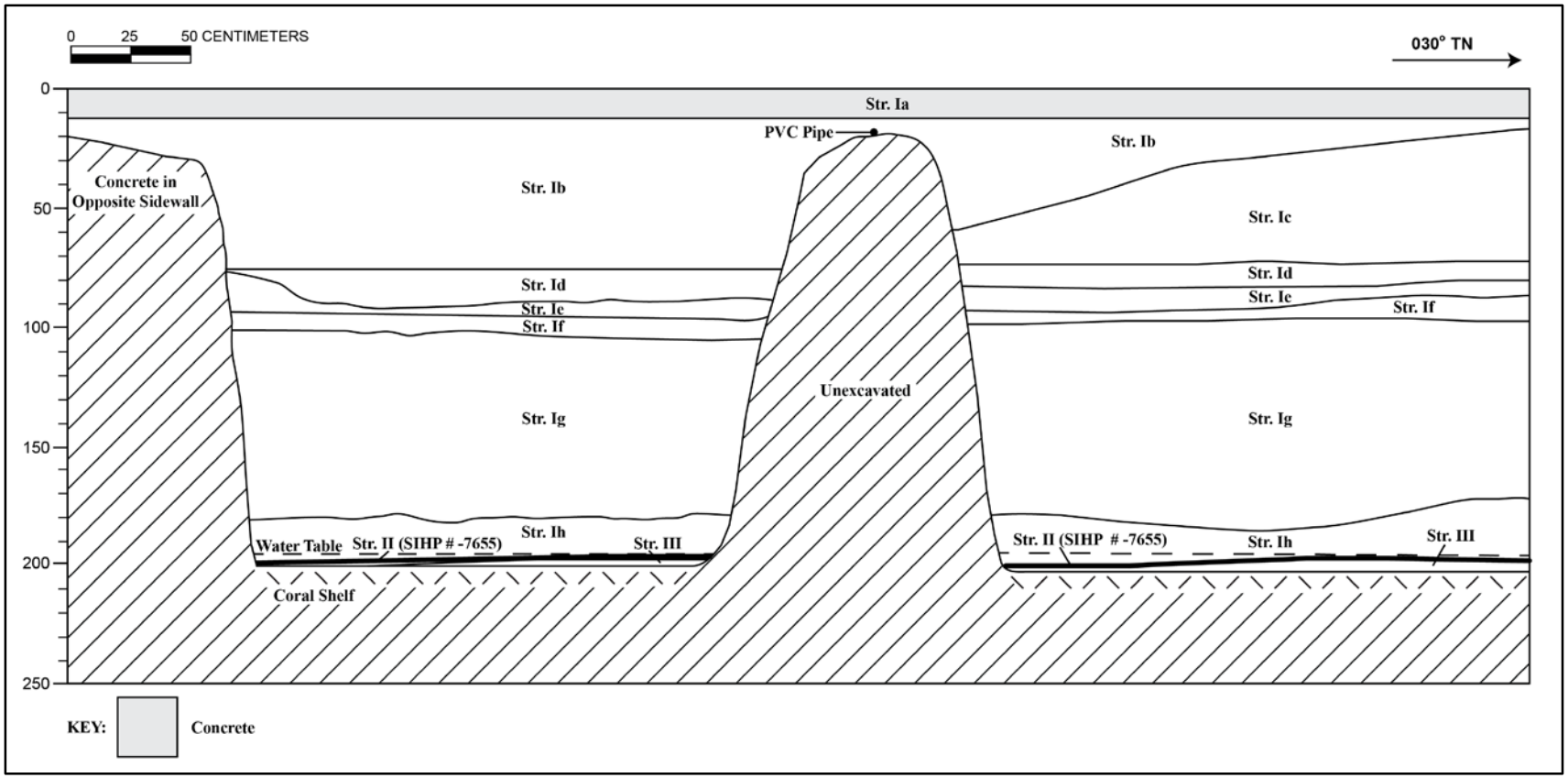

Figure 40. Profile of TE 26 west wall (Block B East), showing laminated organic deposit (Stratum II/SIHP # - 7655), approximately 4 cm above the coral shelf

Figure 41. Photograph of TE 26 west wall, showing laminated organic deposits (Stratum II/SIHP # -7655), just above the coral shelf

Figure 42. Photograph of two layers of laminated organic material within TE 22 (Block B East) (Stratum II/ SIHP # -7655), evidencing possible scraping of the salt pan beds during salt making processes or structural maintenance and the intermingling of the organic layers with the underlying natural wetland clay

