Draft
Archaeological Inventory Survey Report for the Block B East Project, Kaka‘ako Ahupua‘a, Honolulu (Kona) District, O‘ahu
TMK: [1] 2-3-001:005 (por.)

Prepared for
Howard Hughes Corporation

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Management Summary

Reference	Archaeological Inventory Survey Report for the Block B East Project, Kaka‘ako Ahupua‘a, Honolulu (Kona) District, O‘ahu, TMK: [1] 2-3-001:005 (por.) (Sroat et al. 2014)
Date	July 2014
Project Number(s)	Cultural Surveys Hawai‘i, Inc. (CSH) Job Code: KAKAAKO 119
Investigation Permit Number	CSH completed the archaeological inventory survey (AIS) 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	VWL
Project Location	The Block B East project is a discrete project within the larger Ward Neighborhood Land Block 2 area. 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, to the southwest by Ala Moana Boulevard, to the southeast by a parking lot, and to the northwest by the Ward Warehouse complex. The project area is depicted on the 1998 Honolulu U.S. Geological Survey (USGS) 7.5-minute topographic quadrangle.
Project Description	The proposed Block B East project is a discrete project of HHC's 60.5-acre (24.5-hectare) Ward Neighborhood Master Plan, a long-range development plan of 20-plus years expected to evolve over time to fulfill the needs of the community. It follows guidelines set forth in the Mauka Area Plan of the Hawai‘i Community Development Authority (HCDA). The Block B East project consists of the construction of a high-rise residential tower with commercial space located on the ground floor. 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)
Area of Potential Effect (APE) and Survey Area Acreage	The project's APE is defined as the entire approximately 2.2-acre project area. The project area's surrounding built environment is urban (paved streets and low-rise commercial buildings).

Historic Preservation Regulatory Context	The proposed project is subject to Hawaiʻi State environmental and historic preservation review legislation (Hawaiʻi Revised Statutes [HRS] §343 and HRS 6E-42 and Hawaiʻi 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 prepared and submitted to the SHPD on 20 July 2012. An AISP (Sroat et al. 2014) for this project was accepted in an SHPD §6E Historic Preservation Review (LOG NO: 2013.6925; DOC NO: 1401SL19; see Appendix A). This archaeological inventory survey report was prepared to address the Block B East component of the Ward Neighborhood Master Plan and was prepared in accordance with the requirements for an archaeological inventory survey report as stated in HAR §13-276-5.
Fieldwork Effort	The fieldwork component of this archaeological inventory survey was conducted between 21 April 2014 and 9 June 2014. CSH archaeological field personnel consisted of Ena Sroat, B.A. (project director), Megan Hawkins, M.A, Michelle Pammer, B.A., Andrew Soltz, B.A., Abby Mierzejewski, B.S., Amanda Eggers, B.A., Tim Zapor, B.A., Jessica Leger, M.Sc., Scott Belluomini, B.A., Tara del Fierro, B.A., Tara Seaver, B.A., James Thain, B.A., Laura Vollert, B.A., Pua Guanzon, B.A., Jonas Madeus, B.A., Nifae Hunkin, B.A., and Melina Reveal, M.Sc. All fieldwork was conducted under the direction of the principal investigator, Matt McDermott, M.A
Consultation	Consultation with the SHPD, the Oʻahu Island Burial Council (OIBC), and recognized cultural descendents was conducted both during the course of AIS fieldwork and following the completion of fieldwork on 5 June 2014. Consultation included presentation to the OIBC of preliminary AIS results, discussion with the SHPD and cultural descendants concerning testing results and proposed test location shifts, and a cultural descendants' consultation meeting following the completion of AIS fieldwork. A consultation letter was also forwarded to the Office of Hawaiian Affairs (OHA) presenting the results of the AIS testing program.

Historic Property Significance	SIHP # 50-80-14-7655 consists of subsurface historic salt pan remnants, documented as laminated organic material and associated man-made berms. 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. The historic property reflects land-use activities related to historic salt pan operations, and has the potential to offer insight into these practice SIHP # 50-80-14-7656 consists of a previously identified, isolated human cranial fragment. SIHP # -7656 is assessed as significant under Hawai‘i state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) and criterion “e” (historic property has cultural significance to an ethic group, including, but not limited to, religious structures, burials, and traditional cultural properties) pursuant to HAR § 13-284-6. This assessment was based exclusively on the information it has provided and its cultural significance. SIHP # 50-80-14-7658 consists of buried historic surfaces, including asphalt, concrete, coral and tar pavement, oil-rolled surfaces, and fence-lines. SIHP # -7658 is assessed as significant under Hawai‘i state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR § 13-284-6. SIHP #-7658 has provided, and can potentially provide, additional information on twentieth century commercial infrastructure within Kaka‘ako. SIHP # 50-80-14-7659 consists of the concretized Ward Estate *‘auwai.* SIHP # -7659 is assessed as significant under Hawai‘i state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR § 13-284-6. This assessment was based on the historic property’s potential to provide information on land modification associated with the Kewalo reclamation project and subsequent urban development. SIHP # 50-80-14-7660 is a historic trash fill deposit, utilized to fill in an abandoned drain line box. SIHP # -7660 is assessed as significant under Hawai‘i state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR § 13-284-6. This assessment was based on the historic property’s potential to provide information on the urban expansion of Honolulu into Kaka‘ako.

Historic Properties Identified	Five historic properties were identified within the current project area: 1) State Inventory of Historic Properties (SIHP) # 50-80-14-7655, consists of subsurface historic salt pan remnants, documented as laminated organic material and associated man-made berms. The historic property reflects land-use activities related to historic salt production. 2) SIHP # 50-80-14-7656 consists of a previously identified, isolated human cranial fragment located within disturbed and reworked sand 3) SIHP # 50-80-14-7658, consists of 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. 4) SIHP # 50-80-14-7659 consists of the concretized Ward Estate *‘auwai.* 5) SIHP # 50-80-14-7660 is a historic trash fill deposit, utilized to fill in an abandoned drain line box.
Effect Recommendation	The proposed project will potentially affect five historic properties (SIHP #s -7655, -7656, -7658, -7659, and -7660) identified within the project area. CSH’s project specific effect recommendation is “effect, with agreed upon mitigation commitments.” The recommended mitigation measures will reduce the project’s potential adverse effect on significant historic properties.

Mitigation Recommendations	This AIS indicates that the Block B East project area contains: 1) historic salt pan remnants consisting of low-lying wetlands converted to salt pan basins enclosed by man-made berm structures, located beneath land reclamation fill within the central and *mauka* portions of the Block B East and Block C West project areas (SIHP # -7655); 2) disturbed and reworked Jaucas sand along the *makai* boundary of the Block B East project area containing a single human skeletal fragment (SIHP # -7656); 3) buried mid-twentieth century development land surfaces, consisting of asphalt, concrete, coral and tar pavement, and oil-rolled surfaces (SIHP # -7658), observed throughout the Block B East and Block C West project areas; 4) the buried, concretized Ward Estate *ʻauwai* (SIHP # -7659) within the center of Block B East; and; 5) a historic trash fill layer (SIHP # -7660) encountered with an abandoned concrete drain box located along the *makai* boundary of the Block B East project area. Due to the inherent limitations of any sampling strategy, however, it is possible that additional historic properties or features, potentially including human burials and non-burial archaeological deposits, may be uncovered during construction activities. The recommended mitigation measures for the five historic properties encountered within the Block B East project area (SIHP #s -7655, -7656, -7658, -7659, and -7660) include burial treatment, data recovery, and archaeological monitoring. It is a requirement of Hawaiʻi state burial law that the treatment of the previously identified burial sites within the project area (SIHP # -7656) be addressed in a project-specific burial treatment plan prepared for the consideration of the Oʻahu Island Burial Council (OIBC) (HAR §13-300-33). The burial treatment plan will incorporate appropriate input from SHPD, the recognized lineal/cultural descendants, and the OIBC. In consultation with the SHPD, it has been determined that an archaeological data recovery program is an appropriate mitigation for the historic salt pan remnants SIHP # 50-80-14-7655, located within the central and *mauka* portions of the project area and the concretized Ward Estate ʻauwai (SIHP # -7659), which extends through the western and central portions of the project area. This archaeological data recovery program would begin with an archaeological data recovery plan for the review and approval of the SHPD. An End of Data Recovery Fieldwork Letter Report would need to be accepted by the SHPD prior to the construction project breaking ground. The monitoring program will facilitate the identification and proper treatment of any archaeological deposits disturbed by project construction, and will enable collection of additional samples and information related to the five identified historic properties. The

	archaeological monitoring program will include additional documentation, sampling, and analysis of SIHP #s -7655, -7656, -7658, -7659, and -7660. Jaucas sand deposits present in the makai portion of the project area will be fully recorded and closely examined for potential historic properties. The details of the monitoring program will be included in the project's archaeological monitoring plan to be reviewed and approved by the SHPD.

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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 inventory survey report (AISR) for the Block B East 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 eastern portion of the Ward Warehouse commercial complex. It is bounded to the northeast by Auahi Street, to the southwest by Ala Moana Boulevard, to the southeast by a parking lot, and to the northwest by the Ward Warehouse complex. 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 Hawai‘i Community Development Authority (HCDA).

The 2.2-acre (0.89-hectare) Block B East project is part of the Ward Village Gateway project, which also includes the adjacent Block C West 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 B East project consists of the northern 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 and Document Purpose

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 this project was accepted by the SHPD in a letter dated 24 January 2014 (LOG NO.: 2013.6925, DOC. NO.: 1401SL19). This archaeological inventory survey report was prepared to address the Block C West component of the Ward Neighborhood Master Plan and was prepared in accordance with the requirements for an archaeological inventory survey report as stated in HAR §13-276-5.

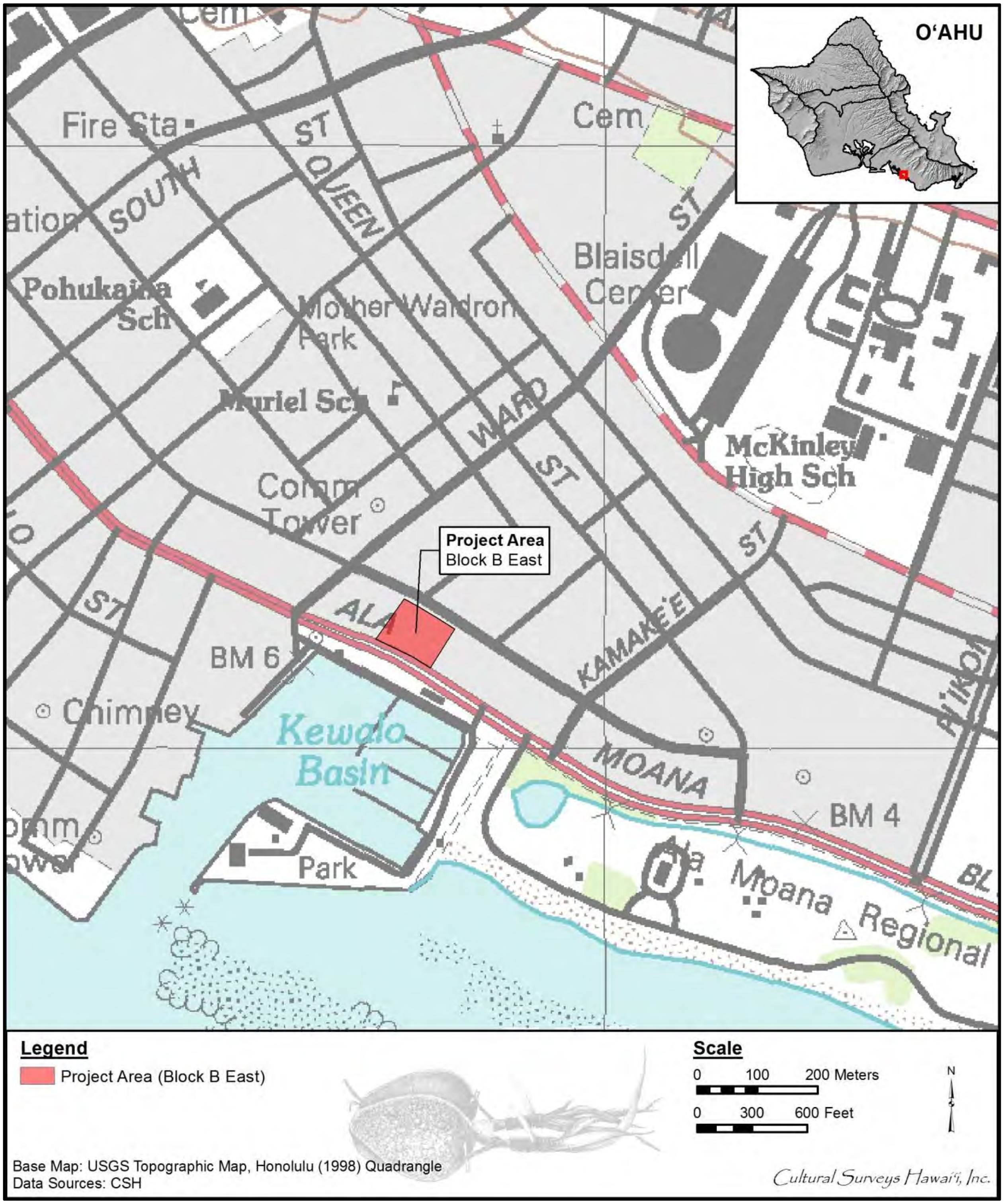

Figure 1. 1998 Honolulu USGS 7.5-minute topographic quadrangle showing the location of the Block B East project area south of the intersection of Ala Moana Boulevard and Ward Avenue

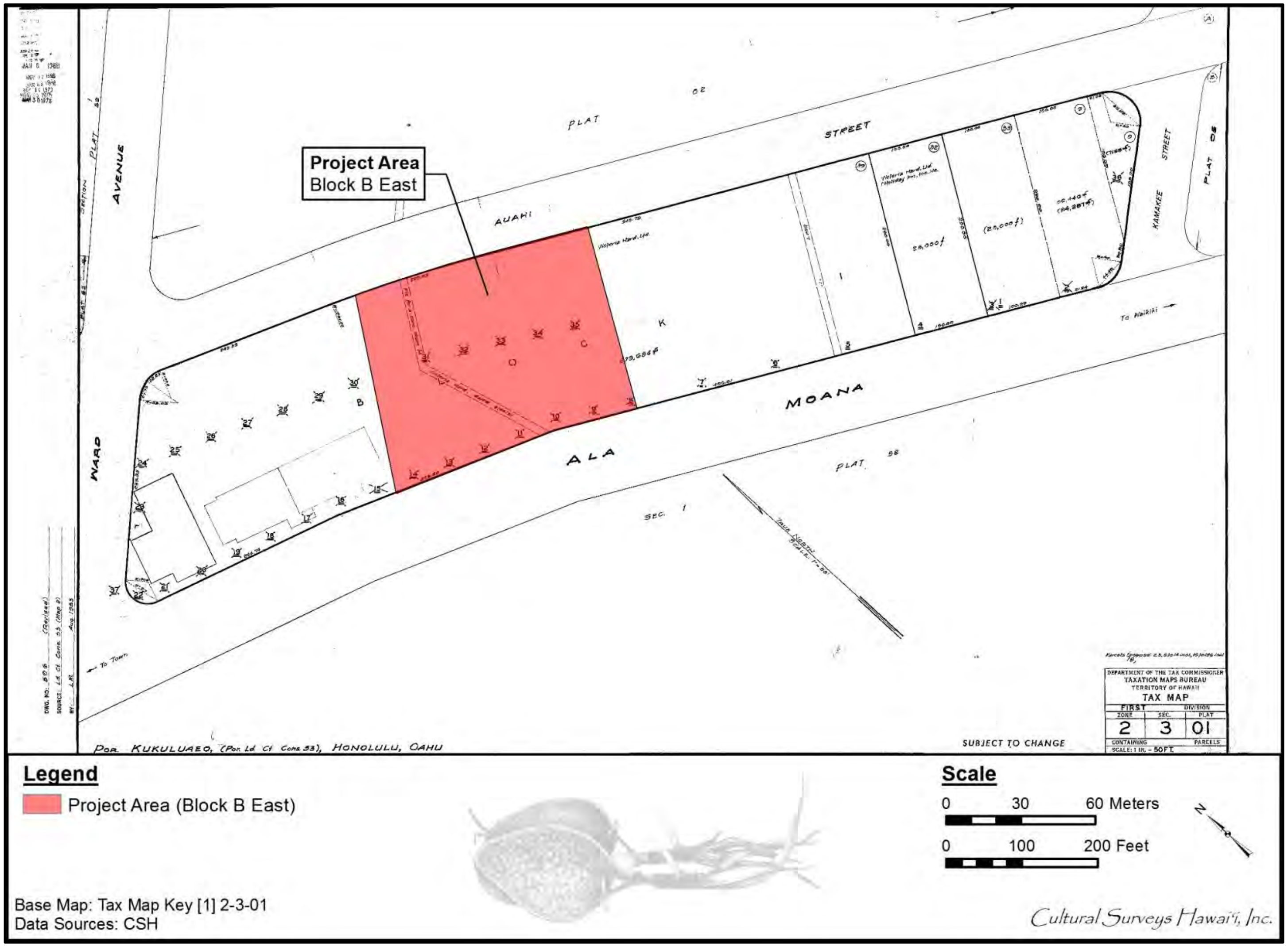

Figure 2. Tax map key (TMK): [1] 2-3-01, showing the location of the Block B East project area

Figure 3. Aerial photograph showing the location of the Block B East project area (base map: Google Earth 2013)

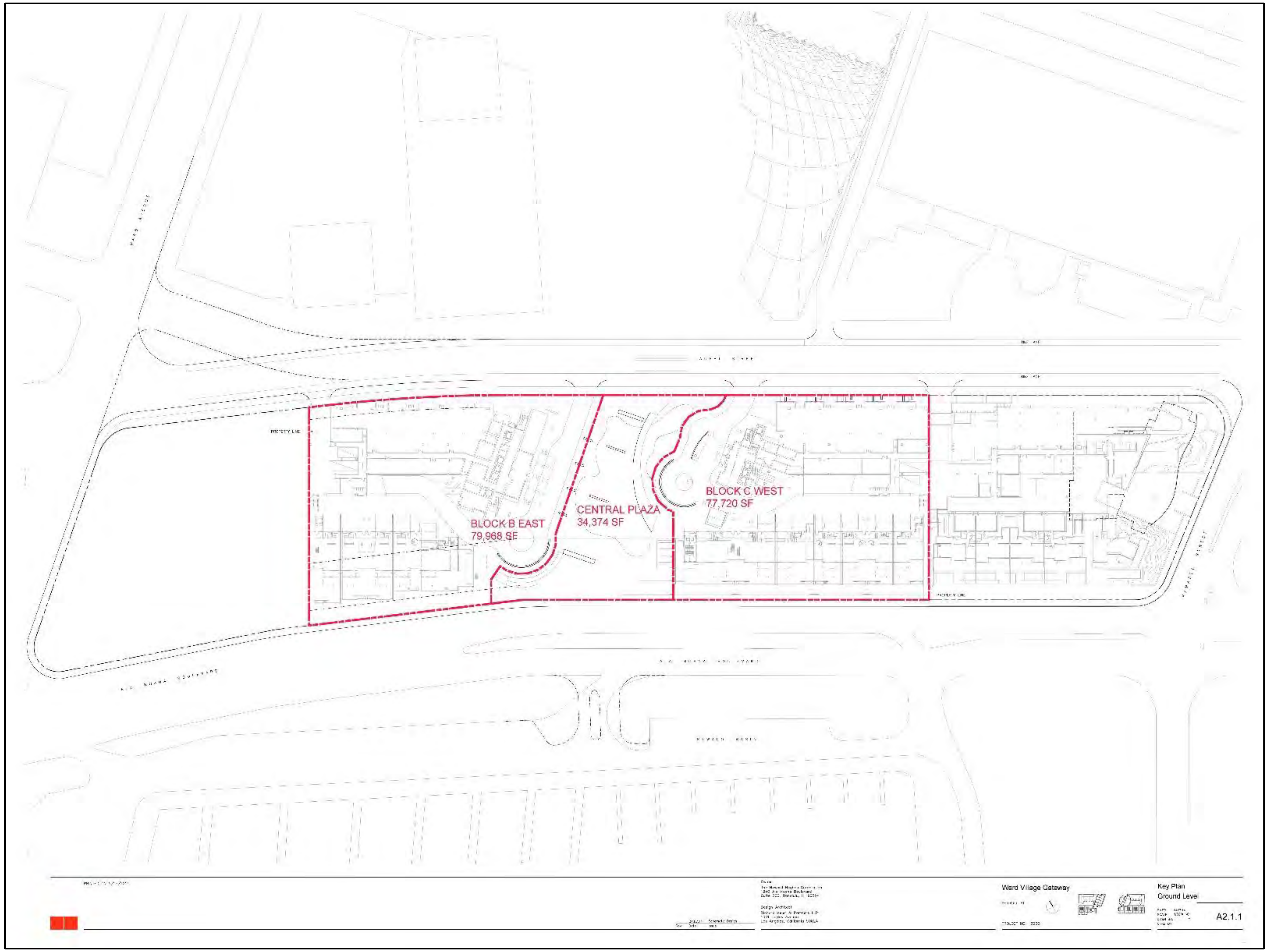

Figure 4. Project design showing the Ward Village Gateway building complex, straddling the Block B East and Block C West project areas, consisting of low-rise villas, residential towers, and commercial retail shops separated by a central plaza

1.3 Environmental Setting

1.3.1 Natural Environment

The Block B East project area is within a portion of Oʻahu 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 Block B East 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).

While fill materials will likely be found throughout the project area, the coastal location of Block B East indicates natural Jaucas sand (JaC) may be encountered underneath portions of the Block B East 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.

1.3.2 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.

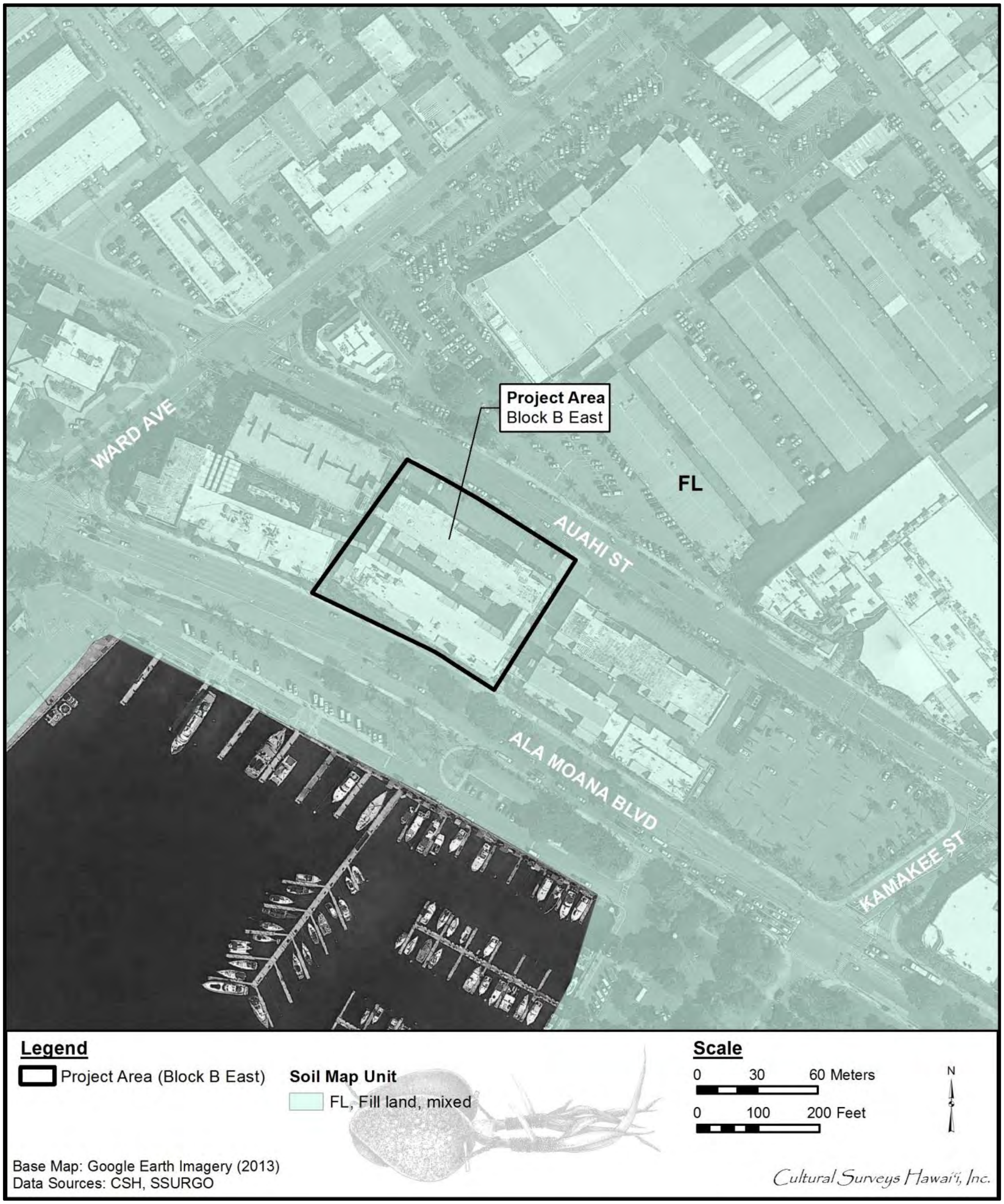

Figure 5. Overlay of *Soil Survey of the State of Hawaii* (Foote et al. 1972), showing Fill lands (FL) within and surrounding the Block B East project area (base map: Google Earth 2013)

Section 2 Methods

2.1 Field Methods

This section details the research design and methods used by CSH personnel during fieldwork, laboratory analysis, and the preparation of this archaeological inventory survey report for the Block C West project. This research design (from the SHPD accepted AISP for this project) meets specifications for an archaeological inventory survey plan outlined in HAR § 13-284-5.