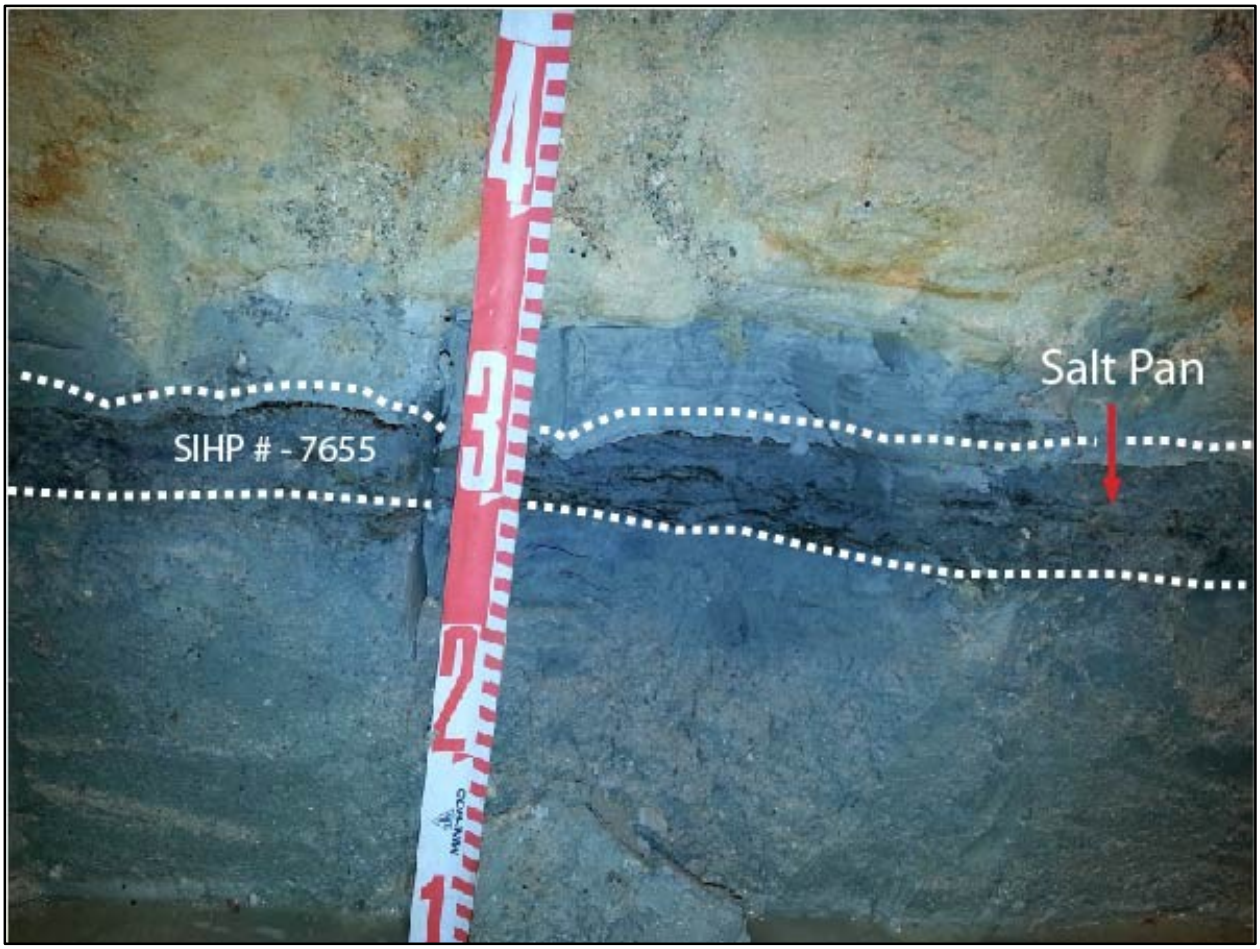

Figure 43. Photograph of multiple layers of laminated organic material within TE 14 (Block C West) (Stratum II/SIHP # -7655)

Organic laminations interpreted as salt pan bed remnants were documented throughout the majority of the Block B East and Block C West project areas. Within these contiguous project areas the laminated deposits were largely consistent, comprised of distinct micro-layers differentiated by color and texture and usually containing partially intact leaf structures and grass-like stalks. Just *mauka* of these two project areas however, within the on-going Block I AIS project area, further salt pan remnants have been documented which are believed to be part of the same salt complex (Sroat et al. 2014). Within the Block I project area, two additional types of organic material deposits associated with salt pan beds were identified, both markedly distinct from the thin laminated deposits found within the current project areas. These organic deposits consisted of a less structured, thicker organic layer in the *makai* portion of the Block I project area (just across Auahi Street from the current project areas), which sequenced into extraordinarily thick laminated deposits in the *mauka* portion, consisting of hundreds of micro-laminations with intact leaf structures. These three distinct organic deposits are interpreted to most likely represent different types of salt pan beds and functions. Given the current project areas' location along the coast, it is likely that these salt pan organic deposits represent remnants from the initial storage ponds. The successive salt pan deposits within Block I likely represent later stage salt processing, such as evaporating ponds and strike ponds.

The laminations observed within the Blocks B East and C West project area salt pan beds possibly signify reworking, or maintenance (such as scraping), of the salt pan beds in the interval between salt water floodings, or alternatively the chemical alteration and biogenic modification of the underlying natural sediments caused by the salt water and organic material. The organic material observed within and/or overlying the laminations, consisting of leaf structures and grass-like stalks, may represent remnants of organic lining of the salt pan beds, as noted by Cook (1784) in his description of traditional Hawaiian salt beds.