2.2 Research Design

The research efforts described in the AISP (Sroat et al. 1014) are archaeological research activities, and as such, should be governed by a research design. A research design is essentially a plan that clearly identifies:

1) What is currently known about the research subject;
2) The research objective(s) and the methods that will be used to answer the research objective(s);
3) How the results of the investigation will be interpreted and evaluated.

The objective of this AISR is to identify, document, and assess any subsurface historic properties (non-burial and burial) encountered in the project area, and to make mitigation recommendations to address any project impacts on them.

2.3 Research Objectives

Based on historic background research and previous archaeological investigations (see Sections 3 and 4), four specific research objectives were formulated within the AISP for the Block B East project area:

1) An 1883 map of Honolulu Water Works System shows an extensive system of grid-like salt pans within Kaka‘ako, extending at its southern limit across the majority of the Block B East project area. To what extent are these salt pans still extant beneath twentieth century reclamation fill deposits? Are remnant salt pans similar in depositional sequence (alternating layers of peat and clay) to documented salt pans in the northern portion of Kaka‘ako (refer to Pammer et al. 2011)? Can salt pan structures be identified (e.g. berms, drainage channels)? Have nineteenth century historical salt pans significantly altered or removed underlying natural strata and/or cultural deposits?
2) Does the Block B East project area contain culturally enriched deposits beneath the fill layers, in particular along the *makai* boundary of the project area? If so, how can we characterize the function, spatial distribution, and chronology of these deposits? Is there any evidence of traditional Hawaiian use of this coastal area (e.g. habitation, burials, fishing practices)?
3) Is there evidence of pre- and/or early post-Contact Hawaiian cultural use of the northern corner of the project area in the location of LCA 1903:2 (documented as containing a fishpond and house lot)?

4) What evidence exists of the various reclamation projects within the Block B East project area and can any deposits be correlated with specific reclamation projects?

2.4 Pedestrian Survey

A 100 percent coverage pedestrian inspection was conducted within the project area in order to locate any surface historic properties. The pedestrian survey concluded that the entire project area has been mechanically modified as a result of development of the Ward Warehouse commercial complex, including significant elevation of the ground surface above the surrounding environment. No surface historic properties were identified within the project area. Accordingly, fieldwork within the project area focused on a program of subsurface testing to locate any buried cultural deposits that may be present beneath the modern land surface and to facilitate a thorough examination of stratigraphy within the project area.

2.5 Subsurface Survey

According to background research, potential archaeological cultural resources located within the project area include pre- and post-Contact traditional Hawaiian cultural deposits (particularly along the *makai* boundary of the project area), human burials, a portion of the Kaka‘ako salt pans, fishpond remnants and/or traditional Hawaiian cultural activity within the northern corner in the location of LCA 1903:2, remnants of the pre-channelized Ward Estate *‘auwai*, remnants of mid-twentieth century commercial development, and reclamation fill deposits, including historic trash layers or incinerated fill.

In order to locate and document these potential archaeological cultural resources, thirty-three test excavations were proposed for Block B East, distributed generally throughout the project area (Figure 6). Ten of these test excavations specifically targeted identified locations of potential cultural resources: the *makai* edge of the project area where Jaucas sands were anticipated (TE 30 through TE 33); the northern corner of the project area in the vicinity of LCA 1903:2 (TE 1 through TE 3); and the estimated location of the pre-channelized Ward Estate *‘auwai* (TE 6, TE 19, and TE 32).

During the AIS investigation, following the survey strategy provisions of the AISP, a certain number of the test excavations required slight locational shifts (Figure 7). Trench location shifts were due largely to the presence of dense subsurface utility corridors. The main obstacles consisted of a complex of subsurface utilities identified within the central parking lot, running parallel in a northwest-southeast orientation, and a nexus of utility lines originating from a utility control center located in the northwest portion of the project area alongside the Ward Warehouse concrete parking structure. These utility nexuses necessitated relocation of TE 15 and slight shifts in the location of TE 17, TE 20, TE 21, and TE 24.

Several of the interior test excavations were also shifted or relocated, due in part to logistical issues—the Ward Warehouse center is an active commercial complex with operational tenants, and in part to the results of the AIS exterior test excavations. The initial stage of the subsurface testing program concentrated on the exterior (parking lot and landscape) test excavations. These test excavations consistently documented similar stratigraphy throughout the paved areas of the project area, consisting of historic salt pan remnants. Based on these results, it was determined that the *mauka* Ward Warehouse commercial building was located within this very well documented

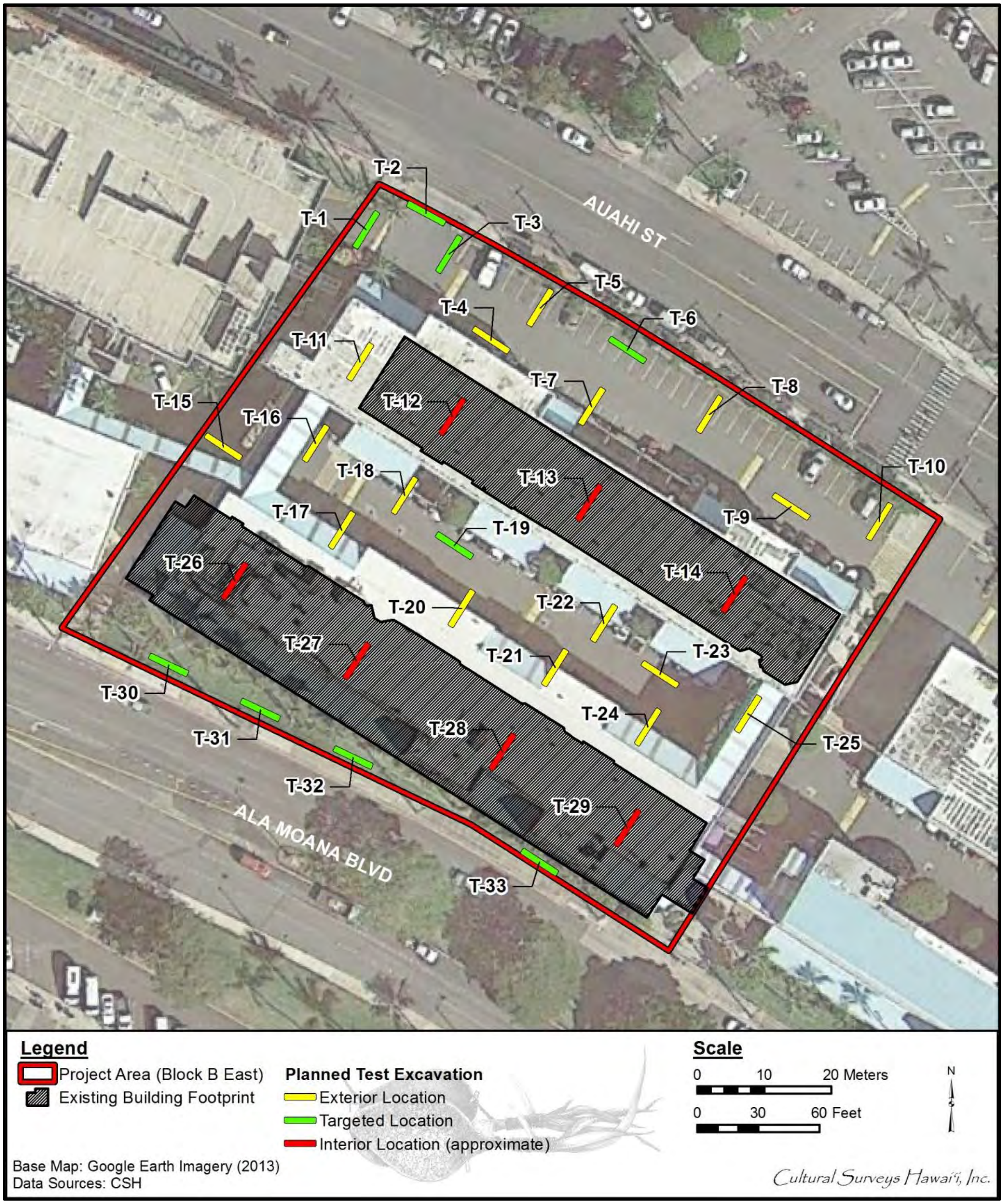

Figure 6. Aerial photograph showing the location of the AISP-proposed Block B East test excavations (base map: Google Earth 2013)

Figure 7. Aerial photograph showing the location of the Block B East project area AISR test excavations (base map: Google Earth 2013)

stratigraphic zone; therefore Test Excavations 13 and 14 were relocated to the *makai* project area boundary in an effort to provide additional documentation in the area surrounding an isolated human cranial fragment find (T-31). Within the *makai* Ward Warehouse commercial building, four test excavations were shifted slightly in a lateral direction, but still remained within the building footprint area. All significant shifts in test excavation locations were discussed with and approved by the SHPD and the recognized cultural descendants participating as cultural monitors during the AIS investigation (see Section 2.10 –Consultation Effort).

During the timeframe of the Block B East AIS fieldwork, refinement of the Ward Neighborhood Master Plan Project's engineering plans also necessitated a slight expansion of the Block B East project area. The contiguous Blocks B East and C West are located in what is proposed to become the Ward Village Gateway. The Gateway project consists of two areas of low-rise villas, residential towers, and commercial retail shops separated by a central plaza (see Figure 4 – in Introduction). In order to accommodate these plans, the northwestern (‘Ewa) boundary of the Block B East project area was expanded slightly into the adjacent Block B West project area, thereby encompassing five test excavations originally proposed for the Block B West AIS. The five new test excavations were designated TE 34 through TE 37. Four of the new test excavations remains within their proposed vicinity, while one (TE 37) was relocated, due to the utility center nexus, to target findings within TE 7.

On average, the test excavations measured 0.6 by 6.1 m (2 by 20 ft), constituting 139.08 sq m (1,520 sq ft). All test excavations extended to the coral shelf or to below the water table, unless obstructed by subsurface infrastructure.

Initial excavation methods consisted of saw cutting of the asphalt parking lot surface (exterior excavations) or commercial flooring (interior excavations). Removal of the underlying fill deposits was undertaken via backhoe (exterior) or via mini-excavator (interior). Fill deposits included various layers of base course material, imported fill sediments, and hydraulic fill. Archaeologists and project cultural monitors observed the excavation and removal of all fill sediments from the excavation.

Per the requirements of the AISP, all natural sand deposits underlying historic fill layers necessitated excavation by hand, while all other natural non-sand deposits allowed for slow removal via thin mechanized shovel scrapes. Natural marine sandy clay deposits were encountered only along the *makai* boundary of the project area; while no undisturbed Jaucas sand deposits were identified in this area, these natural deposits were nevertheless hand excavated based on the potential for encountering traditional Hawaiian cultural deposits and/or burials in this zone. The remainder of the Block B East project area encountered non-sand deposits and was excavated by backhoe, with controlled pauses in which to enter the test excavations and investigate the stratigraphy.

All artifacts and historic pit features found in situ were mapped in plan or profile view and were excavated by hand if feasible. Large pit features containing rubble or historic material, were sampled using a combination of hand and mechanized excavation methods. Artifact assemblages in fill deposits and historic pit features primarily consisted of very small fragments not readily identifiable as diagnostic or construction debris; in most cases these historic fragments were photographed and documented in the field, reducing sample sizes collected for further analysis and curation. Photographs and analysis information pertaining to artifacts documented in the field were included in the report. In cases where larger, diagnostic artifacts were encountered, these were collected for further analysis within the CSH laboratory.

The stratigraphy in each test excavation was drawn and photographed. The sediments were described for each of the test excavations using USDA soil description observations and terminology. Sediment descriptions included Munsell color, texture, consistence, structure, plasticity, origin of sediments, descriptions of any inclusions such as cultural material and/or roots and rootlets, lower boundary distinctiveness and topography, and other general observations.

Photographs were taken of the general project area and in-progress work, recording on-the-job procedures, personnel, work conditions, and the area’s natural and/or built environment. Additionally, overview and profile view photographs were taken of each trench showing stratigraphic sequence, the presence/absence of utilities, and any possible cultural or construction-related stratigraphic features. A photographic scale was included as appropriate, and the general orientation was noted for each photograph.

The location of the majority of the exterior test excavations was recorded using a Trimble Pro XH mapping grade GPS unit with real-time differential correction. This unit provides sub-meter horizontal accuracy in the field. GPS field data was post-processed, yielding horizontal accuracy between 0.5 and 0.3 m. GPS location information was converted into GIS shape files using Trimble’s Pathfinder Office software, version 2.80, and graphically displayed using ESRI’s ArcGIS 9.1. Interior test excavation locations, as well as exterior test excavations located in areas inaccessible to accurate GPS readings, were recorded using tape measurements and a project area footprint map and added to GIS data layers.

The SHPD was notified immediately of all human skeletal remains (*iwi kūpuna*) identified during subsurface testing. All human skeletal remains encountered during the AIS fieldwork were handled in compliance with HRS § 6E-43 and HAR § 13-300 in consultation with OIBC and the SHPD. With the concurrence of the SHPD, additional testing within the vicinity of the *iwi kūpuna* was conducted (TE 13 and TE 14).

2.6 Sampling Methods

Sampling of potential archaeological cultural resources was conducted in an effort to characterize the deposits and to help establish the spatial extent and chronology of their deposition. As the project area primarily consisted of buried archaeosediments associated with historic salt pan remnants as well as underlying natural wetland and/or marine sediments, sampling consisted of a combination of bulk sediment samples and column samples.

Column samples targeting potential salt pan remnants were collected from cleaned test excavation sidewalls or from large multi-strata bulk samples collected in discrete chunks, which were later cleaned and processed within sterile laboratory conditions. Column samples included subsamples divided by stratigraphic layer (e.g., organic layer, natural wetland clay) in order to obtain the entire depositional sequence. Bulk samples were collected from archaeosediments throughout the project area (i.e. salt pan berm and salt pan bed sediments) as well as the natural underlying wetland sediments. These bulk samples were collected in order to better characterize and cross-compare within the CSH laboratory. Bulk samples were typically 1 to 5 liters in volume. All sediment sample collection locations were recorded on test excavation documents and the sediment samples were labeled with provenience information.

Historic artifacts, typically consisting of small fragments, and construction debris identified within historic pits and fill layers were documented within test excavation forms and photographed. Larger diagnostic historic artifacts, including glass bottles and ceramic fragments as well as wooden post remnants found within historic post mold pits, were collected for further analysis in the laboratory.

2.7 Laboratory Methods

Materials collected during AIS fieldwork were identified and catalogued at CSH’s laboratory facilities on O‘ahu. Analysis of collected materials was undertaken using standard archaeological laboratory techniques. Artifacts were washed, sorted, measured, weighed, described, photographed, and catalogued. In general, artifact analysis focused on establishing, to the greatest extent possible, material type, function, cultural affiliation, and location and age of manufacture.

2.7.1 Traditional Hawaiian Artifacts

No traditional Hawaiian artifacts were identified during the Block C West AIS investigation.

2.7.2 Historic Artifacts

Historic artifacts were identified using standard reference materials and resources available on the internet (e.g., Elliott and Gould 1988; Fike 1987; Kovel 1986; Lehner 1988; Lindsey 2010; Lockhart 2004-2010; Toulouse 1971; Whitten 2009; and Zumwalt 1980). Analyzed materials were tabulated and presented within Section 5 of this AISR. As noted above, the results of the historic artifact analysis were used to better characterize the age, function, and potentially the cultural affiliation of the associated archaeological deposits.

2.7.3 Bulk Sediment Samples

Bulk samples collected during the AIS investigation were analyzed within the CSH laboratory. The bulk samples consisted of archaeosediments and natural wetland and/or marine sediments, and were collected in order to further characterize and compare the samples. Additionally, close-up photographs were taken of collected salt pan bed organic sediments in order to help distinguish and document any distinctive traits.

2.7.4 Vertebrate Material

Non-human skeletal material was identified to the lowest possible taxa at the CSH laboratory using an in-house comparative collection and reference texts (e.g., Olsen 1964; Schmid 1972; and Sisson 1953).

2.7.5 Invertebrate Material

No invertebrate remains were collected during AIS fieldwork.

2.7.6 Wood Taxa Identification

No charcoal samples were identified or collected during AIS fieldwork.

2.7.7 Radiocarbon Dating

No appropriate samples were collected during AIS fieldwork.

2.7.8 EDXRF Analysis

No lithic artifacts were collected during AIS fieldwork.

2.7.9 Pollen/Micro Charcoal Particle Analysis

Six column sediment samples were collected during AIS fieldwork, prepared, weighed, and sent to PaleoResearch Institute of Golden, Colorado for pollen analysis and micro charcoal quantification. A chemical extraction technique based on flotation was used to remove pollen from the sediment matrix. After additional treatments, a light microscope was used to count and identify pollen grains within the sample.

2.8 Disposition of Collections

All collections, including samples and artifacts, resulting from the AIS process, are considered to be the property of the land owner, Victoria Ward, Limited. At the conclusion of the AIS investigation, all collected materials have been temporarily curated at the offices of Cultural Surveys Hawai‘i, Inc. in Waimanalo, O‘ahu, until a permanent curation facility can be decided upon, based on consultation with the landowner, the SHPD, and any other potential stakeholders.

2.9 Document Review

Background research included: a review of previous archaeological studies on file at the SHPD/DLNR library; review of historical documents at Hamilton Library of the University of Hawai‘i, the Hawai‘i State Archives, the Mission Houses Museum Library, the Hawai‘i Public Library, and the Archives of the Bernice Pauahi Bishop Museum; study of historic photographs at the Hawai‘i State Archives and the Archives of the Bishop Museum; study of historic maps at the Hawai‘i State Land Survey Division; and study of historic maps and photographs at the CSH library. This research provided the environmental, cultural, historic, and archaeological background for the project area. The sources consulted were used to formulate a predictive model regarding the expected types and locations of historic properties that may be located in the project area.

2.10 Consultation Effort

On July 10, 2012, as part of the Ward Neighborhood Master Plan Project consultation effort, the Howard Hughes Corporation (HHC) coordinated an informational meeting with recognized cultural descendants for the Ward Village Shops Project in order to introduce the Ward Neighborhood Master Plan Project, as well as present results of the recent supplemental archaeological inventory survey for the Ward Village Shops Phase II Project. Attendees included Kaka‘ako cultural descendants (Ka‘anohi Kaleikini, Keala Norman, Kepo‘o Keli‘ipa‘akaua, and Kahili Norman), O‘ahu Island Burial Council (OIBC) representative Hinaleimoana Wong-Kalu, HHC representatives (John Simon, David Striph, and Nick Vanderboom), CSH principal investigator Matt McDermott, and Ku‘iwalu cultural consultant Dawn Chang. Prior to this meeting, all cultural descendants were mailed a hard copy of the archaeological literature review and predictive model study (O’Hare et al. 2012) completed for the Ward Neighborhood Master Plan Project as part of its historic preservation review process and as a cultural and historical resource document. Cultural descendants were also mailed a copy of CSH’s cultural impact assessment for the subject project (Cruz et al. 2012). A summary of the Ward Neighborhood Master Plan Project was provided by HHC Vice President of Development, Nick Vanderboom,, focusing on the upcoming initial portions of the project and development of archaeological inventory survey (AIS) plans for Blocks C, K, and O. Mr. Vanderboom also communicated HHC's desire to coordinate with the Office of Hawaiian Affairs (OHA) and Kamehameha Schools (KS), given their ownership of large tracts of land within Kaka'ako, and to develop cultural guidelines for the project. The cultural descendants were very supportive of the idea of incorporating *mo'olelo* (stories) of the area into the Hawaiian architecture and the use of native plants within the landscaping designs. They further suggested that resource gardens where Native Hawaiians could gather native plants could be established. In terms of the project's archaeological investigations, the cultural descendants were assured that AIS plans and AIS investigations would be prepared and conducted for each phase of the development and that the descendants would be kept informed of Master Plan developments and archaeological investigations.

Also invited to the July 10, 2012 meeting was Mr. Manny Kuloloio, a cultural descendant of the Honolulu and Kaka'ako area. Mr. Kuloloio called Ms. Chang the following day to express his regret at being unable to attend the meeting. As a follow-up, Mr. McDermott of CSH called Mr. Kuloloio to discuss any input he might have regarding development of the Ward Neighborhood Master Plan Project and AIS plans. Mr. Kuloloio acknowledged receipt of the archaeological literature review and predictive model document, but did not have any specific comments at this time.

On July 20, 2012, Nick Vanderboom of HHC and Matt McDermott of CSH met with the SHPD Administrator, Dr. Pua Aiu, and the SHPD O'ahu Lead Archaeologist, Dr. Susan Lebo, to present an overview of the Ward Neighborhood Master Plan Project. Copies of the project's background research studies, a draft cultural impact assessment (Cruz et al. 2012) and a draft archaeological literature review and predictive model study (O'Hare et al. 2012), were submitted to SHPD at the meeting. Mr. Vanderboom explained the documents' requirement by the Hawai'i Community Development Authority (HCDA) as part of the development approval process and their function as planning aides in the development of the project's AIS plans. A brief presentation of the upcoming Blocks C, K, and O project areas was then followed by discussions regarding the limitations of AIS testing within in-use buildings and the proposed sampling strategy, including both within and outside existing structures.

SHPD agreed with the approach of using the predictive model study as the overarching background section for the Master Plan development, with individual AISPs for different construction phases/project areas which would focus on the specific footprint of each individual project area and refer to the predictive model for more general Kaka'ako background information. Dr. Lebo stated the individual AISPs should clearly describe in the methodology section how historic artifacts would be treated and should include a discussion regarding the assignation of historic property numbers to historic fill layers that can be linked to specific deposition activities and events, such as the Kaka'ako incinerator fill layer.

On November 6, 2013, an informational meeting concerning proposed AIS testing strategies for Blocks B East, C West, I, and M of the Ward Neighborhood Master Plan Project was held for recognized cultural descendants. Attendees included Kaka'ako cultural descendants (Keala Norman, Ka'anohi Kaleikini and *'ohana* members), OIBC representative Hinaleimoana Wong-Kalu, HHC representatives (David Striph, Race Randle, and Nick Vanderboom), CSH principal investigator Matt McDermott, and Ku'iwalu cultural consultant Dawn Chang. Mr. McDermott reviewed the Ward Neighborhood Master Plan Project context, the historic background of the four project parcels, and previous archaeological studies within the vicinity. The archaeological testing strategy for each block project area was then presented, including the constraints imposed by testing within active commercial centers. The OIBC representative and cultural descendants expressed support for the proposed testing strategies and the extent of archaeological testing. Discussion also included the possibility of commencing limited AIS work within Blocks I and M prior to the SHPD approval of the AISPs. At the present moment, a percentage of the interior commercial space within the project areas is unoccupied by tenants and thus more easily accessible for archaeological excavation. Given the difficulties of excavating within in-use commercial space, the cultural descendants and OIBC representative were amenable in this particular case to limited excavation prior to approval of the AISPs. It was resolved that the SHPD would be consulted regarding possible early testing within these project areas.

Prior to the cultural descendants' meeting, Matt McDermott of CSH contacted Edward Halealoha Ayau and Kihei Nahalea of Hui Mālama I Nā Kūpuna O Hawaiʻi Nei in order to provide notification of the upcoming projects and the scheduled consultation meeting as well as to inquire whether a representative of Hui Mālama would be interested in participating in upcoming consultation meetings. On November 5, 2013, Mr. Ayau responded that attendance at the consultation meetings would not be necessary and that alternative forms of communication would be sufficient (e.g. email, telephone, mail, Skype). On November 15, 2013, Mr. Nahalea confirmed that Mr. Ayau should continue to be the point of contact for Hui Mālama.