Pollen Results

Eleven samples from Block B East (Samples 1–6) and Block C West (Samples 7–11) were submitted to PaleoResearch Institute, Inc. of Golden, Colorado for pollen analysis. The collected samples represent the laminated organic material (labeled "peat" within the pollen report) representing the salt pan beds associated with SIHP # -7655, and the underlying wetland sediments. The 11 sediment samples were analyzed to determine any changes in the environmental record that may be indicative of salt pan use. A report was prepared by PaleoResearch Institute (Cummings and Varney 2014). Below is a summary of the results.

The samples from Block B East were collected from Test Excavation 6, Strata IIb (Sample 1) and III (Sample 2); Test Excavation 21, Strata II (Sample 3) and III (Sample 4); and Test Excavation 22, Strata II (Sample 5) and III (Sample 6). The samples from Block C West were collected from Test Excavation 1, Stratum IIb (Sample 7); Test Excavation 6, Strata II (Sample 8) and III (Sample 9); and Test Excavation 23, Strata II (Sample 10) and III (Sample 11).

Discussion

The pollen and microscopic charcoal analysis of the samples collected from Block B East and Block C West indicate these areas may have been inundated with water. The presence of foraminifera (single-celled protists that live in marine and/or freshwater environments) in all of the Block B East samples (Samples 1–6) and in only one of the Block C West samples (Sample

10) suggests the Block B area may have contained more water than Block C. Additionally, the lower pollen concentration values in the wetland sediments (Stratum III) of Block C West suggest a more rapid sedimentation process in this area.

In general, the pollen record from the 11 sediment samples was dominated by *kolea* (*Myrsine*). *Kolea* are small to medium-sized native evergreen trees (Little and Skolmen 1989:268) that are most likely insect-pollinated (Vaughn Bryant and Donald Drake, personal communication 2014). Most plants in the Myrsinaceae family are insect-pollinated. According to Dr. Donald Drake, Professor of Botany at the University of Hawaii at Mānoa, a study on the pollination of *kolea* (*Myrsine*) trees has never been completed. However, the flowers of the *kolea* tree are more adapted to insect or bird-pollination than wind-pollination. Unlike wind-pollinated plants (i.e., grasses, rice, pine) that produce an abundance of pollen that often travels long distances and survives well in the archaeological record, insect-pollinators produce less copious amounts of pollen and are, therefore, usually under-represented in the archaeological record. Although *kolea* pollen has been documented in coastal areas (Cummings 2013), the high percentage of *kolea* pollen in all of the samples from Blocks B East and C West is unusual. One explanation for the abundance may be that *kolea* leaves were utilized to line and waterproof the salt beds. The missionary William Ellis, on his tour of the Hawaiian Islands in 1822 and 1823, noted the final step in the salt making process, which includes the use of evergreen leaves to line the pans:

The natives of this district (Kawaihae) manufacture large quantities of salt, by evaporating the sea water. We saw a number of their pans, in the disposition of which they display great ingenuity. They have generally one large pond near the sea, into which the water flows by a channel cut through the rocks, or is carried thither by the natives in large calabashes. After remaining there for some time, it is conducted into a number of smaller pans about six or eight inches in depth, which are made with great care, and frequently lined with large **evergreen leaves**, in order to prevent absorption. Along the narrow banks or partitions between the different pans, we saw a number of large **evergreen leaves** placed. They were tied up at each end, so as to resemble a narrow dish, and filled with sea water, in which the crystals of salt were abundant. [Ellis 1827:403-404]

The presence of *Myrsine* pollen within the underlying wetland sediments (Stratum III) that were analyzed is somewhat unusual. However, considering the samples were collected directly below the overlying laminated organic material (Strata IIb and II), it is possible the presence of *Myrsine* pollen is a result of contamination.

Vegetation in the outlying areas of the suspected salt pans included grasses and sedges, indicated by the identification of Poaceae and Cyperaceae pollen in almost all of the samples. The low concentration values of these wind-pollinators suggest these plants were not growing within the salt pan areas. Fern spores were recovered in almost all of the samples, suggesting ferns were growing in the vicinity of the project areas.

Pollen representing alien species included Australian pine, *koa haole*, and *kiawe*. The presence of at least one or more of these in each of the samples indicates the sediments are most likely historic.

Identified Polynesian cultigens included coconut (*Cocos nucifera*), sugar cane (*Saccharum* sp.), and sweet potato (*Ipomoea batatas*-type). Rice (*Oryza*-type) and mango (*Mangifera*-type) were the only introduced cultigens and both were identified in the two samples from Block C West Test

Excavation 6 (Samples 8 and 9). It is possible there were sugar cane fields and rice paddies in the outlying areas of the salt pans. These wind-pollinators are usually well-represented in the pollen record. Therefore, the low concentration and lack of these pollen types suggests they were not growing within the immediate vicinity of the salt pans. Sweet potato, coconut, and mango, however, are insect-pollinated so their presence may indicate their nearby cultivation. The identification of all of these cultigens (coconut, sugar cane, sweet potato, rice, and mango) within the Test Excavation 6 samples suggests some of these plants, particularly the insect-pollinators, may have grown near Test Excavation 6. Alternatively, this area may have been used as a trash dump or midden area where these cultigens were deposited at one time. Interestingly, Test Excavation 6 samples did not contain foraminifera which are indicative of inundated areas.