On November 8, 2013, consultation letters concerning the four upcoming projects (Blocks B East, C West, I, and M), as well as three additional upcoming projects (Blocks B West, G, and N East), and the proposed testing strategies were mailed to the Office of Hawaiian Affairs (OHA), Hui Mālama I Nā Kūpuna O Hawaiʻi Nei, the OIBC, and the SHPD (History and Culture Branch).

At the November 13, 2013 OIBC monthly meeting, Mr. Vanderboom of HHC introduced the the four proposed projects (Blocks B East, C West, I, and M) to the OIBC and Mr. McDermott provided a PowerPoint presentation of the historical and archaeological background of the project parcels and the proposed AISP testing strategies. No public comment was received.

On November 18, 2013, an additional cultural descendants' consultation meeting was held. Dr. Susan Lebo of the SHPD was present for this meeting as well as cultural descendants (Mana Caceres, Kekaimalino Kaopio, JR Williams, Keala Norman, Kaʻanohi Kaleikini, and Kalā Kaleikini), OIBC Kona representatives (Hinaleimoana Wong-Kalu and Jonathan Scheuer), HHC representatives (Nick Vanderboom, Race Randle, John Simons, and David Striph), CSH principal investigator Matt McDermott), and Kuʻiwalu cultural consultant Dawn Chang. Following a brief PowerPoint presentation by Mr. McDermott describing the four project areas, background research, and the proposed archaeological testing strategy, the cultural descendants reaffirmed their approval of the proposed AIS testing strategy. The cultural descendants also reaffirmed acceptance of limited AIS testing within vacant interior commercial space prior to SHPD approval of the AISPs, with the understanding that this would not set a precedent for future projects. Following discussion regarding this matter, it was agreed that in this particular circumstance, in which the AISPs were prepared as part of the Ward Neighborhood Master Plan Project's settlement agreement and not at the request of the SHPD, it would be acceptable for limited AIS fieldwork to proceed while the AISPs were still under SHPD review. It was understood that the final SHPD-approved AISPs may require revisions to the testing strategy; however, any revisions would likely not affect the need to excavate the proposed interior test excavations.

A follow-up email was sent by Matt McDermott on November 21, 2013 to Dr. Lebo summarizing the November 18, 2013 consultation meeting and the agreement of meeting participants to allow limited interior space test excavations within the project areas prior to the SHPD-approval of the AISPs.

AIS fieldwork for the Block B East project area commenced on 21 April 2014. Following completion of the exterior test excavations, Matt McDermott met with Dr. Susan Lebo of the SHPD in order to provide a brief outline of preliminary results and to discuss the shifting or relocation of several interior test excavations. As discussed within Section 2.5, six interior test excavations were proposed to be shifted or relocated based on the AIS results and logistical difficulties. Based on the preliminary AIS results, which documented a large area of buried historic salt pan remnants within the majority of the project area, Dr. Lebo agreed that two of the interior excavations (T-13 and T-14) could be relocated to the *makai* edge of the project area in order to provide more testing in an area containing an isolated human cranial fragment, and four test excavations (T-26 through T-29) could be shifted laterally within the *makai* Ward Warehouse building to alleviate access issues. The proposed relocations and rationale were also discussed with recognized cultural descendant and project area cultural monitor, Ka‘anohi Kaleikini, who agreed to the relocations/shifts.

On 14 May 2014, Matt McDermott also presented an overview of the Ward Neighborhood Master Plan Project’s ongoing AIS fieldwork, including the Blocks B East, C West, and I project areas. The discussion focused on a summary of the *iwi kūpuna* (human skeletal remains) finds documented within Block I and Block B East.

On 16 June 2014, a follow-up meeting was held with the project area’s recognized cultural descendants. Attendees included CSH principal investigator Matt McDermott, Kaka‘ako cultural descendants (Keala Norman, Mana Caceres, Ka‘anohi Kaleikini and *‘ohana* members), OIBC representatives Hinaleimoana Wong-Kalu and Jonathan Scheuer, and HHC representatives (David Striph, Race Randle, Nick Vanderboom, and John Simons). Matt McDermott provided a summary of the recently completed test excavation results from both Block B East and Block C West, as well as of the ongoing AIS excavations within Block I. The discussion and cultural descendants’ concerns focused on the burial finds within Block I. There were no concerns expressed regarding the Block C West AIS testing or findings.

Following completion of the Blocks B East and C West AIS fieldwork on 16 June 2014, a consultation letter was mailed to the Office of Hawaiian Affairs (OHA) on 20 June 2014 (see Appendix D). The major findings of the two AIS investigations were provided and any comments and/or concerns requested from OHA. The consultation letter specifically noted the presence of a disturbed, isolated cranial fragment within the *makai* portion of Block B East.

Section 3 Background Research

3.1 Traditional and Historical Background

3.1.1 Explanation of Place Names

As noted in the introduction, the project area is within the Kakaʻako Community Development District. However, the boundary of this development district is not the same as the ancient boundary of Kakaʻako. The development district is comprised of the *ʻili* (land section) of Kakaʻako and lands once known as Kaʻākaukukui, Kukuluāeʻo, and Kewalo, and even smaller areas—portions of *ʻili*—called Kawaiahaʻo, Honuakaha, Kaʻalaʻa, ʻĀpua, ʻAuwaiolimu, Pualoalo, Puʻunui, and Kolowalu. The Block B East project area is within the ʻ*ili* of Kukuluāeʻo (Figure 8).

The land called Kukuluāeʻo was named for the Hawaiian stilt bird (*Himantopus himantopus*), also called *kukuluāeʻo,* 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 Kaʻākaukukui. Salt was formerly made there."

John Papa ʻĪʻī mentions some of these lands while discussing early nineteenth century trails in the Honolulu/Waikīkī area (Figure 9). The fact that the trail traversed this region—characterized by ponds, marshlands and *loʻi* (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" (ʻĪʻī 1959:89).

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

3.2 Legendary Accounts

The Block B East project area is located in an area called Kukuluāeʻo on historic maps. The place name Kakaʻako is found in various legends and traditions, but Kukuluāeʻo 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 Puʻukea may have once been located in Kukuluāeʻo. This *heiau* is mentioned in a *mele* (chant) to the chief Huanuikalalaʻilaʻi, who was born in Kewalo, the land section north and adjacent to Kukuluāeʻo.

ʻO Hua-a-Kamapau ke ʻliʻi	Hua-a-Kamapau the chief
O Honolulu o Waikīkī	Of Honolulu, of Waikīkī
I hanau no la i kahua la i ***Kewalo,***	Was born at **Kewalo**,
ʻO Kālia la kahua	Kālia was the place [the site]

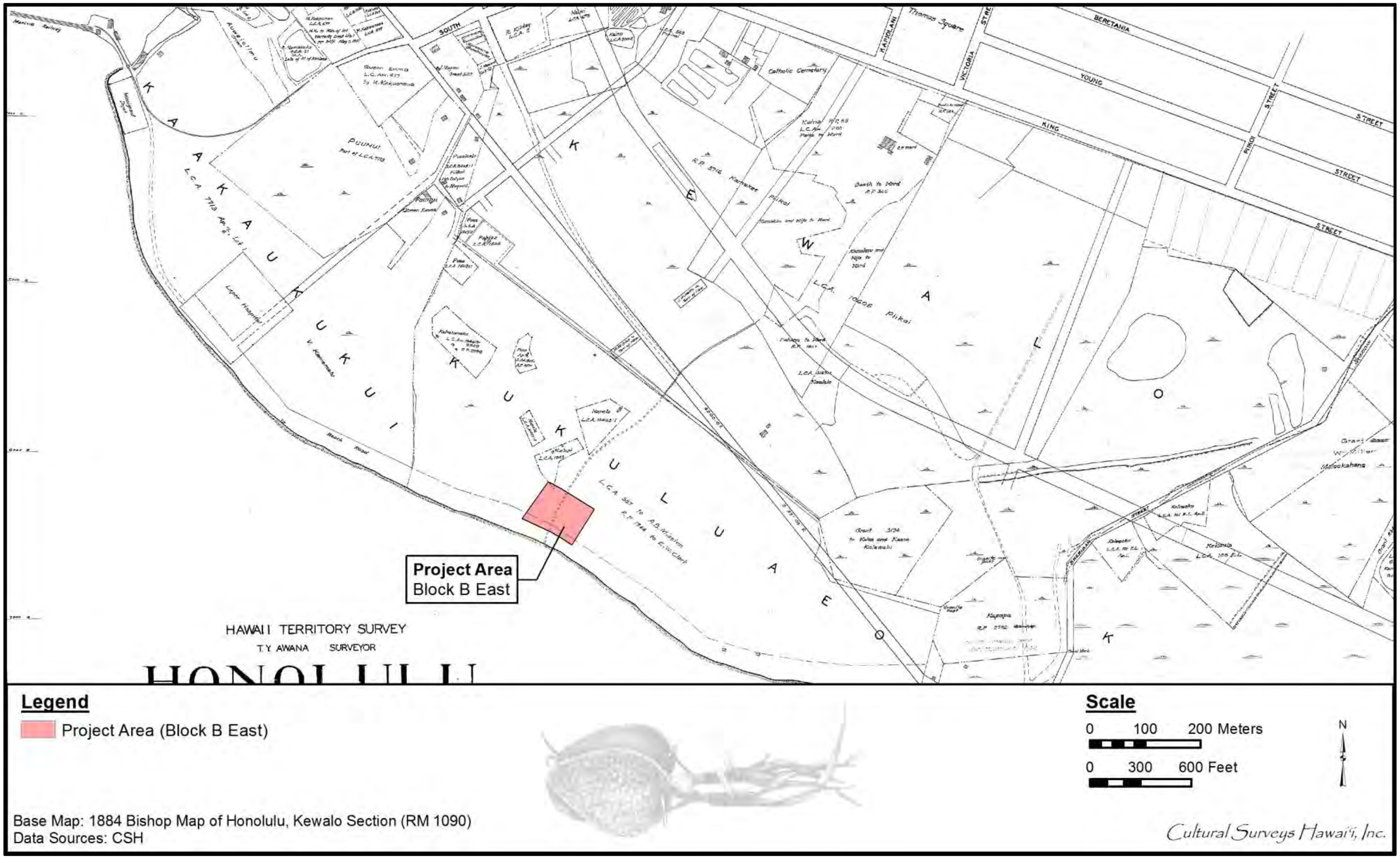

Figure 8. 1884 map of Honolulu, Kewalo Section (portion), by S.E. Bishop, showing place names and Land Commission Award (LCA) locations within and near the project area (Hawai‘i Land Survey Division, Registered Map 1090)

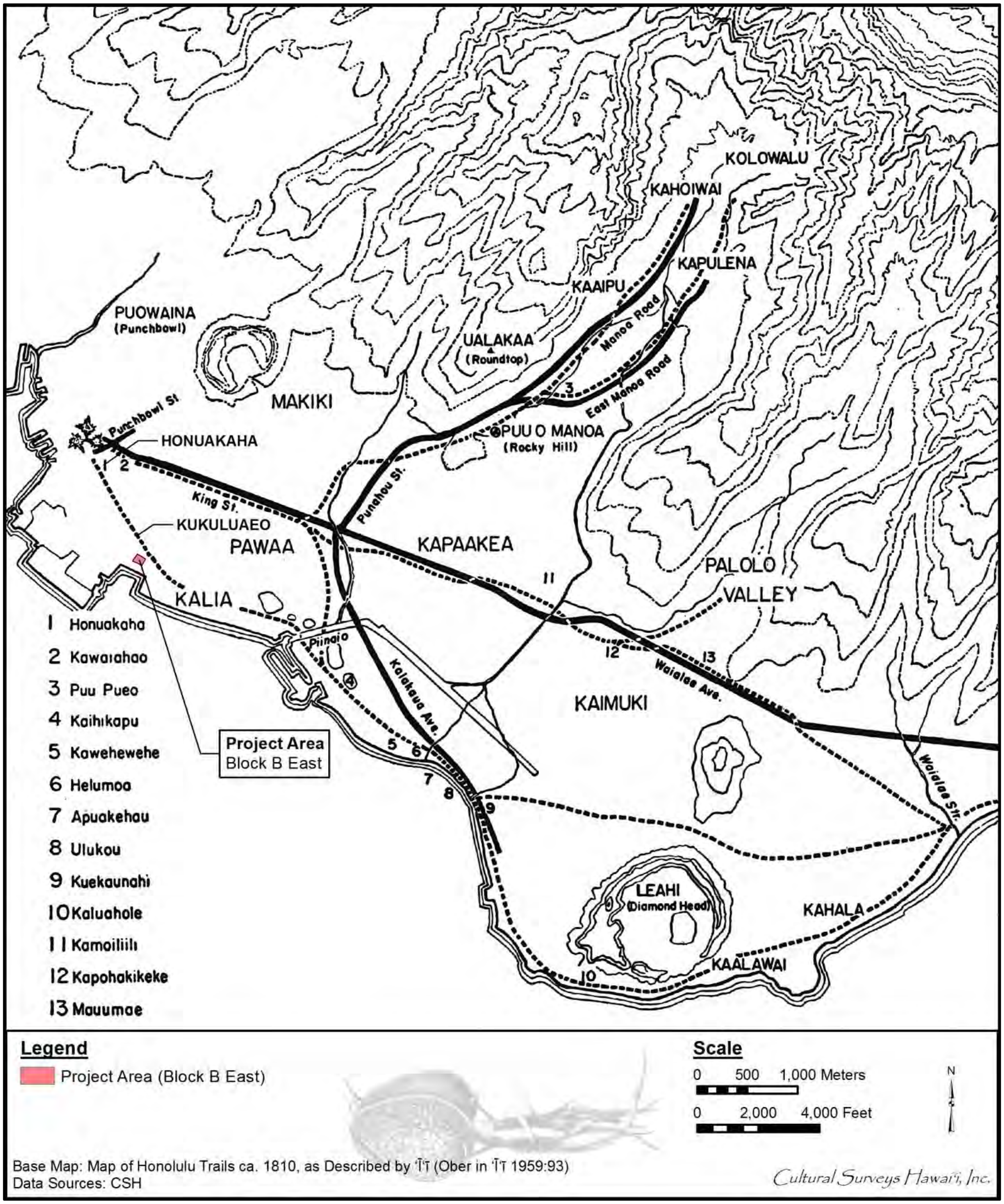

Figure 9. Early nineteenth century (ca. 1810) trails on the southwest coast of Oʻahu (illustration by Gerald Ober from ʻĪʻī 1959:93), showing the location of Honuakaha, Kukuluāeʻo, and Kālia

O Makiki la ke ēwe,	At Makiki the placenta,
I Kānelāʻau i Kahehuna ke piko,	At Kānelāʻau at Kahehuna the navel cord,
I Kalo i Pauoa ka ʻaʻa;	At Kalo at Pauoa the caul;
I uka i Kahoʻiwai i Kanaloahoʻokau . . .	Upland at Kahoʻiwai, at Kanaloahoʻokau . . .
[Kamakau 1991:24]	

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

[*Ka makaua ua kahi o ʻEwa*]	[The increasing "first rain" of ʻEwa]
Ua puni ka iʻa o Mokumoa,	Overcomes the fish of Mokumoa,
Ua kau iʻa ka nene;	Washes up fish to the nene plants;
Ua haʻa kalo haʻa nu;	Lays low the taro as it patters down;
Haʻa ka iʻa o kewalo,	Lays low the fish of Kewalo,
Haʻa na ʻualu o Pahua,	Lays low the sweet potatoes of Pahua,
Haʻa ka mahiki i ***Puʻukea****,*	Lays low the mahiki grass at **Puʻukea**,
Haʻa ka unuunu i Peleʻula,	Lays low the growing things at Peleʻula
Haʻa 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 ʻai ʻna ka iʻa o Maunalua*] . . .	[Eating the fish of Maunalua] . . .

The chant mentions the *mahiki* grass of Puʻukea 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 ʻ*akiʻaki*, 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 *ʻakiʻaki* 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 Kukuluāeʻo coast was a good habitat and thus a favored place for healers to collect this type of grass. The literal meaning of Puʻukea is "white hill" (Pukui et al. 1974:199), although it may have alternate meanings. Puʻukea is also the name of a small land division within the ʻ*ili* of Kukuluāeʻo, mentioned in at least two Land Commission Awards, 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 ʻ*ili* it is located within, so it is possible that Puʻukea Heiau was also near the junction of Halekauwila and Cooke streets. The majority of the house sites in the mid-nineteenth century in Kukuluāeʻo 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 *puʻu kea* (white hill).

From these legendary accounts it can be seen that Kukuluāeʻo 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 Puʻukea 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.

3.3 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 Nuʻuanu 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 Kukuluāeʻo 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 Kukuluāeʻo 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 Kukuluāeʻo 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 Kakaʻako 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 10) 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 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 11) when Kawaiaha‘o Church was still a long grass-thatched building and one made in 1853 (Figure 12) 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

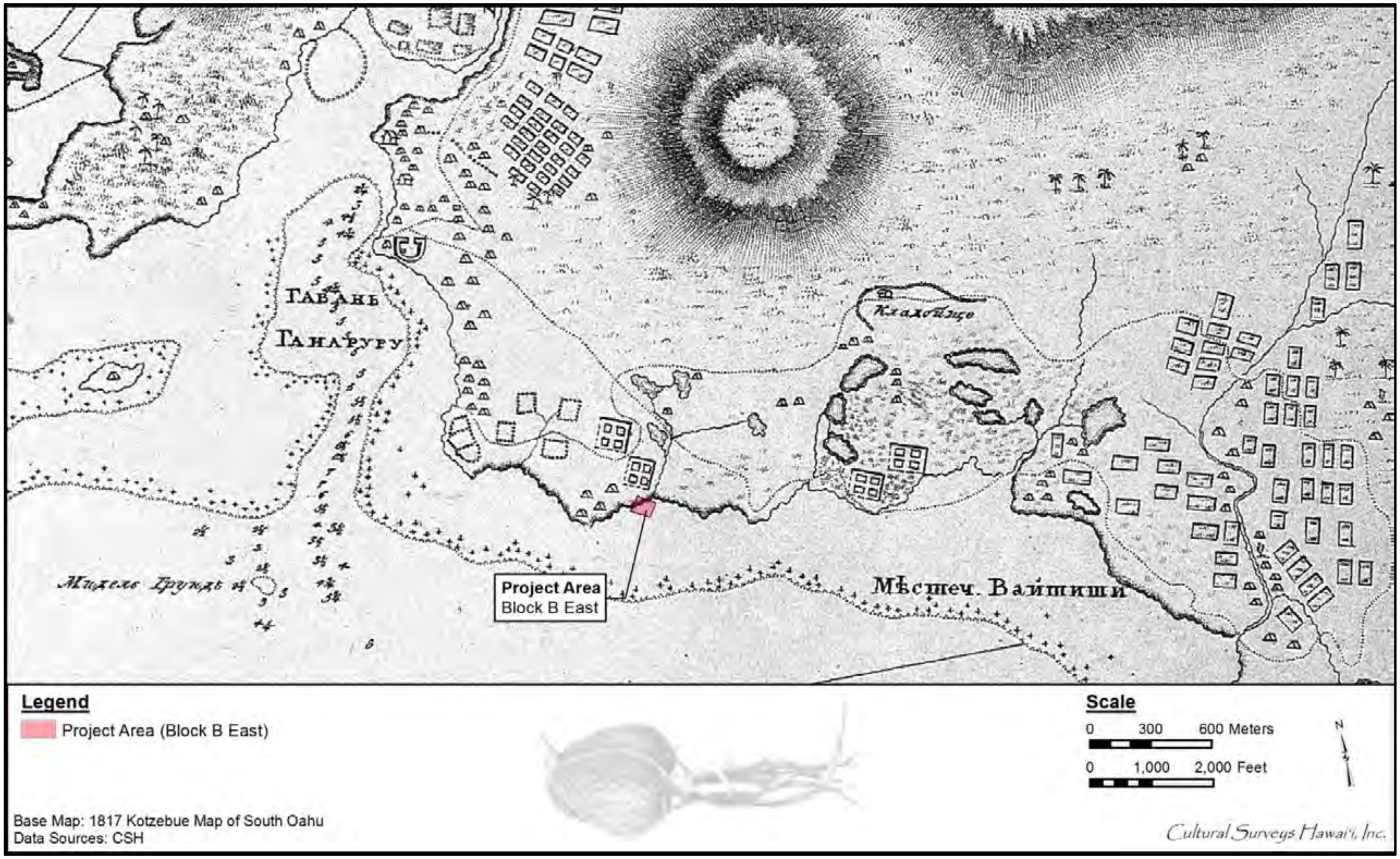

Figure 10. The 1817 map by Otto von Kotzebue of the Russian ship *Rurick* shows taro *lo‘i*, fishponds, and salt pans in Honolulu and Waikīkī; few habitations are depicted along much of the shoreline portions near the project area (map reprinted in Fitzpatrick 1986:48-49). (Note: Although geo-referencing in this map places the project area offshore, in historic times the block was always back from the shore)

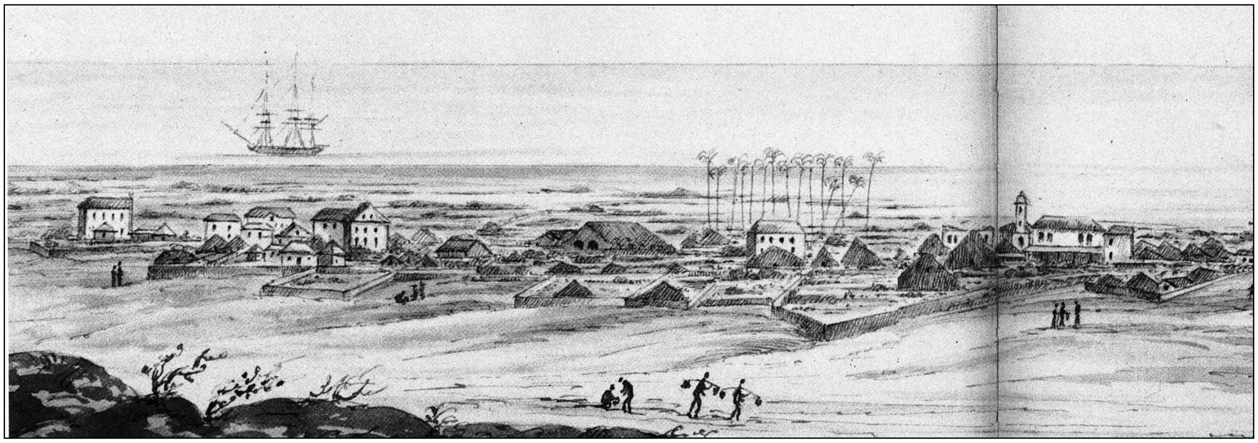

Figure 11. "Town of Honolulu: Island of Woahoo: Sandwich Islands," portion of 1834 sketch by anonymous illustrator; the project area is west and south (left and back) of Kawaiaha'o Church, the long thatched structure in the center of the sketch (original sketch at Bernice Pauahi Bishop Museum; reprinted in Grant 2000:64-65)

Figure 12. "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)

covered by King Street). The project area would be *makai* and left (east) of the church along the shore. An 1887 photograph (Figure 13 and Figure 14) of the area also shows the marshy nature of the area, with only scattered houses near the ponds or near the shore *makai* of Kawaiahaʻo 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).

3.4 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 Hawaiʻi, the *aliʻi,* 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 *aliʻi* 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 *ʻili* of Kukuluāeʻo (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 B. 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 Kawaiahaʻo 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 B]

In the Māhele, however, this sea land became "detached" from the Mānoa award and was instead given to the pastor of the Kawaiahaʻo 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 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]

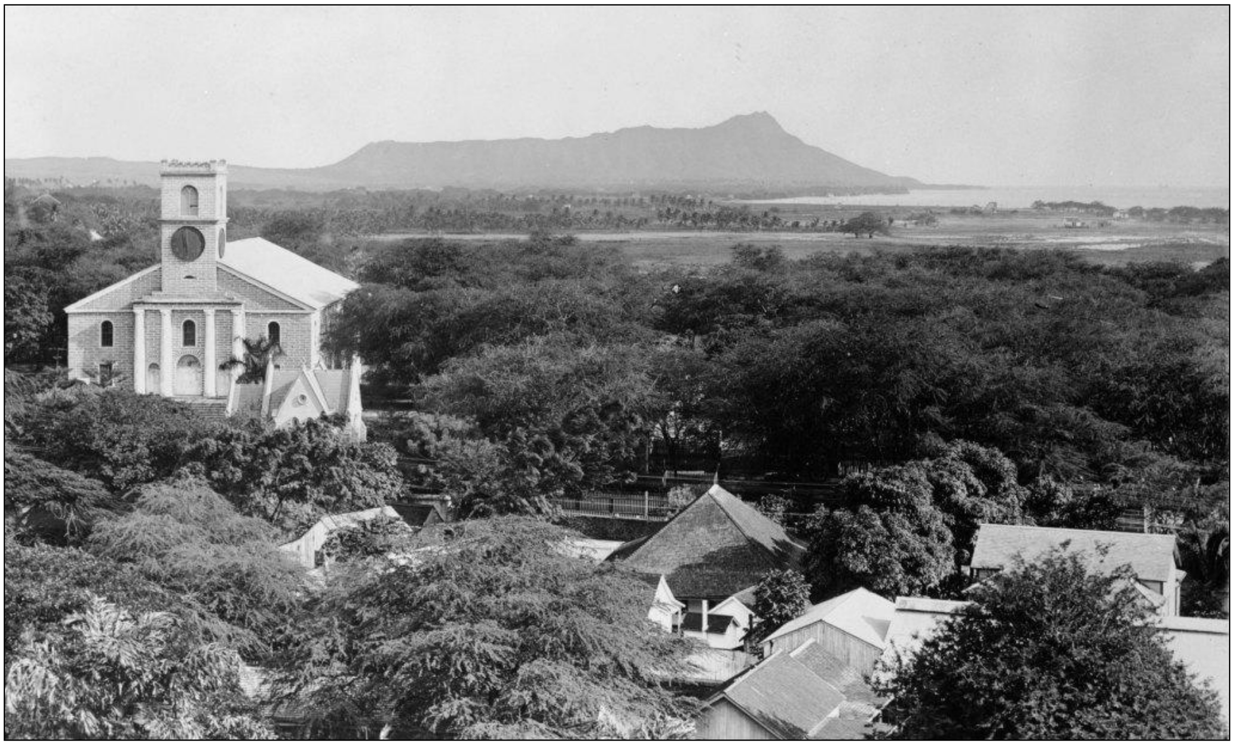

Figure 13. Kawaiahaʻo Church and Honuakaha Village, ca. 1887 photograph; the Ward's House roof cupola, on the *mauka* end of Old Plantation, can be seen to the left of the church steeple; the project area is within the marshlands in the right upper background (Hawaiʻi State Archives, Henry L. Chase Collection; reprinted in Stone 1983:84-85)

Figure 14. Kakaʻako area, portion of a ca. 1887 (see Figure 13 above), close-up of right upper background area, showing marshlands and scattered huts along the coast

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 15) 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.

Only one LCA parcel may overlap part of the Block B East project area, 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 *ho‘oliu* (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 . . .” Kīna‘u 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 Ha‘alilio 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 Hawai‘i (Day 1984:47). Thus Lolohi’s family was given the land sometime between 1842 and 1854 (after Ha‘alilio’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 Nu‘uanu Valley.

3.5 Nineteenth Century Land Use in Kukuluāe‘o

3.5.1 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 (*ho‘oliu*) 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 Kawaiaha‘o Church viewed from the “Old Salt Pans” (Figure 16 and Figure 17).

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 Hawai‘i 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.

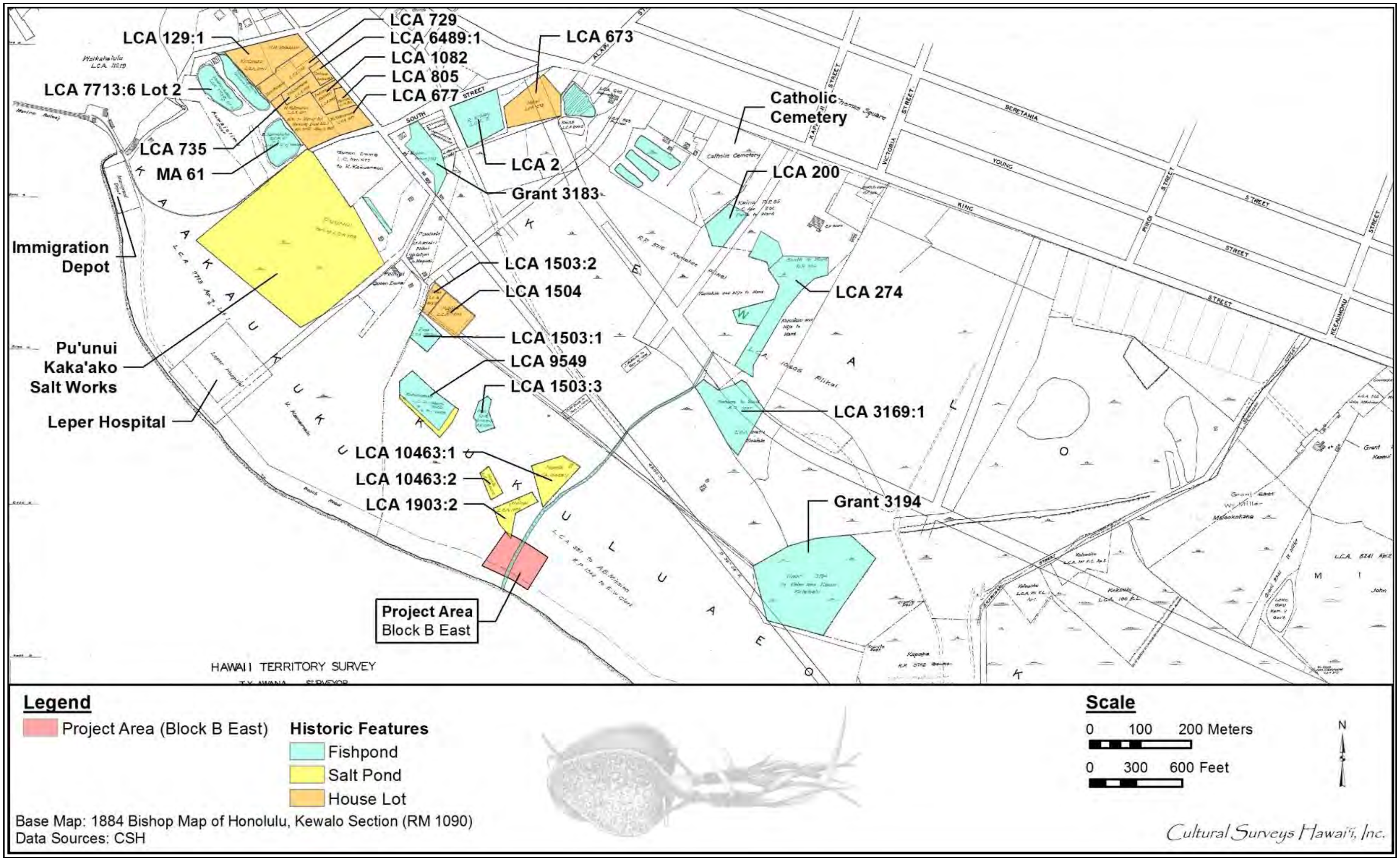

Figure 15. 1884 map of Honolulu, Kewalo Section (portion), by Sereno Bishop (Hawai‘i Land Survey Division, Registered Map 1090), showing the locations of LCA parcels, fishponds, salt lands, and house lots surrounding the project area

Figure 16. "Honolulu Salt Pan, near Kakaʻako," 1838 sketch drawn by a French visitor, Auguste Borget (original sketch at Peabody Essex Museum, Salem, Massachusetts; reprinted in Grant 2000:64-65)

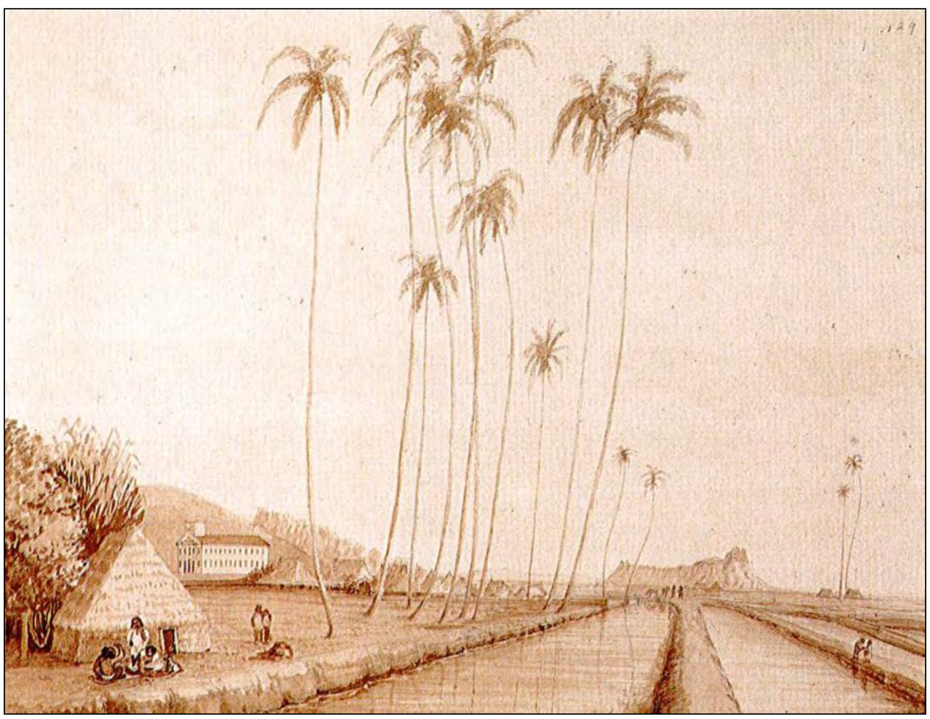

Figure 17. "Native Church [Kawaiahaʻo Church], Oahu, from the Old Salt Pans," 1845 sketch drawn by John B. Dale, from the U.S. Exploring Expedition led by Lt. Charles Wilkes (J. Welles Henderson Collection, reprinted in Forbes 1992:126); the sketch is probably from the salt pans in Kaʻākaukukui, west 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.

> 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]

The Kakaʻako Salt Works shown on historic maps extended into the Block B East project area (Figure 18). This historic salt works consisted of grids of square salt evaporation pans, generally attended by Chinese workers.

The Chinese were involved in salt production, usually in concert with their management of fishponds. One son of a Chinese resident remembered (for ca. 1900) the Chinese form of salt production from salt pans bordering the sea, fed continually with seawater by the tides.

> Both the natural tides and the Chinese method of peddling a wooden wheel that transported water upward, helped to keep the salt beds damp with about three inches of water. After a few months, the senior Mau would drain off the remaining water and use a wooden rake with deep prongs to break up the salt. When the bed was dry a flat rake was used to flatten and smooth out the salt. Later it was raked into piles, packed in cloth bags and distributed. [Chong 1998:108]

3.5.2 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.

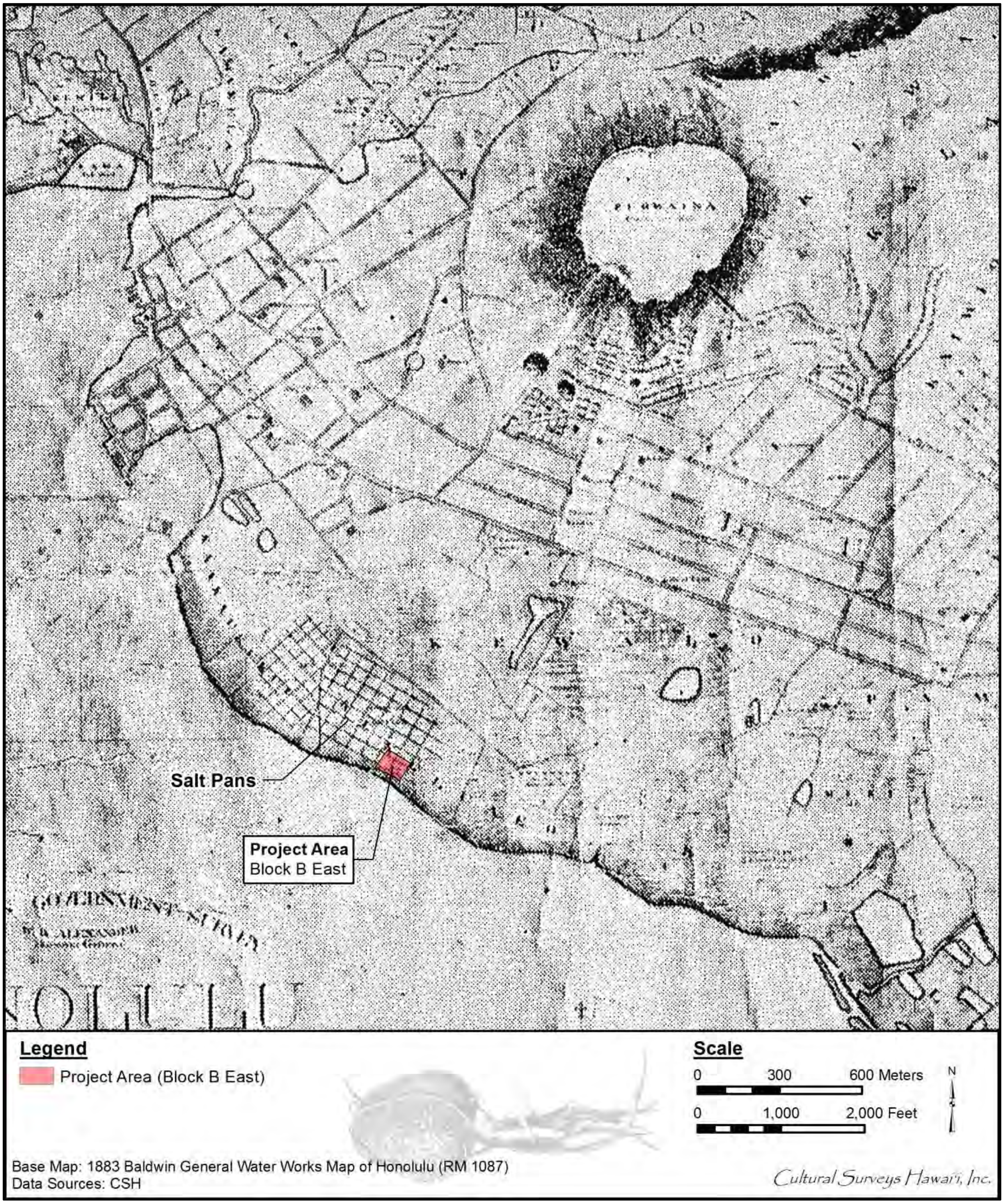

Figure 18. 1883 map of the Honolulu Water Works System by E.D. Baldwin (1883) (Hawai‘i Land Survey Division, Registered Map 1087); the grid symbol within the project area represents salt pans

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 *ali‘i* 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 Kō‘ula 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 *‘ili* of Kukuluāe‘o, *makai* of Queen Street (Hustace 2000:37-38) (Figure 19). The Wards had a permanent easement for the *‘auwai* (ditch) that extended from the long fishpond to the sea through the Kukuluāe‘o section (Figure 20). *Makaloa* grass, used to make mats and hats, grew along this *‘auwai* and was one source of income for the family (Hustace 2000:7-55). The alignment of this ditch is shown on Figure 21; 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 Kukuluāe‘o fishery, which was part of the Kukuluāe‘o LCA 387 award. After the death of her husband in 1882, Victoria Ward derived much of her income from “eggs, bananas, firewood, *‘awa*, 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

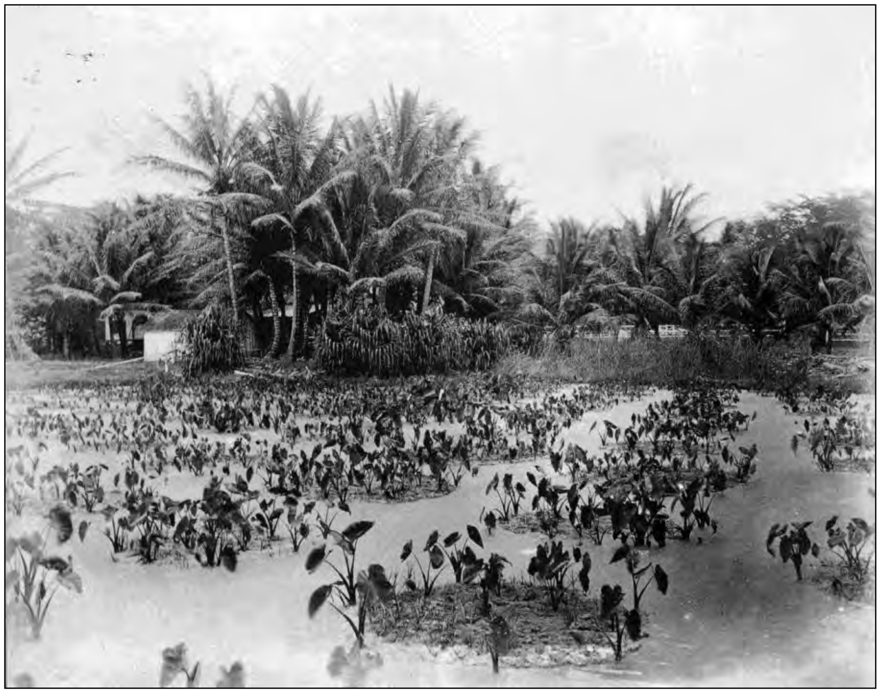

Figure 19. The Kukuluāe‘o portion of the Ward Estate, nineteenth century photograph (reprinted in Hustace 2000:49)

Figure 20. 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)

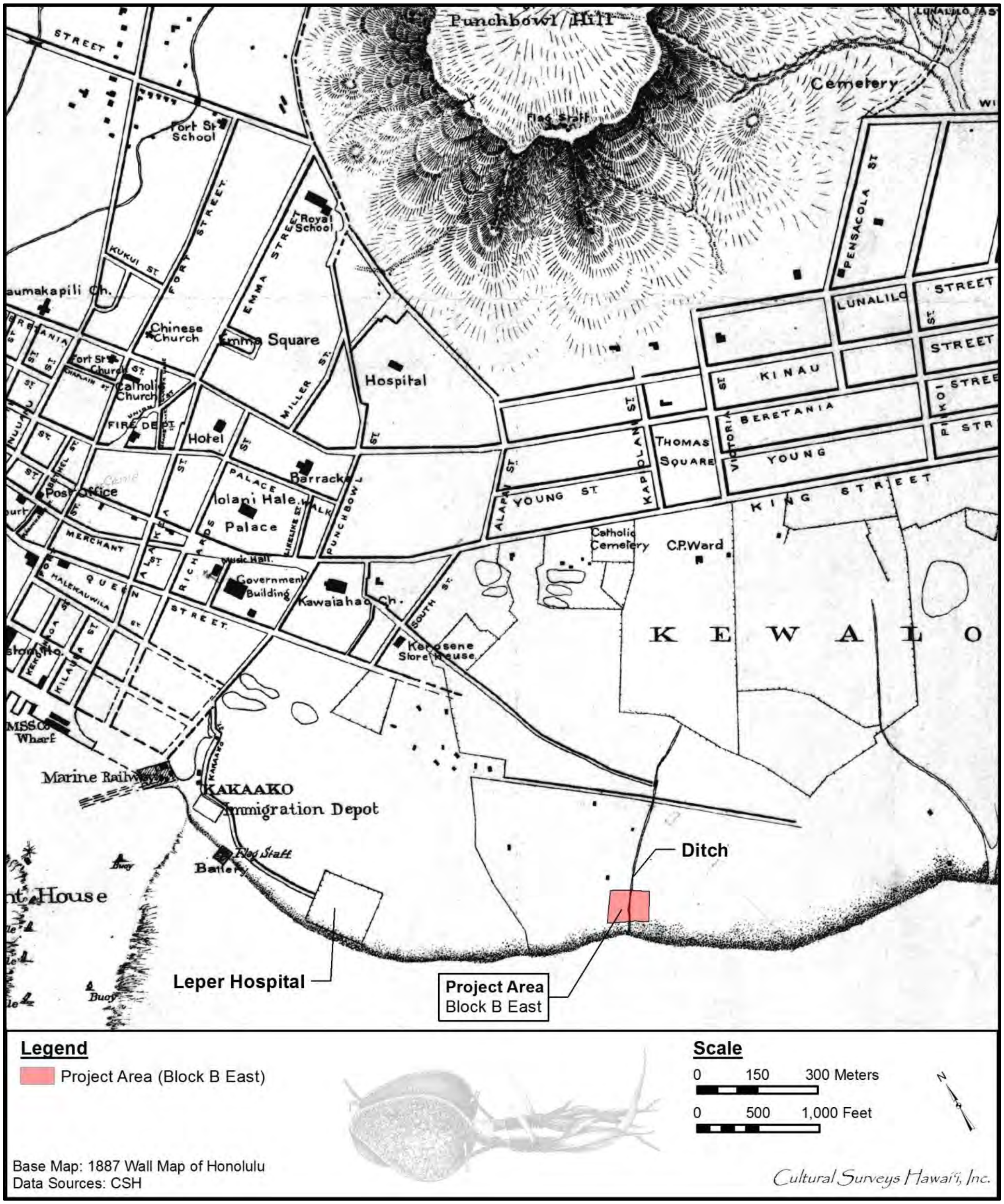

Figure 21. 1887 map of Honolulu (portion), by W.A. Wall (copy at Library of Congress, Geography and Map Division), showing the project area location; also note the location of Ward Estate ditch through Block B East

> 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).

3.6 Twentieth Century Land Use

3.6.1 Trash Burning and the Kakaʻako 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 Kakaʻako 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 22). 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 in1930 by the City and County of Honolulu. The facility was built to dispose of waste from the

Figure 22. Open-air burning of trash in area between Kewalo Basin and Ala Moana Park, 1921 photograph (Hill 1921, reprinted in Scott 1968:578)

Ala Moana dump and use the ash to fill the seawall in Kaʻākaukukui in the late 1940s to create 29 additional acres of land, adjacent to Fort Armstrong (Figure 23). 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).

3.6.2 Kakaʻako 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 (Hawaiʻi Department of Transportation, Harbors Division 2007:3).

By the 1880s, filling-in of the mud flats, marshes, salt ponds in the Kakaʻako 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 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, 'Kakaʻako,' 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

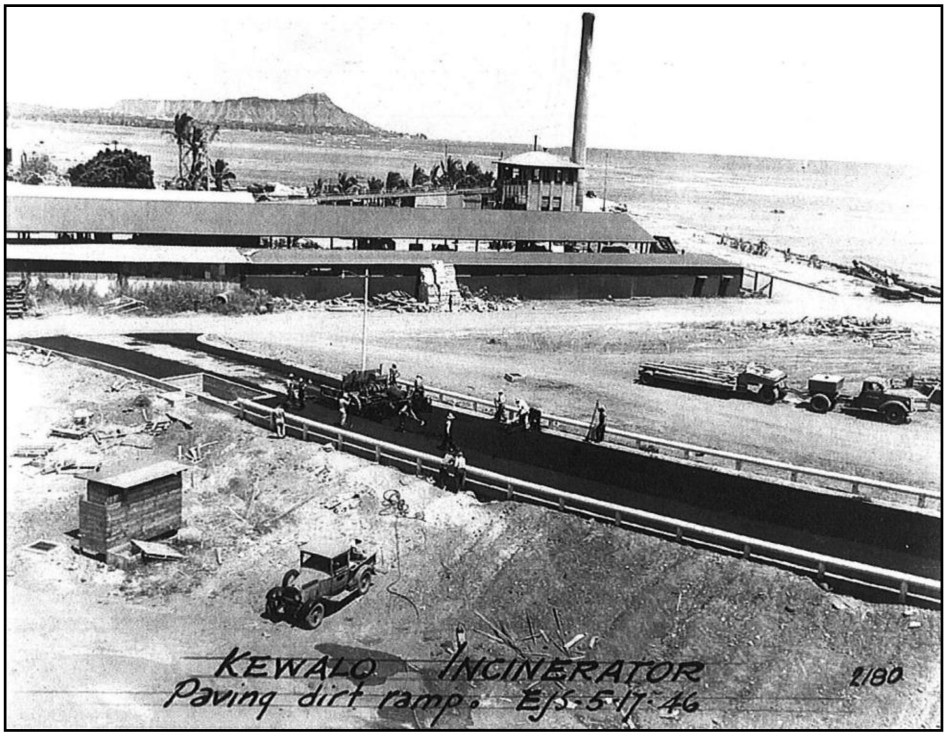

Figure 23. 1946 photograph of the Kewalo Incinerator No. 1, west side of Kewalo Harbor (Mason Architects 2002)

> 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 Kakaʻako (Griffin et al. 1987:13). The first fill material may have been set down for the Kakaʻako 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 Kakaʻako 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.”

3.6.3 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 Kukuluāe‘o and Ka‘ākaukukui), 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 Kukuluāeʻo 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).

3.6.4 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 Kamakeʻe 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 Kakaʻako and Waikīkī (Figure 24). 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).

3.6.5 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 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.

3.7 Twentieth Century Commercial and Residential Development

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 25 through Figure 35).