The pollen analysis identified microscopic charcoal fragments in all of the samples. Concentrations were markedly higher in the wetland sediments of Block B East Test Excavations 21 (Sample 4) and 22 (Sample 6), and Block C West Test Excavation 6 (Sample 9). The laminated organic material from Block C West Test Excavation 1 (Sample 7) contained the highest concentration of charcoal in any of the samples from the two project areas. The presence of charcoal may be a result of widespread burning episodes, or it may be attributed to petroleum contamination, which is common in coastal areas (Cummings 2014).

In general, the low concentrations of wind-pollinators (i.e., Asteraceae, Cyperaceae, Poaceae, *Chenopodium, Casuarina,* ferns, etc.) in the pollen record from Block B East and Block C West sediment samples, suggest these plant types were not growing within the suspected salt pans, but rather in outlying areas. A few plants, including coconut, mango, and sweet potato may have been cultivated along the salt pan berms. The majority of the sediment samples contain foraminifera, consistent with the presence of open water and possible salt pan production.

Comparison with Other Salt Pan Historic Properties within Kaka‘ako

Although no previous archaeological studies have been conducted in the current Block B East and Block C West project areas, potential historic salt pan remnants have been previously identified within the wider Kaka‘ako area (Hammatt 2013; and Morriss et al. 2013; Pammer et al. 2011).

Within the western portion of Kaka‘ako, in an area bounded by Halekauwila, South, Pohukaina, and Keawe Streets, potential historic salt pan remnants were identified by Pammer et al. (2011) within 21 test excavations, designated SIHP # 50-80-14-7190 (Figure 44). The identified salt pan remnants consisted of alternating layers of clay and peat overlying natural marine clay (Figure 45). As described by Pammer et al. (2011:239):

This A-horizon was typically observed directly overlying the natural marine clay (gley) and commonly at the same level as the water table, if not slightly below it. The striations of clay and peat suggest that this area was repeatedly used as a land surface which was exposed long enough to accumulate organic debris before being covered with clay. Based on research of the project area, it is suggested that this A-horizon is the result of the repeated flooding, drying, scraping and removal of salt during salt production. The clay observed within the peat may have been deliberately placed on the bottom of the salt bed to prevent the salty water from soaking into the ground. [Pammer et al. 2011]