The 1884 Bishop map (see Figure 8) 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 25) 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

Figure 24. Honolulu and Waikīkī from Fort Armstrong (lower right) to Diamond Head, 1933 oblique aerial photograph (Hawaiʻi State Archives); new lands of coral fill are shown as white patches in inland areas, along Kapiʻolani Boulevard, and offshore for the new Ala Moana Park; Kewalo Basin is at the western (lower) end of the offshore fill area

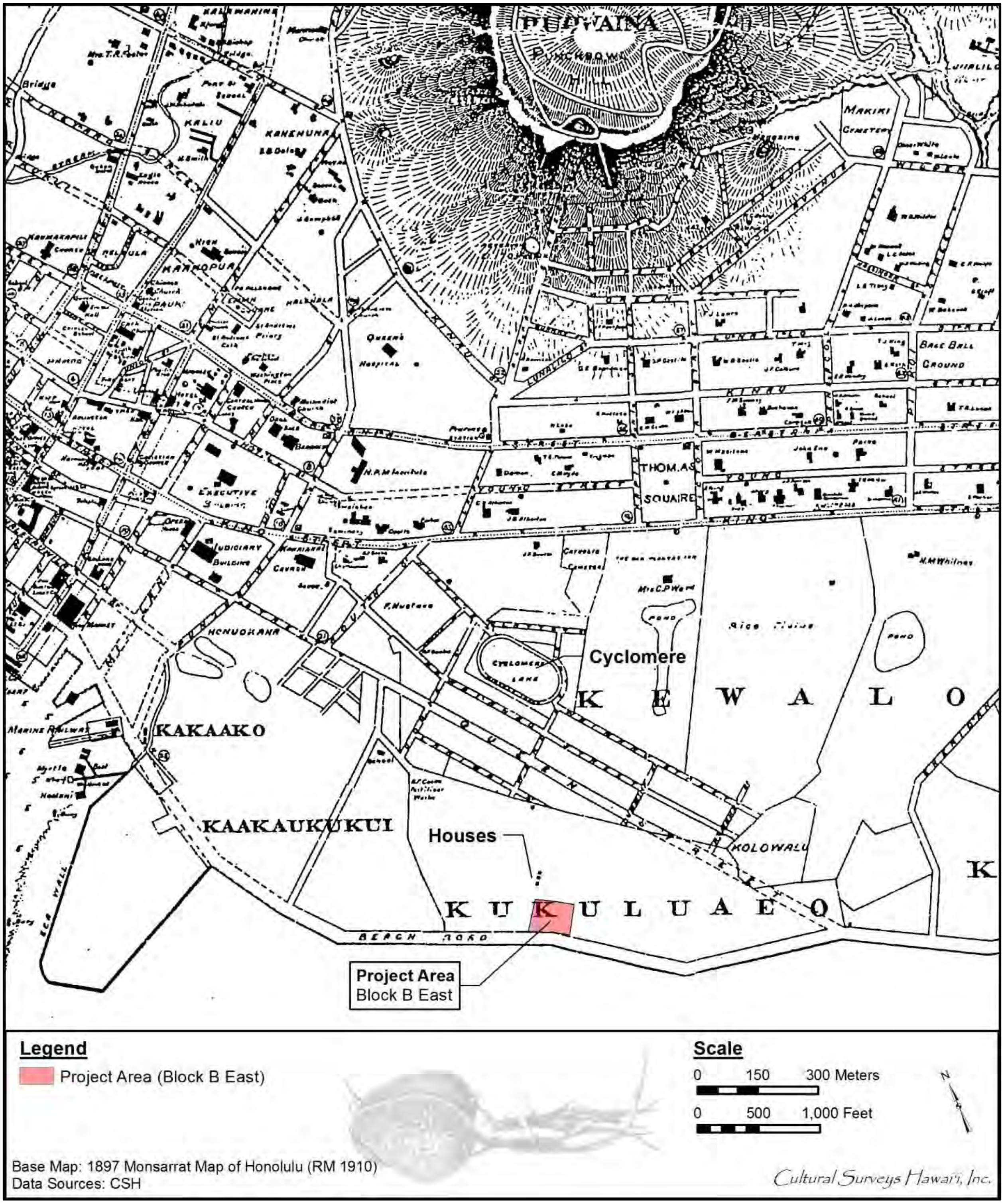

Figure 25. 1897 map of Honolulu by M.D. Monsarrat (Hawai'i Land Survey Division, Registered Map 1910), showing the location of the project area; the map also shows the location of the "Cyclomere"

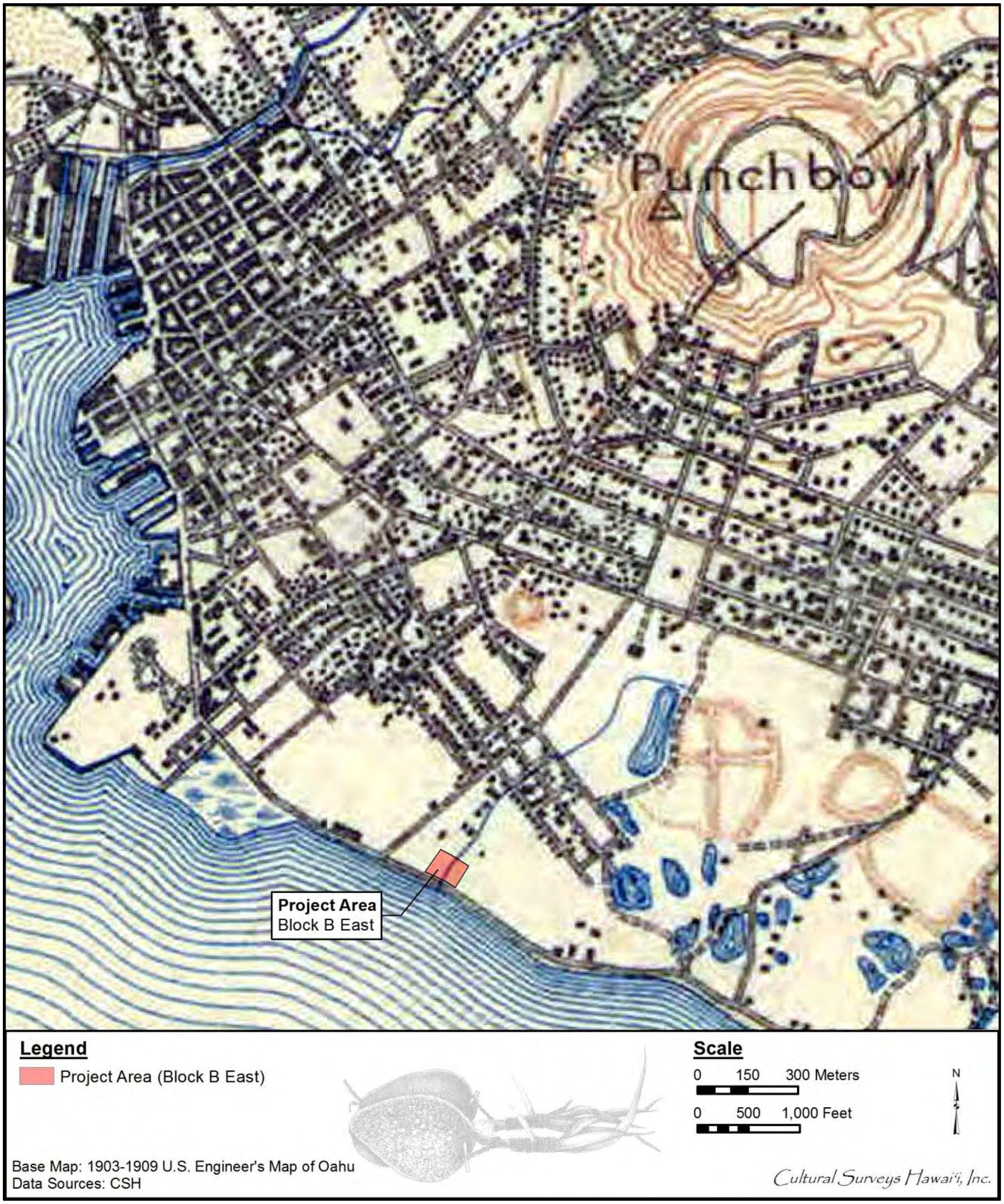

Figure 26. 1903-1909 (published 1917) U.S. Engineer's map of O'ahu (portion) depicting Kaka'ako; many ponds, including Kolowalu and the Ward Estate "Long Lagoon," are still open and unfilled at the eastern terminus of the northwest-southeast aligned Queen Street

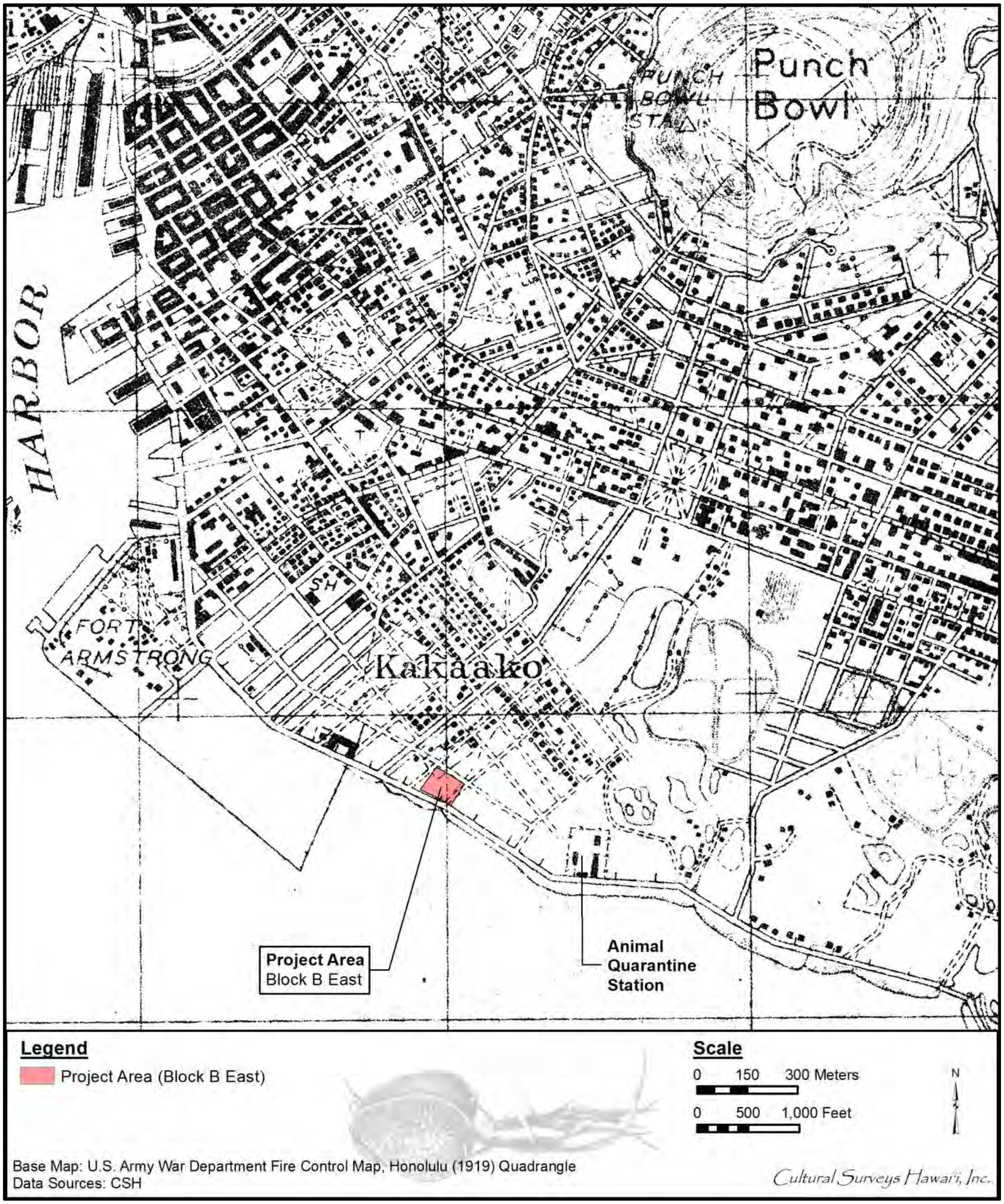

Figure 27. 1919 U.S. Army War Department Fire Control map of O‘ahu, Honolulu Quadrangle, showing the location of the project area within a grid of streets; solid lines denote paved streets, while dotted lines represent unpaved streets or planned streets

Figure 28. 1927 USGS aerial photograph of the Kaka'ako area (USGS; mosaic of photograph sheets from Hawai'i Coastal Geology Group)

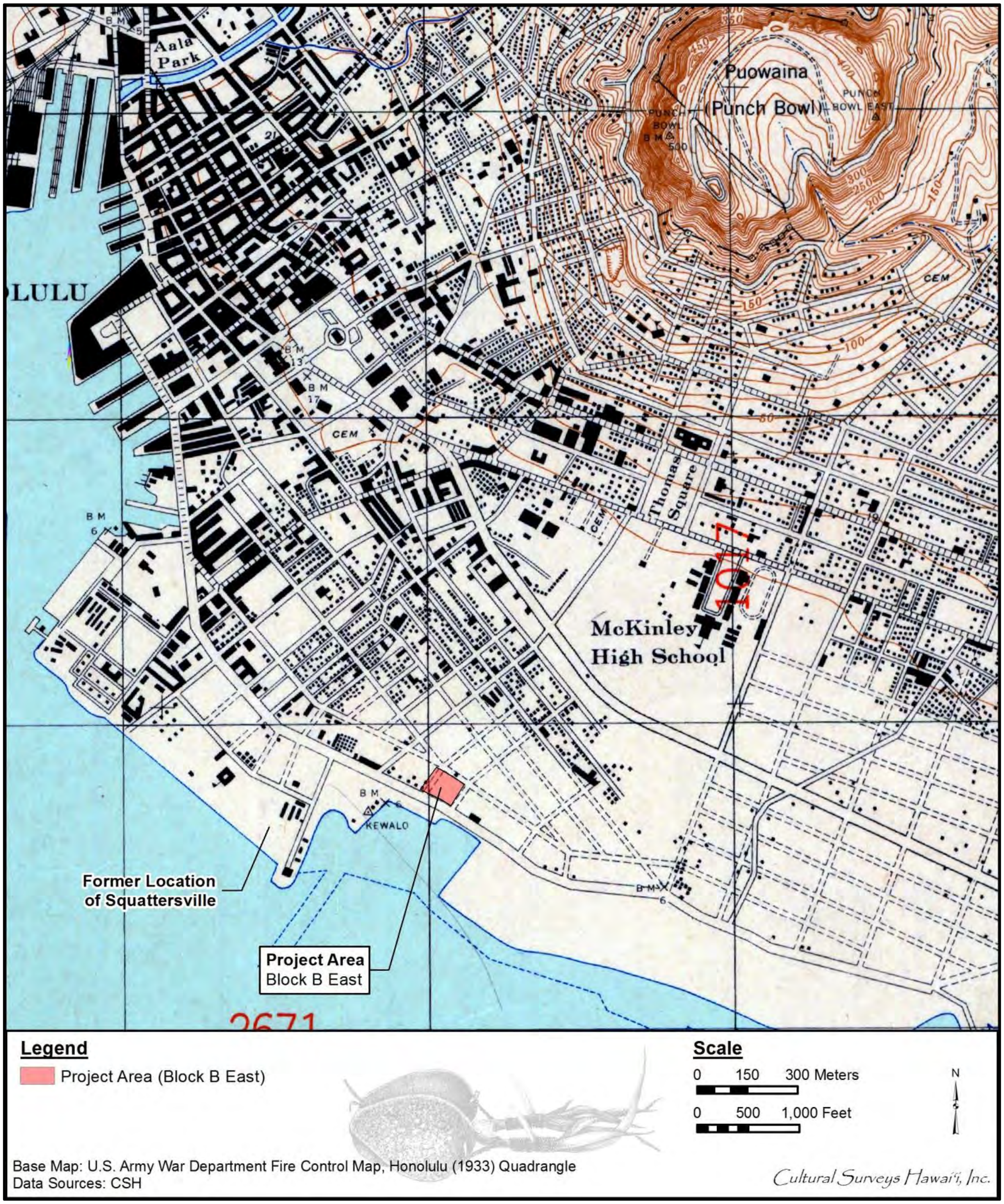

Figure 29. 1927-28 (published 1933) U.S. Army War Department Fire Control map of Oʻahu, Honolulu Quadrangle, showing the project area within a grid of streets; note the former location of Squattersville, adjacent to Kewalo Basin and east of Fort Armstrong

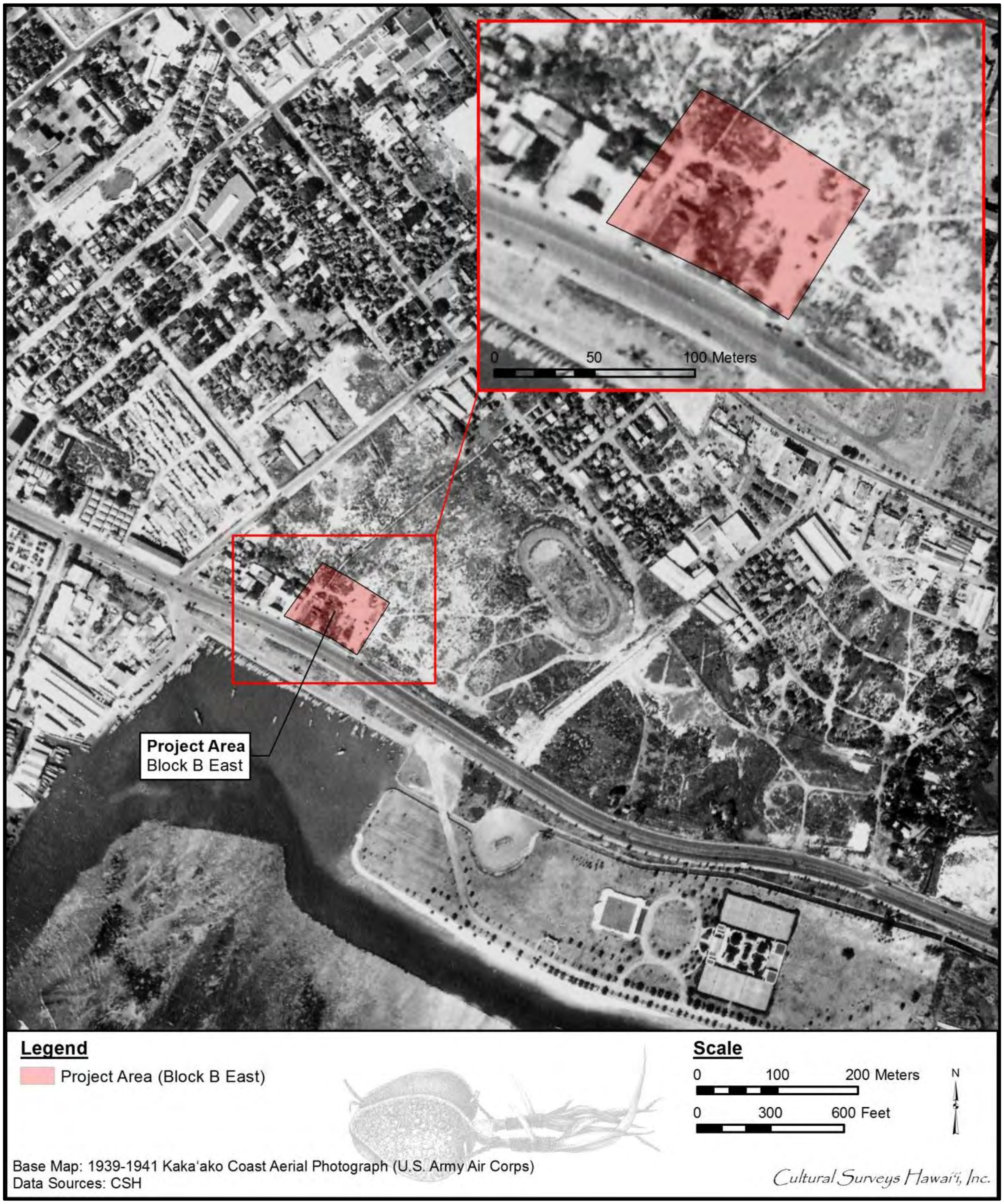

Figure 30. 1939-1941 aerial photograph (U.S. Army Air Corps) of Kakaʻako; note the completion of Kewalo Harbor to the west and the construction of Ala Moana Park to the east along the shore

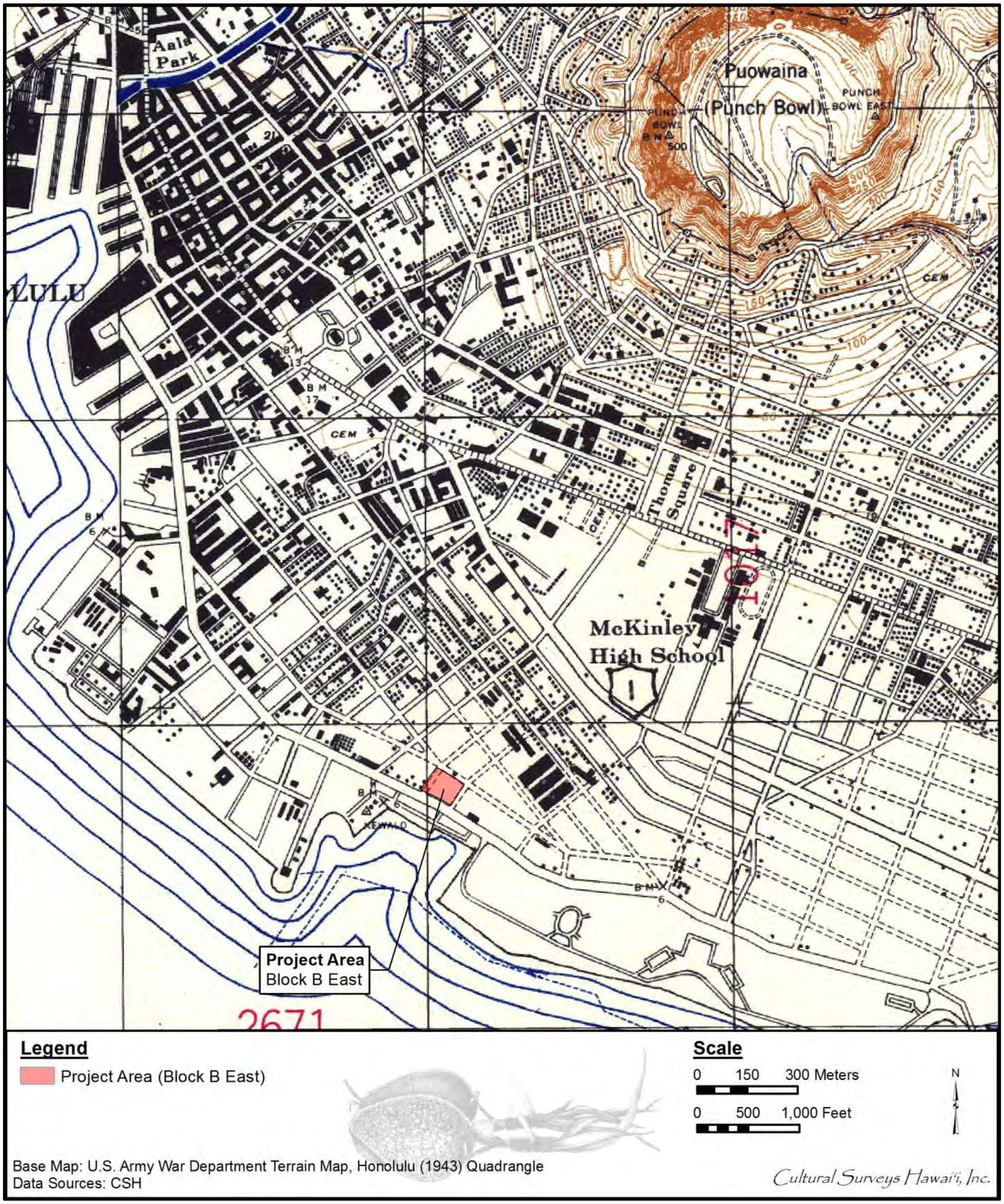

Figure 31. 1943 U.S. Army War Department Fire Control map of O‘ahu, Honolulu Quadrangle; note the location of structures along Ala Moana Boulevard to the east and west of Block B East

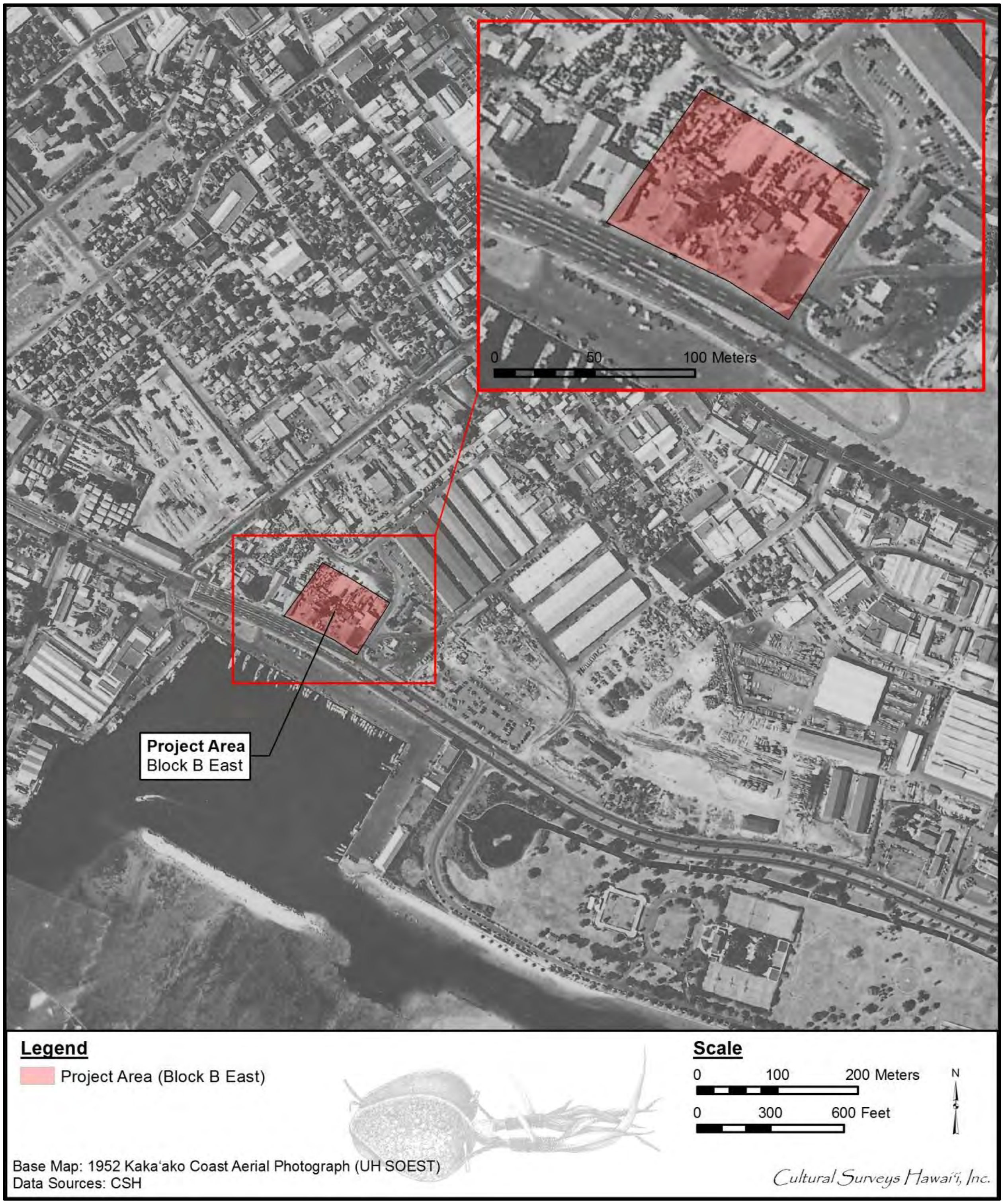

Figure 32. 1952 aerial photograph (U.S. Army Air Corps, mosaic of sheets from Hawaiʻi Coastal Geology Group)

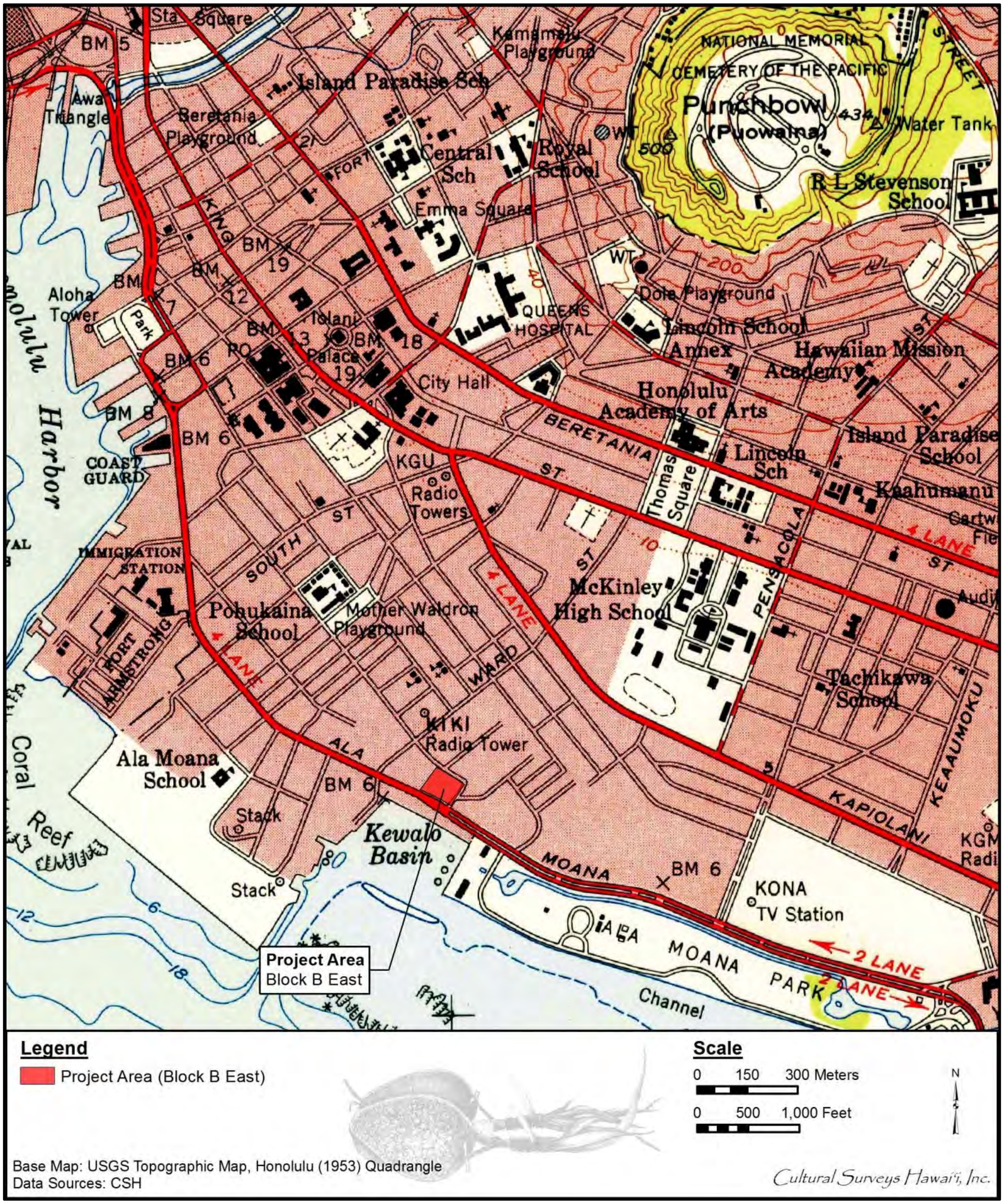

Figure 33. 1953 Army Mapping Service topographic map of Oʻahu, Honolulu Quadrangle, showing project area within an improved street grid

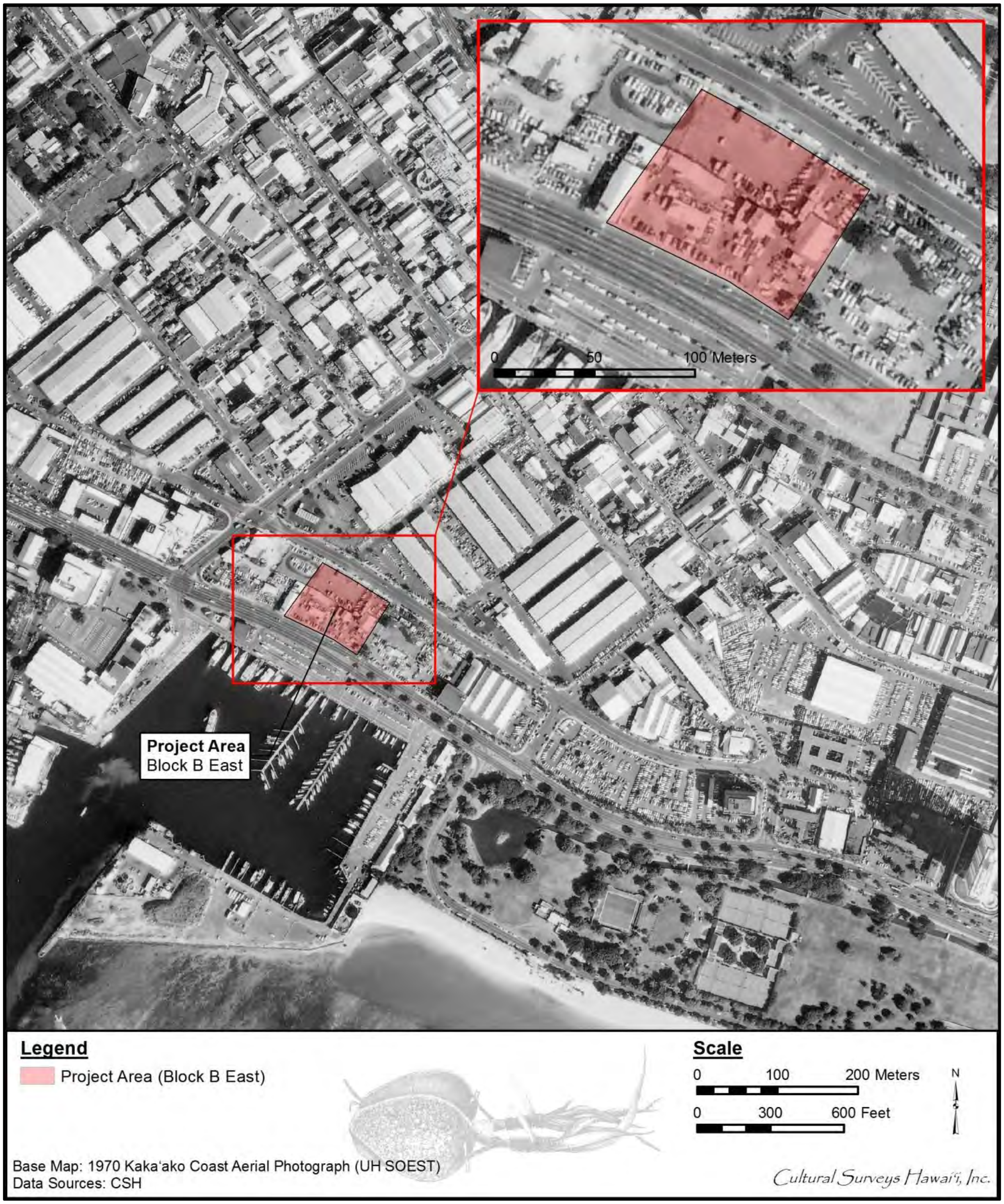

Figure 34. 1970 aerial photograph (R.M. Towill), showing the project area

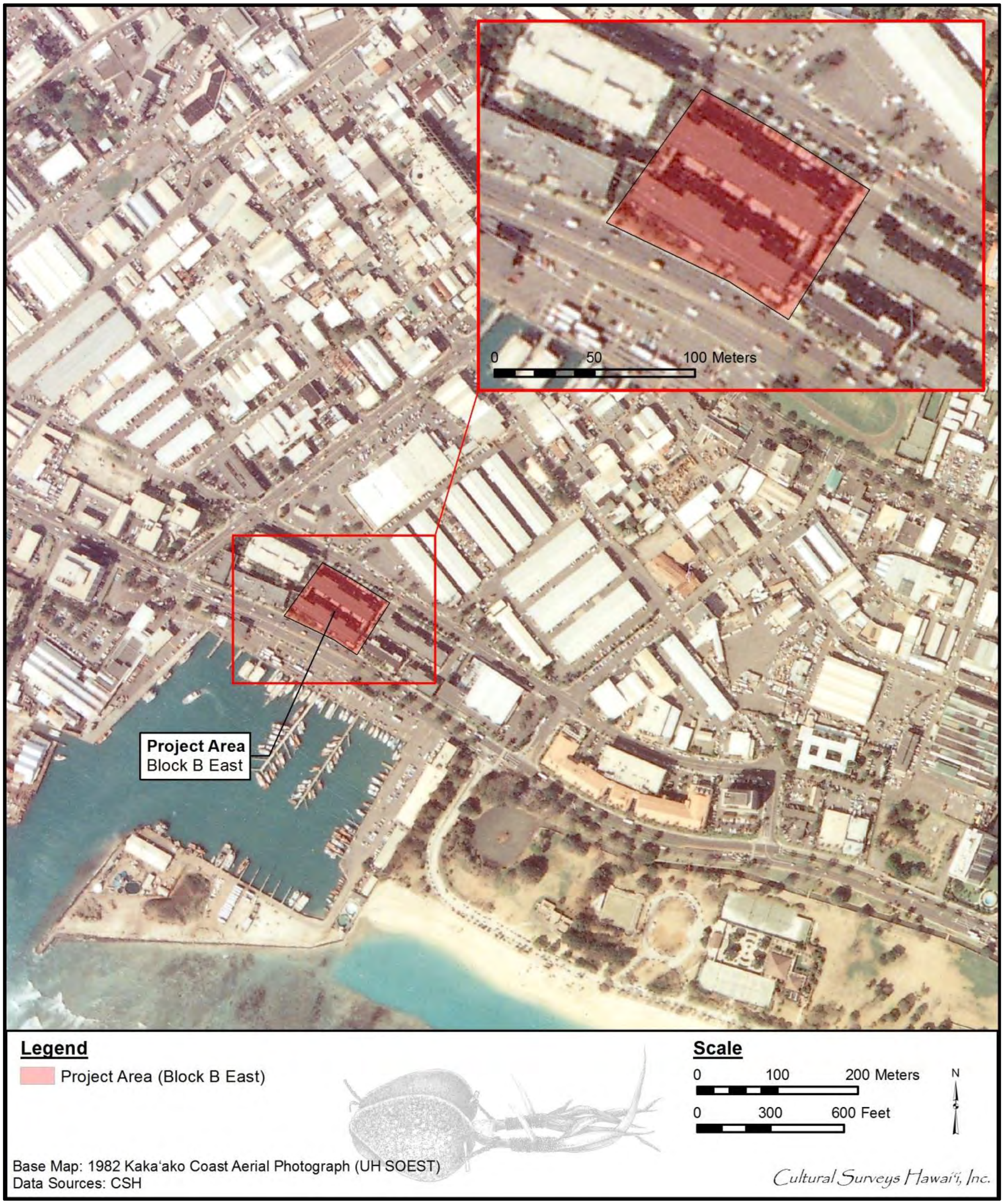

Figure 35. 1982 USGS aerial photograph, depicting large warehouses throughout Kakaʻako and Ward Warehouse within the project area

eventually be constructed. A large portion of Kaka‘ako, 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 Kapi‘olani Avenue between Cooke Street and Ward Avenue.

A 1903-1909 U.S. Engineer’s map (Figure 26) depicts houses clustered around the few paved roads, with a scatter of houses along the Ward Estate *‘auwai* 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 27) 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 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 28) 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 B East, 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 B East.

A 1933 U.S. Army War Department Fire Control map (Figure 29) 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 B East. 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 30), 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. Block B East is still largely undeveloped, although small structures now occupy the western/*makai* corner.

On a 1943 U.S. Army War Department Fire Control map (Figure 31), 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 32) shows major development in the eastern section of Kaka‘ako, with parking lots and small buildings within Block B East. 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 33), 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 34) 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. Small commercial structures are largely clustered on the *makai* half of the Block B East project area.

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 35). 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 B East project area is located within the central portion 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.

3.8 Previous Archaeological Research

3.8.1 Geological Study of Kakaʻako 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 Hawaiʻi 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 Kakaʻako 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 36). Ferrall (1976:53) cautions “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 Kakaʻako 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 (Figure 36). 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 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

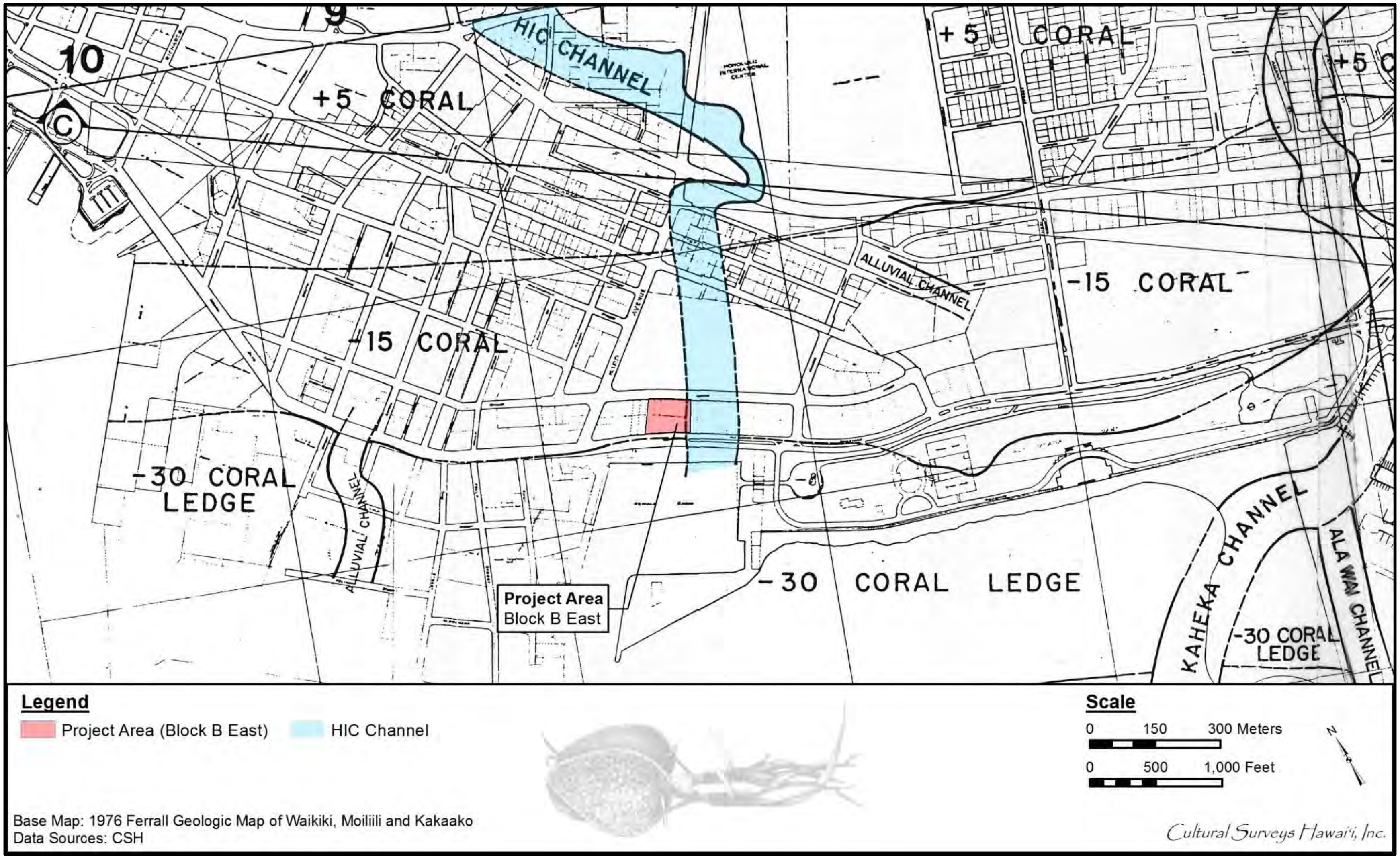

Figure 36. Coral shelf depth (+/- feet above or below sea level) and possible location of the HIC channel within the vicinity of the project area (modified figure of outsize map in Ferrall 1976)

> 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.

3.8.2 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 B East project area, 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 37 shows the locations of previous archaeological investigations and recorded profiles. Figure 38 shows the location of documented historic properties and burials.

3.8.3 Kaka‘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 provided 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 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

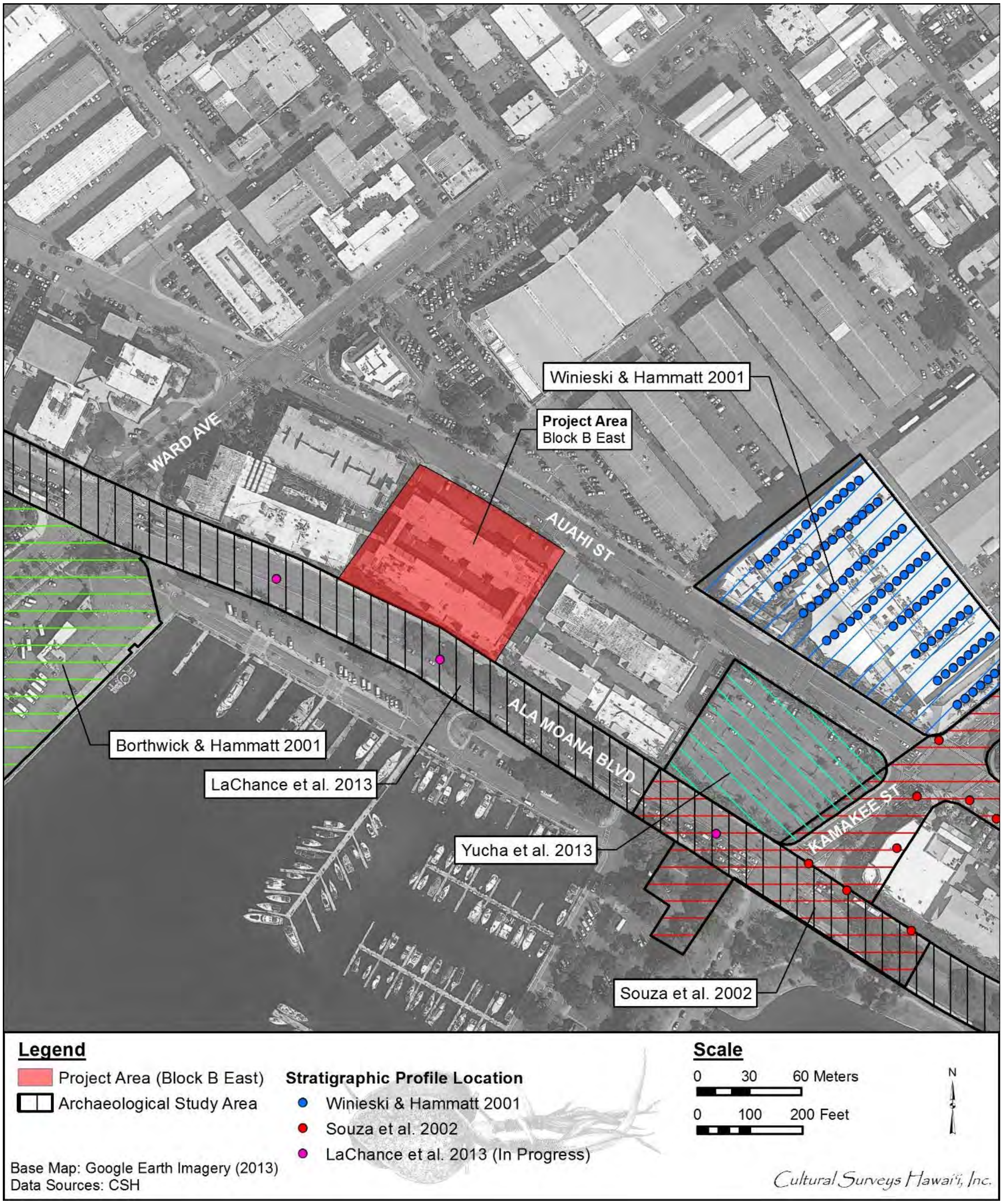

Figure 37. Previous archaeological studies within the vicinity the project area, showing the location of recorded profiles (base map: Google Earth 2013)

Figure 38. 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 B East Project Area

Reference	Project Name	Type of Study	Results
Borthwick and Hammatt 2001	Kakaʻako 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	Kakaʻako 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 the current project area

during archaeological monitoring (Borthwick and Hammatt 2001). The finds were, as anticipated, fill materials over buried tidal flats.

3.8.4 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 37). 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 39 and Figure 40). 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 # 50-80-14-6377) was encountered within the sand matrix during the adjacent Kaka‘ako Improvement District 7 Project.