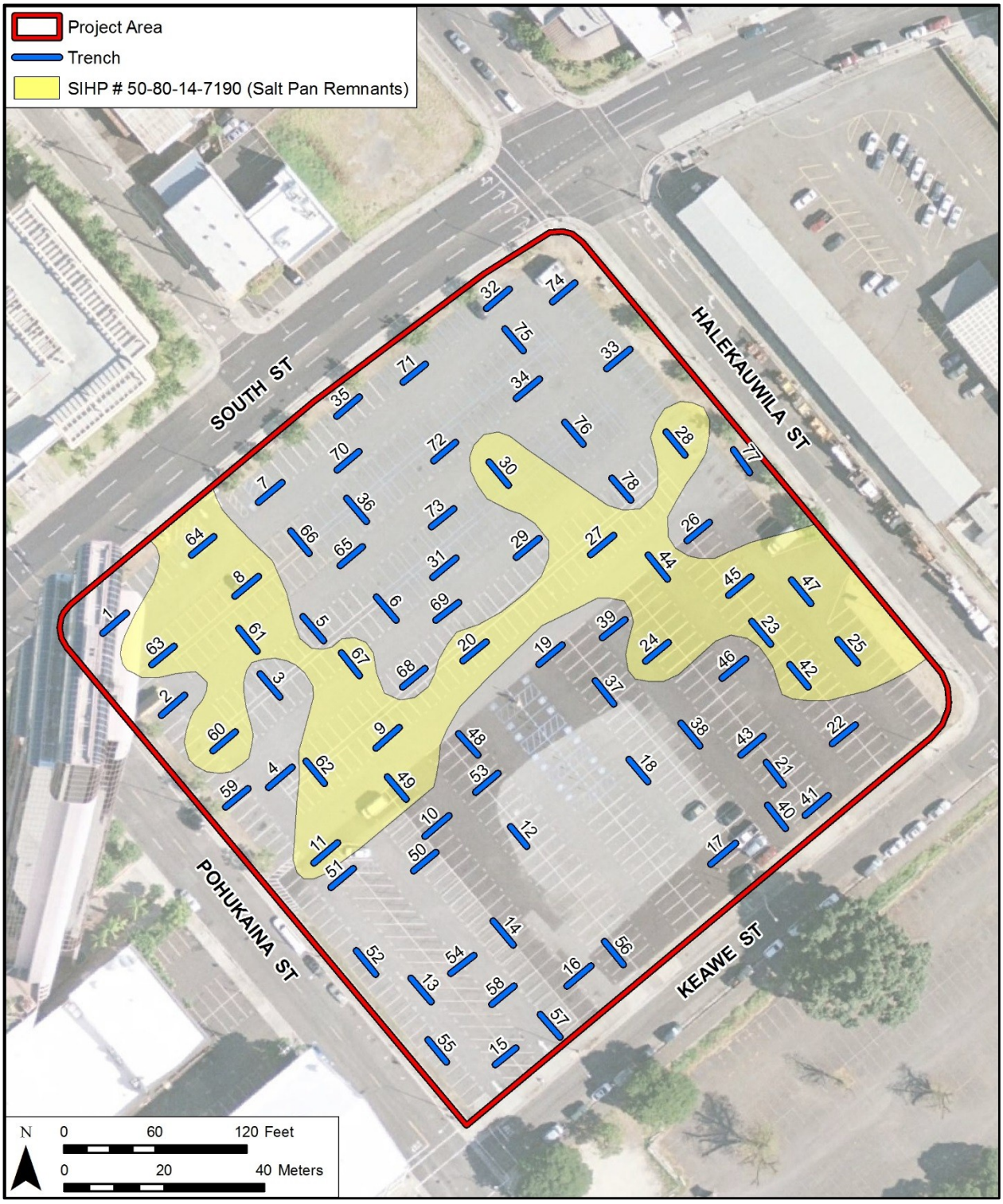

Figure 44. Figure from the Pammer et al. (2011) AIS report showing the location of potential historic salt pan remnants within western Kaka‘ako

Figure 45. Photograph of Test Trench 45 (Pammer et al. 2011) showing dark peat alternating with the lighter colored clay

Similar potential salt pan stratigraphy was subsequently identified within Pohukaina Street by Hammatt (2013) during the Honolulu High-Capacity Transit Corridor Project AIS (Figure 46). These salt pan deposits were considered an extension of SIHP # -7190 documented by Pammer et al. (2011). Within Test Excavation 230, a natural silty clay deposit containing lenses of peat was identified overlying natural marine sand (Figure 47, Figure 48). The alternating layers of peat and silty clay were observed to be comparable to the Pammer et al. (2011) sediments. Within Test Excavation 229, a potential salt pan berm was documented, consisting of an undulating berm of light grayish brown sandy clay with root inclusions (Figure 49, Figure 50).

The berm structure identified by Hammatt (2013) is markedly similar to the salt pan berm structures documented within the current study area. As with SIHP # -7655, the berm material in SIHP # -7190 appears to have been derived from local wetland or marine sandy clay sediments and formed into a retaining structure. The berm also evidenced significant disturbance to the underlying natural sediments during the berm construction process, as indicated by the near absence of these sediments. While the identified salt pan bed sediments differ somewhat from the thin laminated organic layers observed within the Blocks B East and C West project area historic salt pans (SIHP # -7655), they similarly consisted of alternating layers containing distinct organic inclusions. Notably, Test Excavations 14 (C West) and 22 (B East) did evidence a pattern of alternating peat and clay more comparable to the sediments found within SIHP # -7190, and were similarly interpreted as potentially representative of salt production processes, such as the scraping of the salt pan beds.

Within the southern portion of Kaka‘ako, in an area currently occupied by the Ala Moana Shopping Center, potential historic salt pan remnants were identified by Morriss et al. (2013) (Figure 51). Although the project area was located within an area identified as part of SIHP # 50-80-14-6636, the natural Kewalo wetlands, based on historic research this was also an area of historic salt production. Within this area, peat was observed as “distinct layers, usually directly above the [wetland] sandy clay, and as inclusions within the sandy clays” (Morriss 2013:170). Both pollen and phytolith analyses were conducted on the peat and natural wetland sediments in an attempt to ascertain whether salt pan sediments could be definitively identified in this area. Interestingly, the pollen record evidenced a potential change from a natural marsh environment to a less vegetated, possibly anthropogenic altered environment:

The pollen record from sample 6 (Trench 13) might reflect an anthropogenic change in the natural environment. While the pollen taxa from the underlying sediments reflect sedge marsh, the pollens from sample 6 indicate that the area was transformed into an open water or evaporative surface that did [not] support much vegetation. Cyperaceae (sedge) pollen, indicative of marshland, was virtually absent in sample 6. These findings correspond with, but do not prove, the interpretation that the area was utilized in the early 20th century for salt production. [Morriss et al. 2013:174]

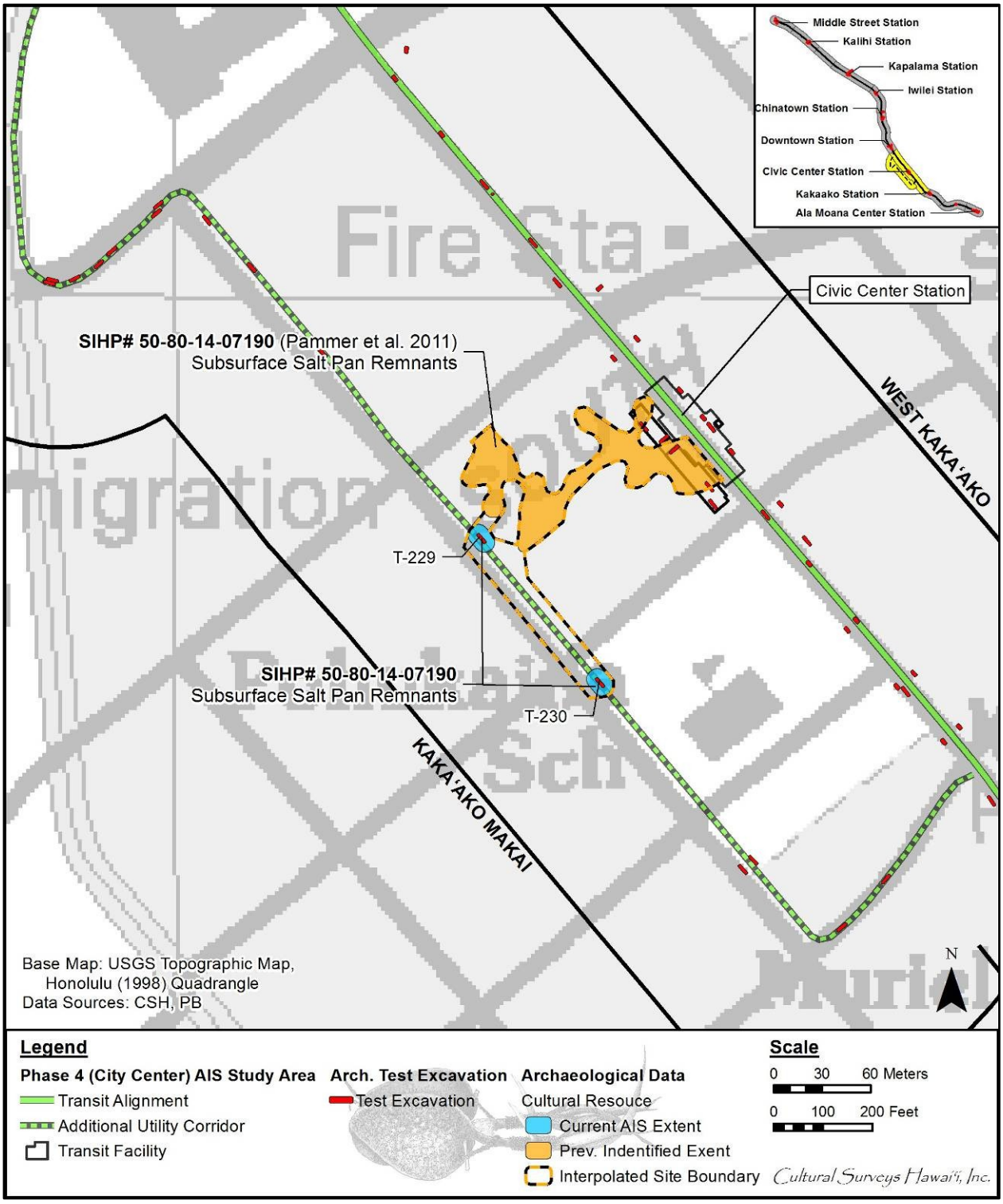

Figure 46. Figure from the Honolulu High-Capacity Transit Corridor Project AIS report, showing the location of SIHP # -7190 as identified by Pammer et al. (2011) and extended by Hammatt (2013)

Figure 47. Photograph of T-230 (Hammatt 2013), showing Stratum II clay and peat salt pan sediments (SIHP #-7190)