3.8.5 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 (see). Burial 1 (SIHP # -6376), a single cranium, was inadvertently discovered by construction personnel in the base yard back dirt pile. The back dirt 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

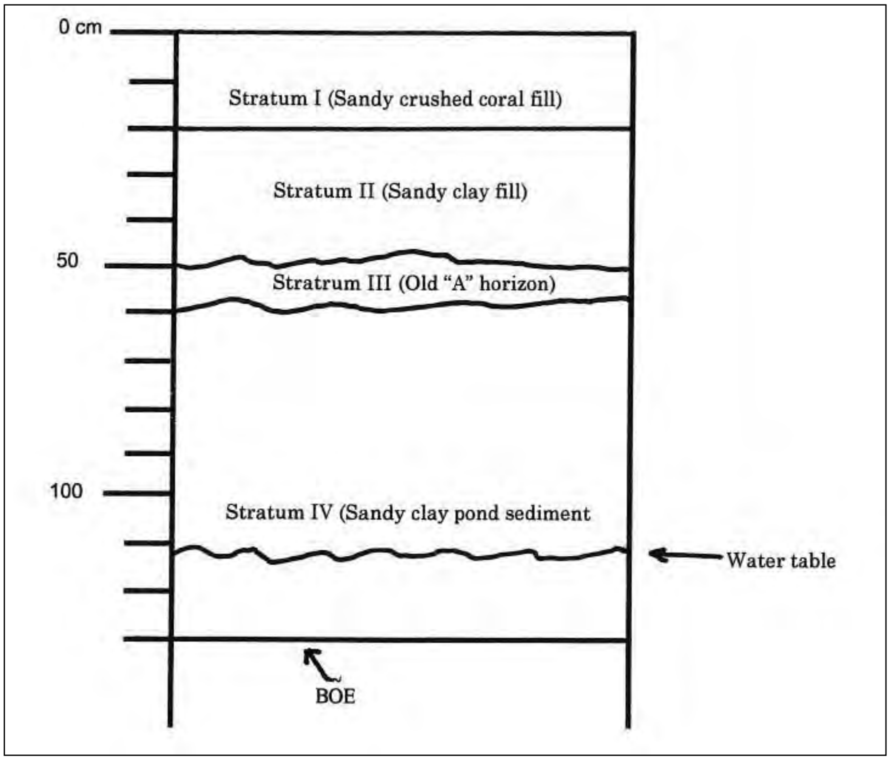

Figure 39. Profile of pile cap excavation in northeast corner of Ward Village Phase II footprint (Ward Theaters) showing old A horizon and pond sediment (Winieski and Hammatt 2001)

Figure 40. Photograph of pile cap trench showing old A horizon (dark stratum) capping sandy clay pond sediments (Winieski and Hammatt 2001)

for a box drain on Kamake‘e Street. The burial was within an undisturbed sand deposit. 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.

3.8.6 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 # 50-80-14-7422). 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 41). 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 42). A majority of the project area (35 test excavations) contained Jaucas sand (Figure 43). 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 44.

3.8.7 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 B East project area along Ala Moana Boulevard (see Figure 37). Profile 7 is located immediately to the south of the current project area. 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 is located to the west of the project area and contained similar stratigraphy with an additional layer of crushed coral fill beneath the base course. Within the two profiles, the upper

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

Figure 42. Aerial photograph depicting the Ward Neighborhood Block C project, showing where a buried A horizon was encountered (Google Earth 2008)

Figure 43. Aerial photograph depicting the Ward Neighborhood Block C project, showing where Jaucas sand deposits were encountered (Google Earth 2008)

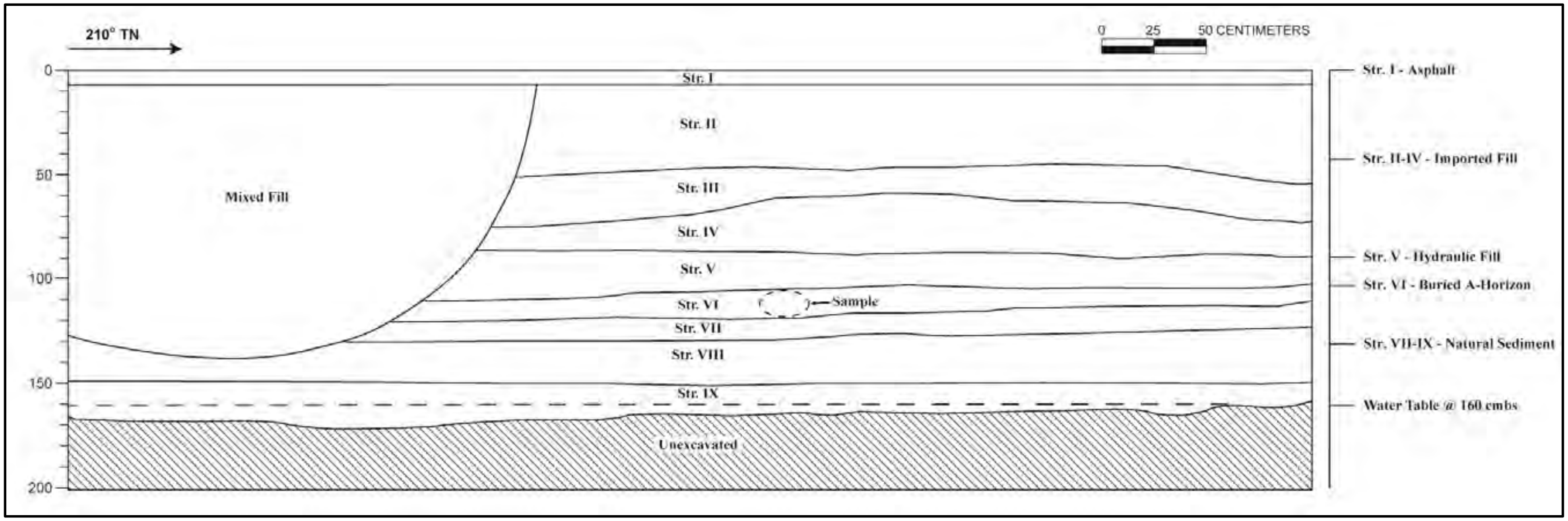

Figure 44. Ward Neighborhood Block C project AIS, Trench 30, profile of southeast sidewall (Yucha et al. 2013)

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

boundary 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 B East.

3.9 Summary of Kaka‘ako Stratigraphy

The Kukuluāe‘o area has been heavily modified over the last 150 years due to filling of the area for land reclamation. However, much of the cultural and natural deposits and land forms of the area (low-land marshes, sand deposits, coral reef flats, and fishponds) survived below this fill. There are the following three major stratigraphic zones in the Kaka‘ako Development District area:

Zone 1

Zone 1 consists of two types of historic fill. The first type was deposited during the various land reclamation projects in Kaka‘ako, when fishponds and other low-lying areas were filled. Using dredged material from Honolulu Harbor and the reef flats fronting the Kaka‘ako area, large amounts of trash and refuse from the town dump, and soil and sand from various locations on the island, the Kaka‘ako area west of Ward Avenue was largely filled over the course of 40 years from 1875 to 1915. The area east of Ward Avenue was filled in the 1920s and 1930s during the Kewalo Basin and Waikīkī Reclamation projects. The second type of fill consists of layers of material used to bring the various roads in the Kaka‘ako area up to grade and to make them passable during the wetter part of the year. The road fill layers in Kaka‘ako were made up primarily of crushed coral, soil, and crushed basalt gravel.

Zone 2

Zone 2 consists of the natural and cultural strata of the land prior to the historic filling of the area including fishpond deposits, traditional pre-Contact and early historic Hawaiian cultural layers, human burials, and the buried A horizon of the pre-fill land surface. Most archaeological features encountered include historic refuse pits, building foundations, scattered historic and pre-Contact artifacts, pre-Contact refuse pits and cultural deposits, fishponds, and both historic and pre-Contact burials. Fishpond deposits are often distinguished as layers of gleyed marine sediments containing marine shell and decaying organic matter. Based on archaeological research completed in Kaka‘ako to date, it has become apparent the vast majority of pre-Contact Hawaiian burials in Kaka‘ako are buried in natural sand layers associated with the pre-Contact intertidal shoreline. These sand layers have been extensively disturbed in some areas, but many undisturbed pockets remain.

Zone 3

Zone 3 is the geologic non-cultural and pre-cultural stratigraphy of the Kaka‘ako area including sterile coralline sand deposits, cinder deposits from the Tantalus/Sugarloaf eruptions, and a coral reef shelf/deposit from the last interglacial period. The Tantalus eruptions are thought to have taken place only 6,000 to 10,000 years ago, making them by far the most recent eruptions of O‘ahu (Farrell 1976). The Tantalus eruptions are relatively unique to O‘ahu in terms of the type of well-sorted cinder produced. The eruption of the cinder predates human occupation in Hawai‘i by thousands of years. The cinder layer provides a very clear demarcation between the underlying sterile geologic stratigraphy and the layers contemporaneous with cultural activity. This cinder is found only on the inland portion of the Kaka‘ako area, northwest of the project area (generally west of Cooke and *mauka* of Halekauwila Streets). On the coastal section, the lowest stratum is of sterile sand. Below both is a coral shelf deposited during the last interglacial period, the Waimanalo Stand, at 122,000 +/- 7,000 years before present.

3.10 Summary of Archaeological Research

No archaeological projects have been conducted within the boundary of the Block B East project area. However, several archaeological investigations have been conducted within the vicinity, including the Ward Theaters (Winieski and Hammatt 2001), sewer work along Ala Moana Boulevard and Kamakeʻe Street (Souza et al. 2012), the Ward Block C AIS (Yucha et al. 2013), and the Ala Moana/Nimitz Highway improvements (LaChance et al. 2013).

In 2000, Cultural Surveys Hawaiʻi performed monitoring for Victoria Ward, Ltd. at the site of the Ward Village Phase II (Ward Theaters) construction project (Winieski and Hammatt 2001). Approximately 90% of the excavations exhibited nearly identical stratigraphic sequences: asphalt overlying a thick crushed coral fill layer, one or more hydraulic clay fills, and the decomposing coral shelf. At the southeast corner of the project area, near the intersection of Auahi and Kamakeʻe Streets, a discontinuous A horizon and sand layer were present.

The Kakaʻako Improvement District 7 (ID-7) project involved improvements to drainage, and utility systems on Kamakeʻe Street between Queen Street and Ala Moana Boulevard (Souza et al. 2002). Most of the excavations occurred in previously disturbed fill material. Natural deposits, though discontinuous, were exposed most frequently along Kamakeʻe Street, especially at the *mauka* Queen Street junction. A buried A horizon was recorded at 35-40 cmbs and sand was noted below fill layers at 40-100 cmbs. Three burials were found during the project, one in a back dirt pile (SIHP # -6378; original location unknown), one along Ala Moana (SIHP # -6376), and one on Kamakeʻe Street (SIHP # -6377).

The Ward Neighborhood Block C AIS consisted of 41 test excavations within the parking lot located at the southern end of Land Block 2 (Yucha et al. 2013). Only one historic property was identified, a burned trash layer located near the corner of Kamakeʻe and Auahi Streets (SIHP # -7422). Stratigraphy within the project area was largely consistent. A deposit of hydraulic fill associated with the reclamation infilling of Kakaʻako during 1913–1930 was found within the north, west, and south portions of the project area. 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. A majority of the project area (35 test excavations) contained Jaucas sand. No cultural material or features were observed.

Between March 2012 and January 2014, CSH performed 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). No finds have been documented within the area immediately adjacent to the current project area; however, natural Jaucas sand was documented just *makai* of Block B East, located just below the Ala Moana Boulevard asphalt and base course.

Section 4 Results of Fieldwork

The fieldwork component of this archaeological inventory survey was conducted between 21 April 2014 and 9 June 2014. CSH archaeological field personnel consisted of Ena Sroat, B.A. (project director), Megan Hawkins, M.A, Michelle Pammer, B.A., Andrew Soltz, B.A., Abby Mierzejewski, B.S., Amanda Eggers, B.A., Tim Zapor, B.A., Jessica Leger, M.Sc., Scott Belluomini, B.A., Tara del Fierro, B.A., Tara Seaver, B.A., James Thain, B.A., Laura Vollert, B.A., Pua Guanzon, B.A., Jonas Madeus, B.A., Nifae Hunkin, B.A., and Melina Reveal, M.Sc. All fieldwork was conducted under the direction of the principal investigator, Matt McDermott, M.A.

Fieldwork consisted of an initial 100% coverage pedestrian survey followed by a subsurface testing program. The pedestrian survey confirmed there were no surface historic properties within the Block B East project area. The pedestrian survey concluded that the entire surface of the project area has been modified as a result of development of the Ward Warehouse commercial complex, including significant elevation of the ground surface above the surrounding environment. As there were no surface historic properties, the archaeological inventory survey focused on the program of subsurface testing to locate any buried cultural deposits and to facilitate a thorough examination of stratigraphy within the project area.

A total of 38 backhoe-assisted test excavations were completed, including both exterior (parking lot/courtyard) (Figure 45) and interior (Ward Warehouse commercial space) locations (Figure 46). The test excavations were distributed throughout the project area in order to provide comprehensive testing coverage. The entire length of each test excavation, measuring approximately 2 ft by 20 ft (with the exception Test Excavation 37 at 2 ft by 26 ft), was excavated to the upper boundary of the hard coral shelf. As discussed in Section 2, limiting factors that prohibited the complete excavation of each trench to depth included the presence of active utility lines, subsurface structural remnants, or safety concerns. In most cases, the complete excavation of the sediment underlying these foundations and utilities was not completed due to the potential for damage or collapse during excavation and subsequent backfilling activities. All unexcavated areas beneath utilities lines or utility jackets are accurately represented on stratigraphic profile maps.

Significant findings of the inventory survey included identification of a large complex of buried historic salt pan structures and sediments throughout the majority of the project area. The historic salt pan remnants, designated SIHP # -7655, consisted of a grid-like system of man-made berms enclosing low-lying, level salt pan beds. The berms consisted of anthropogenic altered local marine sandy clay modified into linear berm structures, which sometime evidenced more than one berm building event. The salt pan beds consisted of natural wetland sediment overlain with laminated organic material. For a complete description of SIHP # -7655, see Section 6.1.

Also identified within the project area, buried beneath modern fill episodes, were extensive remnants of previous twentieth century development of the Block B East and adjacent Block C West project areas, designated SIHP # -7658. The infrastructure remnants consisted primarily of buried asphalt surfaces and concrete foundational surfaces, but also included oil-rolled road surfaces and milled wooden posts. Historic development of the project area began sometime between 1927 and 1952, as evidenced by aerial photographs (see Figure 28, Figure 30, and Figure 32), and continued until 1976, at which time the present Ward Warehouse commercial complex

Figure 45. Photo showing an exterior test excavation location within the Block B East Ward Warehouse complex

Figure 46. Photo showing an interior test excavation location within the Block B EastWard Warehouse complex

was constructed. Additional evidence of historic activity within the project area was observed in the form of the concretized Ward Estate *ʻauwai* (SIHP # -7659) and a historic trash fill layer (SIHP # -7660). A human cranial fragment was encountered within disturbed and reworked sand, along the *makai* boundary of the project area.

4.1 Stratigraphic Summary

This section provides an overview of the stratigraphy observed within the 38 backhoe test trenches excavated within the Block B East project area (Figure 47). For detailed information regarding each of the test excavations, please refer to the trench profiles, sediment descriptions, and photographs which follow this summary section.

In general, the stratigraphic sequence within Block B East from the present land surface to the coral shelf included the modern developed land surface and variable layers of imported fill, overlying buried historic surfaces (SIHP # -7658) and associated grading fill, overlying crushed coral and hydraulic (dredge) reclamation fill, overlying historic salt pan remnants (SIHP # -7655) and/or natural wetland and marine sediments.

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. Within 18 test excavations, beneath these modern layers previous twentieth century development land surfaces (SIHP # -7658) were located, consisting of asphalt, concrete, coral and tar pavement, and oil-rolled surfaces. These buried surfaces were documented 20–90 cm below surface, with an average depth of 47 cm below surface. The buried surfaces represented multiple land use periods, as evidenced by trenches exhibiting buried asphalt overlying buried concrete.

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. 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 64 cm below surface. A total of 31 test excavations contained reclamation fill, located almost ubiquitously throughout the project area, with the exception of the *makai* landscaped edge of the property (see Figure 303).

Background research indicates land reclamation activity within the project area occurred sometime between 1919 and 1927, following allocation of territorial funds for the dredging of Kewalo Basin in 1919 and prior to a 1927 aerial photograph which shows a white coral deposit covering the project area (see Figure 307). 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 later than 1927. For a complete analysis of the reclamation fill deposits, see Section 7.4.

The area of reclamation fill within Block B East aligned almost exactly with the area of underlying historic salt pan remnants (SIHP # -7655). This is consistent with the location of the historic salt pan remnants within areas of natural low-lying wetlands, which were 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 vicinity of the project area. The salt pan beds consisted of the natural underlying wetland sediments covered with very thin organic laminations, likely associated with salt production methods.

Figure 47. 2013 aerial photograph showing the location of AIS test excavations within the Block B East project area

An additional feature to the salt pan remnants was encountered within two adjacent test excavations in the Block B East project area (Test Excavations 15 and 17), consisting of naturally tabular limestone boulders, which were 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, and designated a feature of SIHP # -7655 (SIHP # -7655, Feature 1). An additional limestone boulder feature was observed within a third test excavation located to the northwest (Test Excavation 38), adjacent to a small section of peaty pond sediments. The limestone boulders appeared to be integrated into a man-made berm associated with the SIHP # -7655 salt pans, and were therefore determined to be an additional feature of the salt pan remnants (SIHP # -7655, Feature 2).

Along the *makai* edge of the 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, road way 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 may represent the source of these archaeosediments.

A single human cranial fragment (SIHP # -7656) was encountered within the disturbed sand along the *makai* edge of the project area (TE 31). The cranial fragment was located at approximately 72 cmbs, well within the reworked sand, suggesting the original burial location was within the associated sand prior to its disturbance. No additional fragments of human skeletal material were encountered within the surrounding excavations, suggesting the original burial location may not have been in the immediate vicinity, or that disturbance to the in situ burial was minimal.

An abandoned concrete drain box was observed along the *makai* boundary of the Block B East project area (Test Excavation 32), filled with extremely gravelly silty loam containing a large quantity of historic trash. The historic trash included bottles, ceramic, metal fragments, and boat trash likely related to the nearby fishing and tuna cannery industry (i.e., metal boat cleat, winch). This fill material was only observed within the drain line box, and was designated SIHP # -7660.

Historic maps and photos suggest the Ward Estate *ʻauwai,* concretized and rerouted between 1909 and 1927, extends through the center of the Block B East project area. This concretized channel is a continuous feature running from Kapiolani Boulevard through the project area to the Kewalo basin. A portion of the *ʻauwai* was encountered within two test excavation in the Block B East project area (Test Excavations 15 and 17), and designated SIHP # -7659. The *ʻauwai* consisted of a large concrete structure encountered at 38–45 cm below the current land surface, and extending to, or below, the coral shelf.

Stratigraphy within the project area was designated using a Roman numeration system (e.g., Stratum I, II, III). All modern and historic fill deposits and surface layers were designated Stratum I and further divided into substrata (e.g., Strata Ia–Ig). Within the low-lying wetland areas, sediments associated with historic salt pan remnants were designated Stratum II (with substrata IIa and IIb). All underlying natural strata followed sequentially (e.g., Stratum III, IV, V). Along the *makai* boundary of the project area, Stratum II was used to designate disturbed natural marine sediment, followed by in situ natural marine sediments (e.g., Stratum III, IV). The hard coral shelf was reached at the base of excavation (BOE) within all 38 test excavations but was not assigned a stratum designation.

4.2 Subsurface Testing Results

4.2.1 Test Excavation 1A (TE 1A)

Test Excavation 1A (TE 1A) an exterior excavation located at the entrance of Ward Warehouse on Auahi Street near Ward Avenue, was oriented in a northeast-southwest direction, and measured 6.00 m long by 0.70 m wide. The base of excavation was determined by the presence of a live water main running parallel through the trench at 0.4 mbs. The stratigraphy of TE 2 consisted of asphalt parking surface (Stratum Ia), associated base course (Stratum Ib), extremely gravelly loamy fill (Stratum Ic), and a very gravelly clay loam (Stratum Id) (Figure 48, Figure 49, and Table 2).

Due to the presence of an active water line running parallel through the center of the test excavation, TE 1A was halted at 0.4 mbs. TE 1A was relocated to an adjacent area in an attempt to avoid the utility. The results for this relocated excavation can be found below in Test Excavation IB.

4.2.2 Test Excavation 1B (TE 1B)

Test Excavation 1B (TE 1B), an exterior excavation placed in an effort to relocate TE 1A, was oriented in a northeast-southwest direction, and measured 6.00 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.74 mbs. The stratigraphy of TE 1B consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly sandy loam (Stratum Ic), a coarse loamy sand (Stratum Id), and hydraulic fill (Stratum Ie), overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) and sandy clay wetland sediments (Stratum III) (Figure 50, Figure 51, and Table 3).

TE 1B documented the presence of historic salt pan remnants, designated SIHP # -7655, consisting of locally procured natural sediment modified into a low structural feature (man-made berm) (Stratum II). The berm was observed primarily in the northern half of the test excavation, extending towards the southern end and partially overlying a portion of the natural wetland sediments. Although Stratum II remained level with the natural sediments, it was consistent with the anthropogenic altered marine clay from which the man-made berms are constructed.

According to historic maps, a corner of LCA 1903:2, consisting of two salt beds, two ditches, two salt depressions, and one salt *kula*, extends slightly into this portion of the project area. Although a man-made berm associated with the SIHP # -7655 historic salt pans was present within TE 1B, it is unclear whether this berm is related to LCA 1903:2 or the larger salt pan system observed on subsequent maps (see Figure 18).