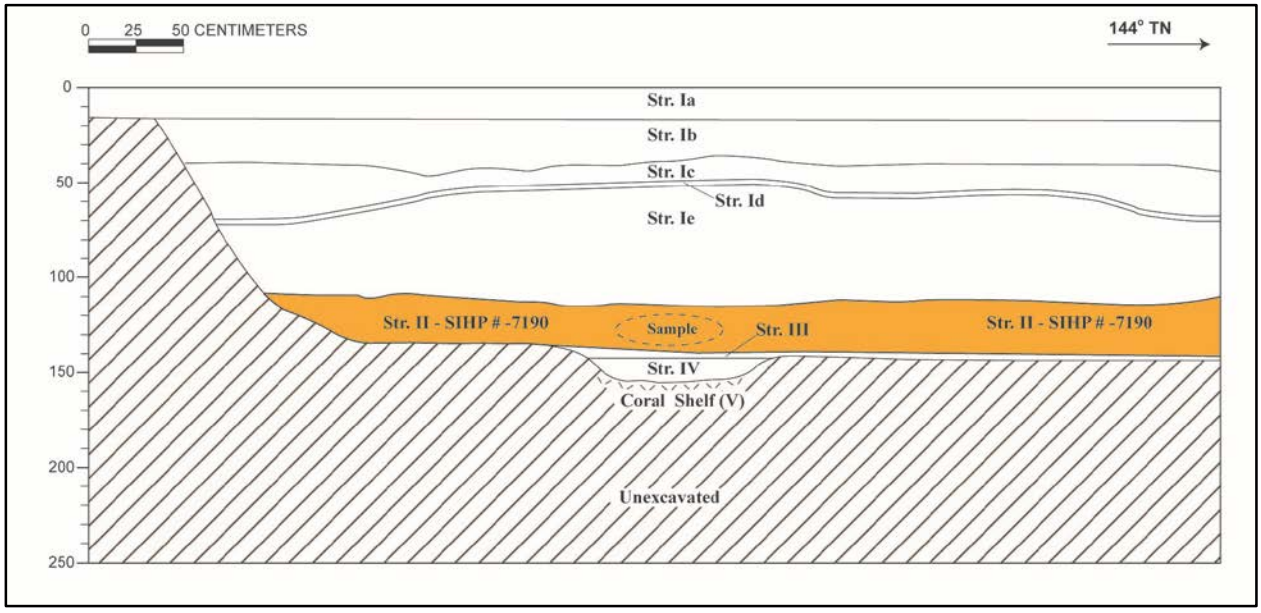

Figure 48. Profile of T-230 northeast wall (Hammatt 2013), showing Stratum II salt pan sediments (SIHP #-7190)

Figure 49. Photograph of T-229 (Hammatt 2013), showing possible a salt pan berm consisting of light grayish brown sandy clay overlying the coral shelf (SIHP #-7190)

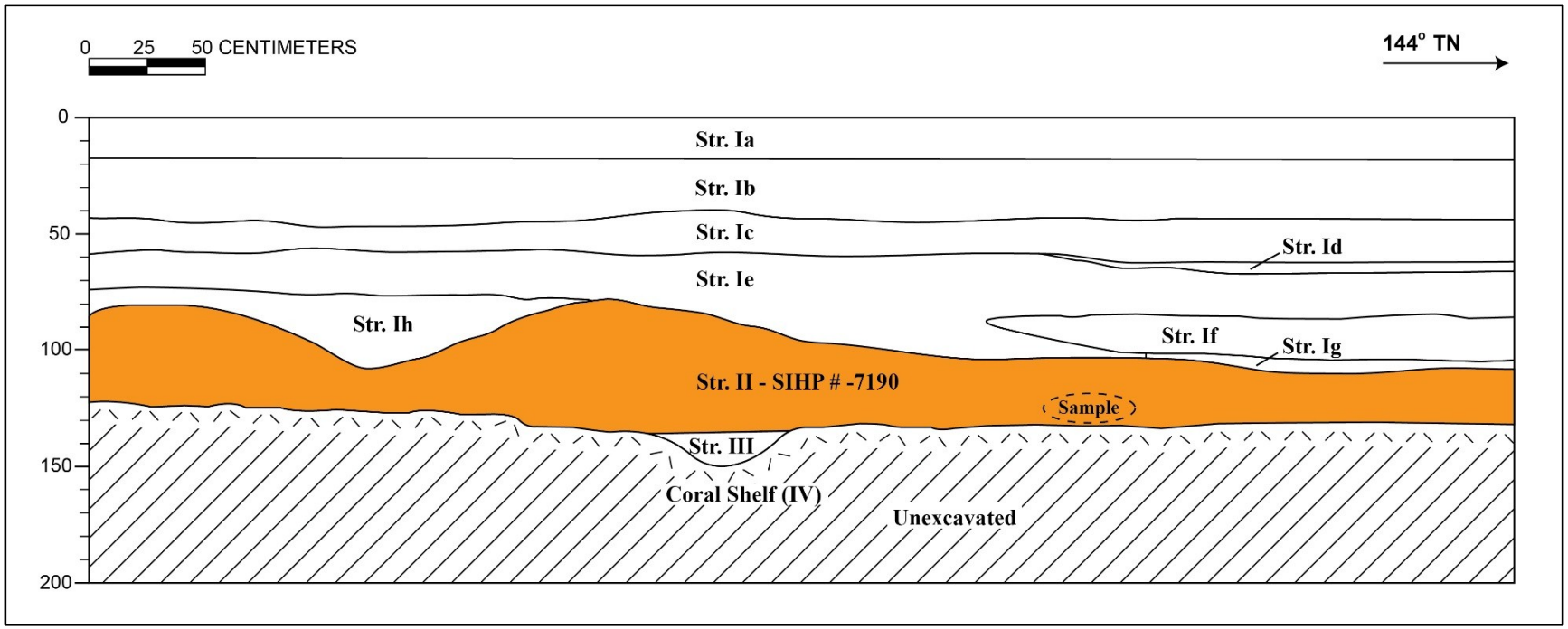

Figure 50. Profile of T-229 northeast wall (Hammatt 2013), showing a possible salt pan berm (Stratum II) designated as a component of SIHP #-7190

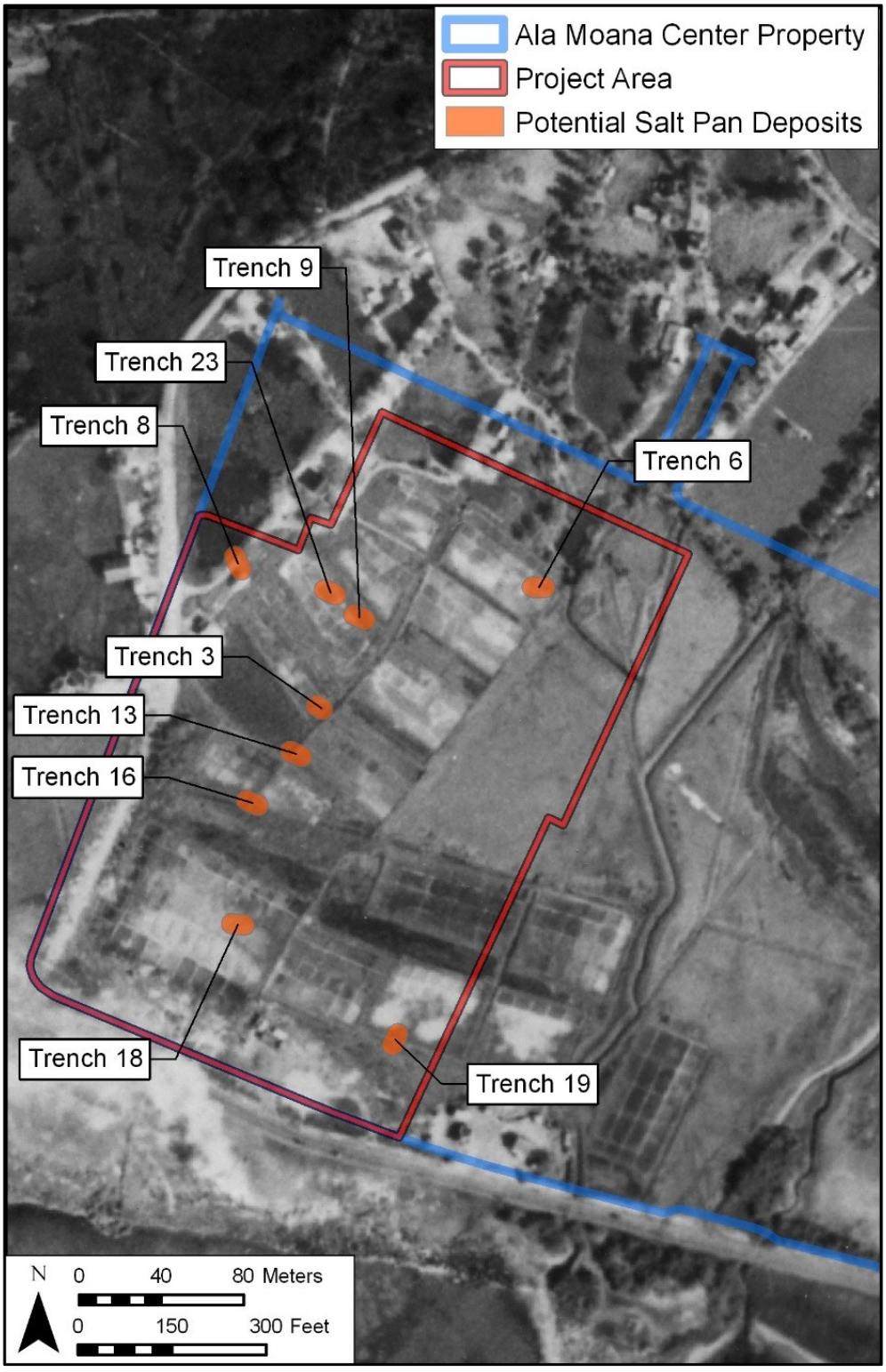

Figure 51. Figure showing the location of potential historic salt pan remnants documented by Morriss et al. (2013) within the Ala Moana Shopping Center area

Summary

SIHP # -7655 consists of a large complex of buried historic salt pan remnants located within the Ward Warehouse commercial center, extending across two contiguous project areas, Block C West and Block B East. The buried salt pan remnants are comprised of an interconnected system of man-made linear structural features (berms) and low-lying, level wetland sediments overlain by thin organic laminations (salt pan beds). Based on the results of the Block B East and Block C West AIS investigations, SIHP # -7655 is assessed as significant under Hawai‘i state historic property significance criterion “c” (embodies the distinctive characteristics of a type, period, or method of construction, represents the work of a master, or possesses high artistic value) and criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR §13-284-6. Based on the potential for SIHP # -7655 to provide further additional information related to the construction, content, and distribution of buried salt pan remnants within Kaka‘ako, a data recovery program is believed to be warranted.