Figure 48. Overview photograph of TE 1A, showing the location of a water line running through the center of the excavation, view to southwest

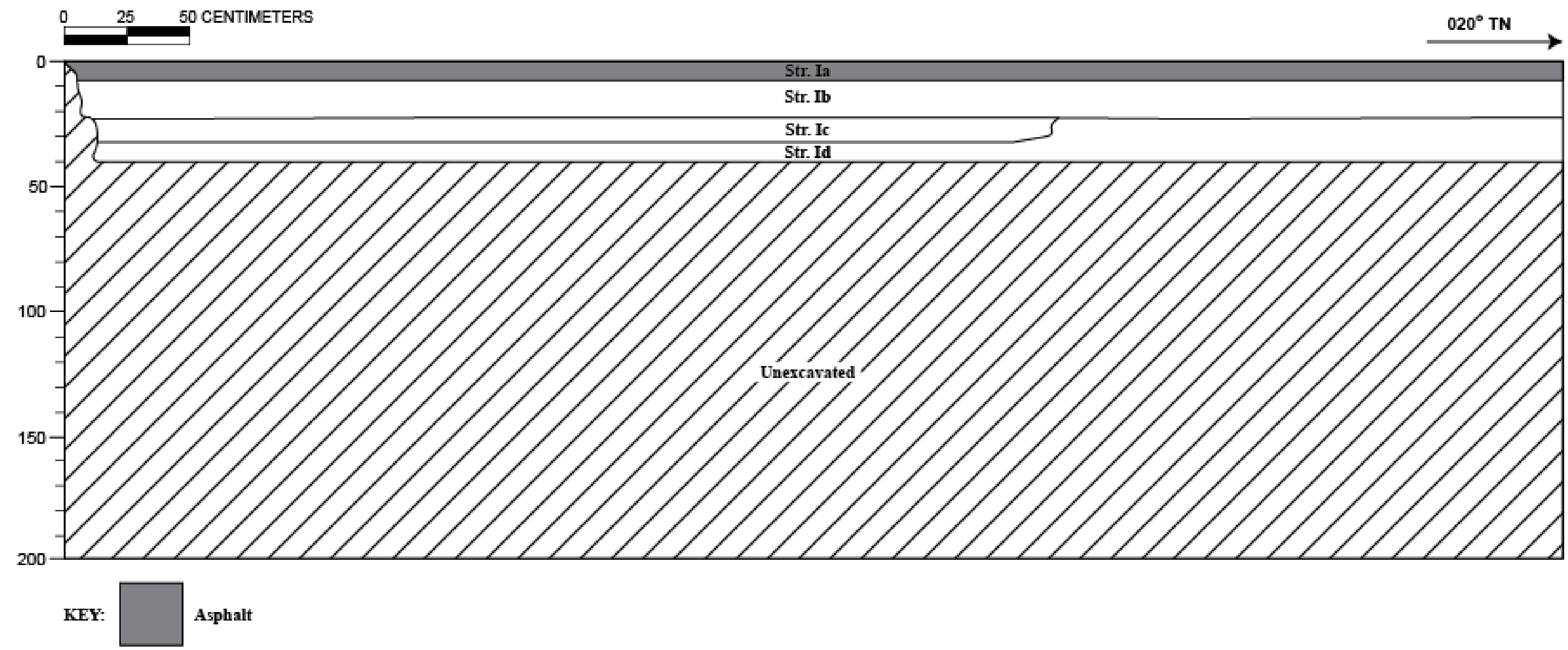

Figure 49. Profile of the TE 1A northwest sidewall

Table 2. Strata Observed within Test Excavation 1A

Stratum	Depth (cmbs)	Description
Ia	0–8	Asphalt surface
Ib	8–23	Fill;.10YR 3/1, very dark gray; base course
Ic	23–32	Fill; 10YR 2/1, black; extremely gravelly sandy loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; mixed origin; abrupt, broken/discontinuous lower boundary; few, fine roots; imported fill
Id	32–40 (BOE)	Fill; 7.5YR 4/3, brown; very gravelly clay loam; weak, fine, crumb structure; moist, friable consistency; slightly plastic; mixed origin; lower boundary not visible; few, medium to coarse roots; modern water pipe (PVC); likely sprinkler system PVC pipe runs throughout T-1

Figure 50. Photograph of the TE 1B northwest sidewall, view to north

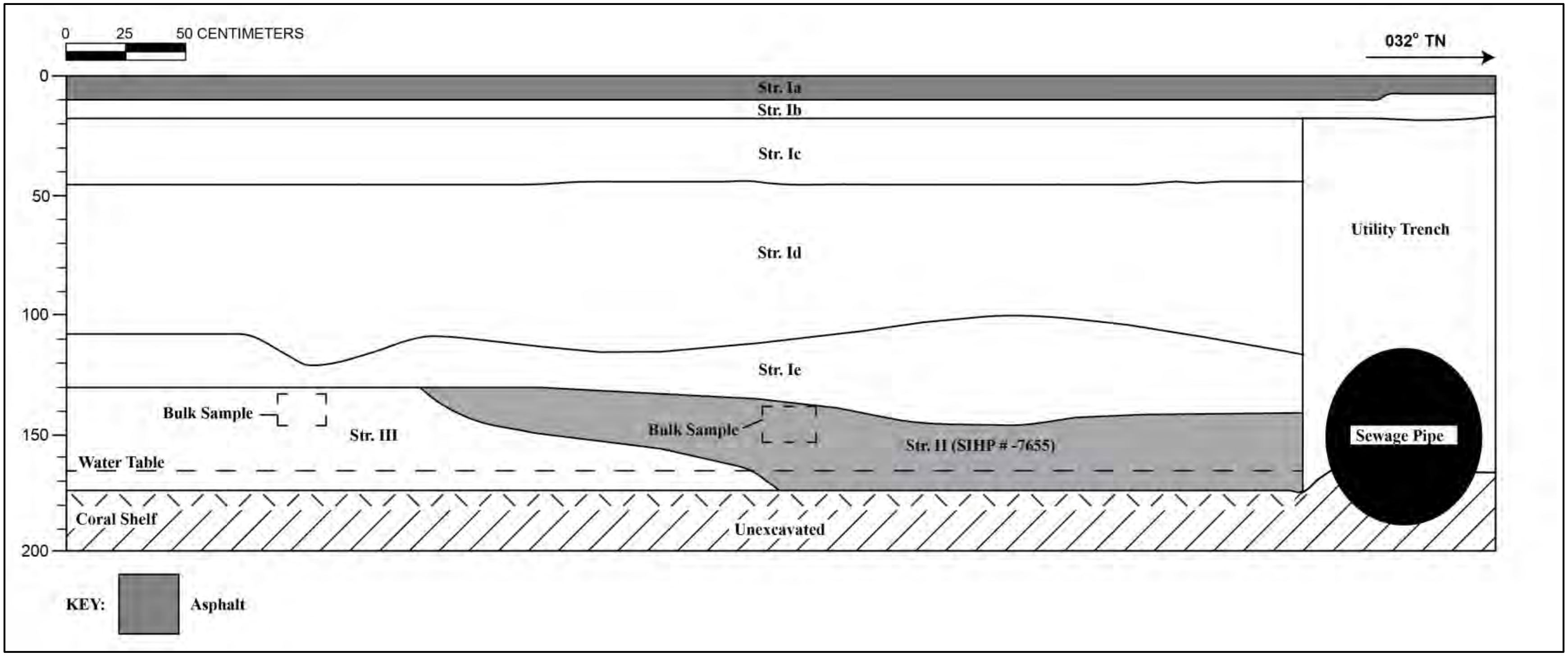

Figure 51. Profile of TE 1B northwest sidewall

Table 3. Strata Observed within Test Excavation 1B

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	7–17	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with the asphalt surface
Ic	17–45	Fill; 2.5Y 4/4, olive brown; gravelly sandy loam; moderate, fine, granular structure; moist, loose consistency; slightly plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill
Id	45–120	Fill; 2.5Y 5/4, light olive brown; coarse loamy sand; structureless (single-grain); moist, loose consistency; slightly plastic; mixed origin; clear, wavy lower boundary; no roots observed; imported fill
Ie	100–145	Fill; 7.5Y 7/4, pale yellow; coarse sandy clay; weak, fine, platy structure; moist, friable consistency; slightly plastic; marine origin; clear, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
Utility Trench	17–174 (BOE)	Fill; 2.5Y 3/2, very dark grayish brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; utility trench for existing sewer line
II	130–174 (BOE)	SIHP # -7655; 2.5Y 6/2, light brownish gray; coarse sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; abrupt, smooth lower boundary; no roots observed; berm associated with the salt pan remnants
III	130–174 (BOE)	Natural; 10Y 5/1, greenish gray; coarse sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; abrupt, smooth lower boundary; no roots observed; wetland sediments

4.2.3 Test Excavation 2 (TE 2)

Test Excavation 2 (TE 2), an exterior excavation located at the entrance of Ward Warehouse on Auahi Street near Ward Avenue, was oriented in a northwest-southeast direction, and measured 6.00 m long by 0.75 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.50 mbs. The stratigraphy of TE 2 consisted of the asphalt surface (Stratum Ia), associated base coarse (Stratum Ib), and various fill layers consisting of gravelly sandy loam (Stratum Ic), clay loam (Stratum Id), gravelly sandy loam (Stratum Ie), and hydraulic fill (Stratum If), overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) and sandy clay wetland sediments (Stratum III) (Figure 52 through Figure 55, and Table 4). A bottle and a bottle fragment were collected from Stratum Ic (Acc. #s 26 and 27) (see Section 5 below).

TE 2 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum II). The berm sediment was observed in the center of the test excavation; however, the full extent of the man-made berm was unable to be determined due to a previous disturbance in the southeast end of the test excavation and structural concrete preventing excavation of the northwestern half.

According to historic maps, a corner of LCA 1903:2, consisting of two salt beds, two ditches, two salt depressions, and one salt *kula*, extends slightly into this portion of the project area. Although a man-made berm associated with the SIHP # -7655 historic salt pans was present within TE 2, it is unclear whether this berm is related to LCA 1903:2 or the larger salt pan system observed on subsequent maps (see Figure 18).

Figure 52. Photograph of the TE 2 northeast sidewall, view to east

Figure 53. Photograph of the modern structural debris in the northwest end of TE 2, view to northwest

Figure 54. Photo of the historic debris within TE 2, Stratum Ic, including Acc. #s 26 and 27

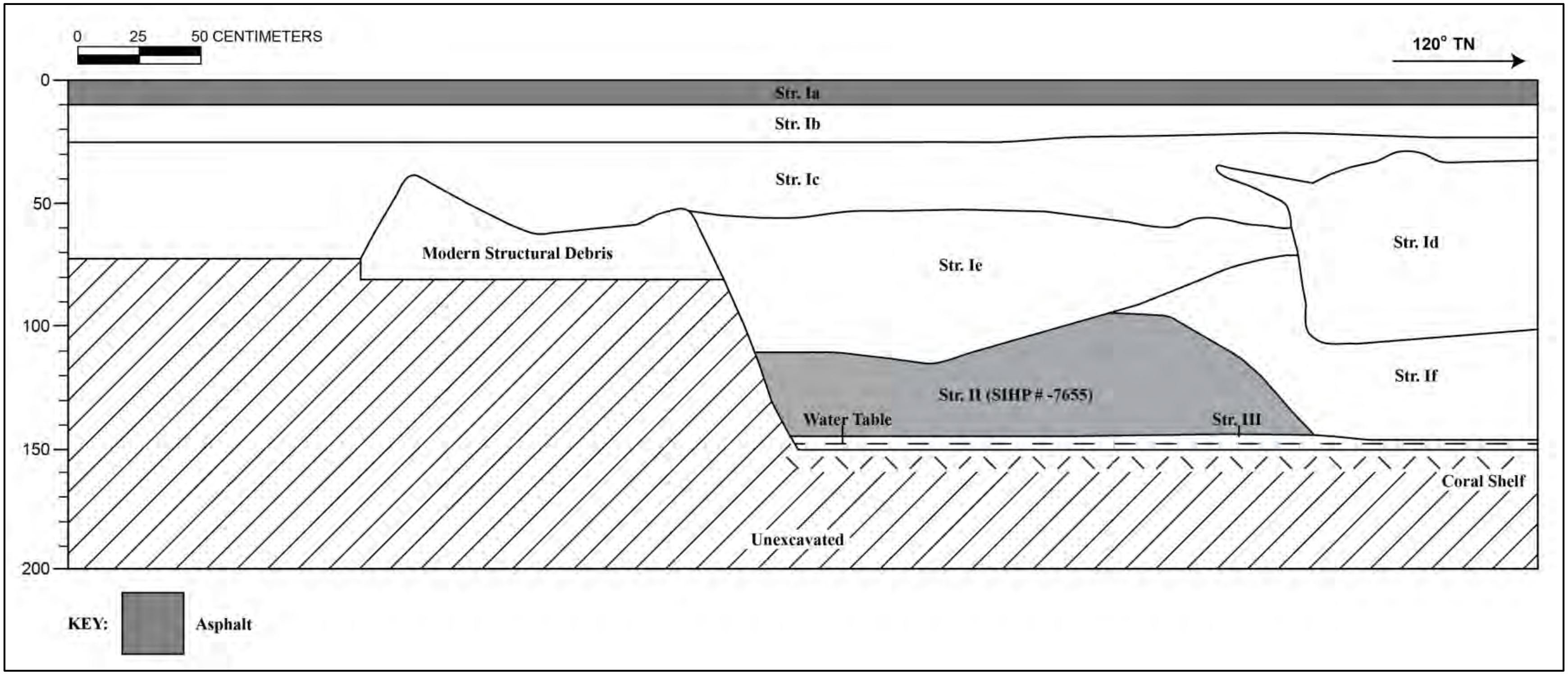

Figure 55. Profile of TE 2, northeast sidewall

Table 4. Strata Observed within Test Excavation 2

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–25	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with the asphalt surface
Ic	20–73	Fill; 2.5Y 4/2, dark grayish brown; extremely gravelly sandy loam; moderate, very fine, granular structure; moist, very friable consistency; slightly plastic; mixed origin; clear, broken/discontinuous lower boundary; few, fine roots; contained historic debris (metal and glass fragments) and a large concrete utility jacket; imported fill
Id	28–107	Fill; 7.5YR 2.5/3, very dark brown; sandy clay loam; structureless (massive); moist, friable consistency; plastic; terrigenous origin; clear, broken/discontinuous lower boundary; few, medium roots; observed in only the eastern end of the trench; imported fill
Ie	53–115	Fill; 5YR 2.5/1, black; gravelly sandy clay loam; weak, fine, crumb structure; moist, very friable consistency; slightly plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; imported fill
If	71–145	Fill; 2.5Y 8/4, pale yellow; coarse sandy clay; structureless (single-grain); moist, very friable consistency; slightly plastic; marine origin; clear, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
II	95–145	SIHP # -7655; 2.5Y 6/2, light brownish gray; coarse sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, broken/discontinuous lower boundary; no roots observed; berm associated with the salt pan remnants
III	145–150 (BOE)	Natural; 10Y 5/1, greenish gray; fine sandy clay; structureless (massive); wet, very sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; no roots observed; wetland sediments containing fresh water snails

4.2.4 Test Excavation 3 (TE 3)

Test Excavation 3 (TE 3), an exterior excavation located on the Auahi Street side of the Ward Center, was oriented in a northeast-southwest direction, and measured 6.0 m long by 0.7 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.74 mbs. The stratigraphy of TE 3 consisted of the asphalt parking surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of a compact, extremely gravelly sandy loam (Stratum Ic), a discontinuous crushed coral lens (Stratum Id), a very gravelly sandy loam (Stratum Ie), crushed coral fill (Stratum If), and hydraulic fill (Stratum Ig), overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) and sandy clay wetland sediments (Stratum III) (Figure 56 through Figure 59, and Table 5). An existing utility was encountered in the southwestern end of the test excavation. Modern construction debris was encountered with Stratum Ic (nails, bricks) but not collected (Figure 58).

TE 3 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum II). The berm sediment was observed intermittently within TE 3, located within the center of the test excavation and a portion of the southwestern end. The berm observed within the center of the test excavation sloped to the northeast and the southwest, while the section in the southwest portion of the trench sloped to the northeast, although the southwestern end was unable to be fully explored due to the presence of an existing utility.

According to historic maps, a corner of LCA 1903:2, consisting of two salt beds, two ditches, two salt depressions, and one salt *kula*, extends slightly into this portion of the project area. Although a man-made berm associated with the SIHP # -7655 historic salt pans was present within TE 3, it is unclear whether this berm is related to LCA 1903:2 or the larger salt pan system observed on subsequent maps (see Figure 18).

Figure 56. Photograph of the TE 3 west sidewall, view to southwest

Figure 57. Close-up of the larger berm feature (SIHP # -7655) within the TE 3 west sidewall, view to southwest

Figure 58. Photograph of the modern trash observed within TE 3, Stratum Ic

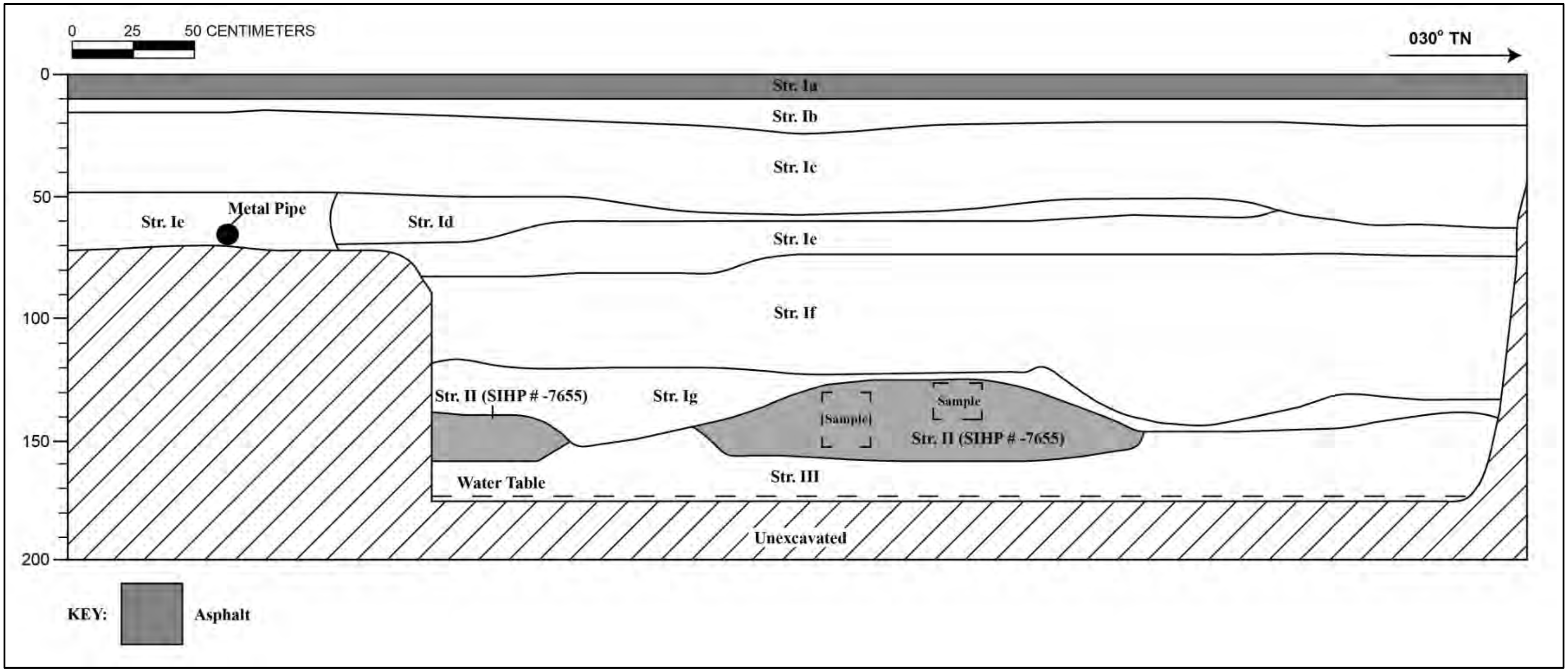

Figure 59. Profile of TE 3, northwest sidewall

Table 5. Strata Observed within Test Excavation 3

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–24	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	15–62	Fill; 10YR 3/3, dark brown; very gravelly sandy loam; weak, fine, crumb structure; moist, very friable consistency; slightly plastic; mixed origin; abrupt, smooth lower boundary; no roots observed; contained modern debris (nails, bricks); imported fill
Id	50–70	Fill; 2.5Y 8/2, pale yellow; extremely gravelly coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; abrupt, broken/discontinuous lower boundary; no roots observed; imported crushed coral fill
Ie	44–83	Fill; 10YR 2/2, very dark brown; very gravelly sandy loam; weak, medium, blocky structure; moist, loose consistency; non-plastic; mixed origin; smooth, smooth lower boundary; no roots observed; imported fill
If	83–142	Fill; 2.5Y 8/2, pale yellow; very gravelly coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ig	116–152	Fill; 2.5Y 7/2, light gray; sandy clay; structureless (massive); wet, sticky consistency; very plastic; marine origin; clear, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
II	125–159	SIHP # -7655; 2.5Y 7/3, pale yellow; coarse sandy clay; structureless (massive); wet, sticky consistency; plastic; marine origin; clear, broken/discontinuous lower boundary; no roots observed; berm associated with the salt pan remnants
III	146–174 (BOE)	Natural; 10Y 6/1, greenish gray; coarse sandy clay; structureless (massive); wet, very sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; no roots observed; wetland sediments

4.2.5 Test Excavation 4 (TE 4)

Test Excavation 4 (TE 4), an exterior excavation located in the northwestern portion of the project area, was oriented in an east-west direction, and measured 6.10 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.80 mbs. The stratigraphy of TE 4 consisted of the asphalt parking lot surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of loamy sand (Stratum Ic), a second layer of loamy sand (Stratum Id), buried concrete surface (SIHP # -7658) (Stratum Ie), crushed coral fill (Stratum If), and hydraulic fill (Stratum Ig), overlying a sandy clay man-made berm (SIHP # -7655) (Stratum IIa), laminated organic material (SIHP # -7655) (Stratum IIb), and sandy clay wetland sediments (Strata III and IV) (Figure 60 through Figure 63, and Table 6). The thick layer of concrete, determined to be a component of SIHP # -7658 (buried historic surfaces) (Stratum Ie), likely represents a former building foundation.

A thick layer of concrete, determined to be a component of SIHP # -7658 (Stratum Ie) was observed in the southeast portion of TE 4. This concrete slab was observed between 90 and 100 cmbs, overlying crushed coral fill and hydraulic fill associated with the 1919–1926 land reclamation. Based on historic maps and aerial photos, the buried concrete surface likely dates between 1939 and 1976.

TE 4 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum IIa) and a thin layer of laminated organic material (Stratum IIb). The low berm (Stratum IIa) was primarily observed within the eastern half of TE 4, sloping slightly to the west, and intersecting with the thin layer of laminated organic material (Stratum IIb) representing the salt pan bed. Due to the presences of a utility jacket in the eastern end of the trench, the full extent of the berm (Stratum IIa) within TE 4 was unable to be determined. Two distinct layers of natural wetland sediments containing freshwater snails and some rootlets were observed underlying the man-made berm.

Construction-related debris was observed within TE4 but not collected, including rusted metal, nails, wires, utility pipe, glass, bricks, cement fragments, and a crushed aluminum “Olympia” beer can. A graphite pencil (Acc. # 1) and a saw-cut faunal bone fragment (Acc. # 2) were collected from Stratum Ib (see Section 5 below).

Figure 60. Photograph of the west end of the northeast sidewall within TE 4, view to northwest

Figure 61. Photograph of the man-made berm (SIHP # -7655) within the TE 4 northeast sidewall, view to northeast

Figure 62. Photograph of the modern trash observed within TE 4 Strata Ic and Id

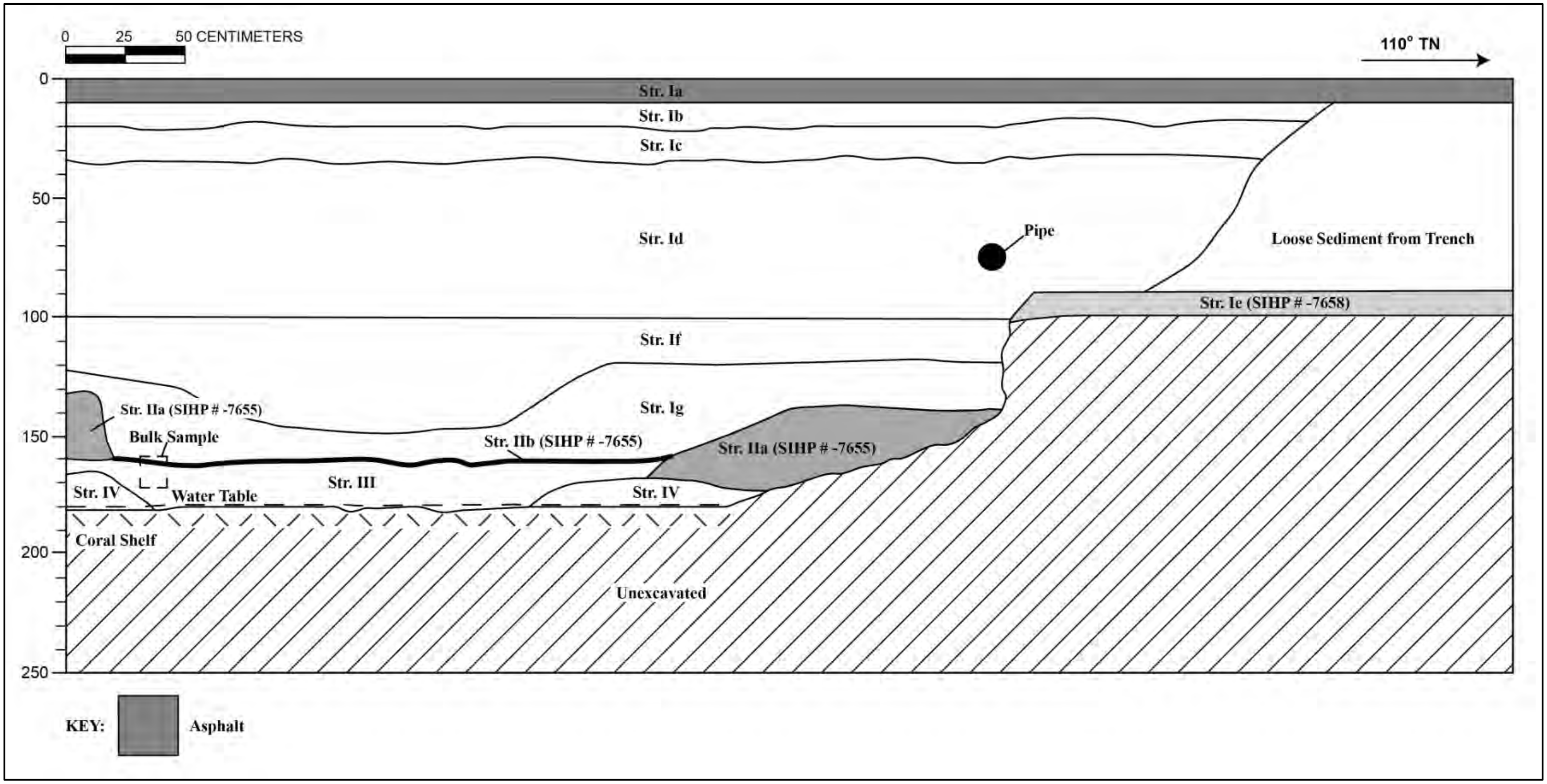

Figure 63. Profile of TE 4, northeast sidewall

Table 6. Strata Observed within Test Excavation 4

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–20	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	18–35	Fill; 10YR 3/3, dark brown; very gravelly medium loamy sand; weak, medium, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; construction related debris including metal, glass, aluminum can, brick, and wires observed; imported fill
Id	35–100	Fill; 10YR 5/3, brown; very gravelly coarse loamy sand; structureless (single-grain); moist, loose consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; contained construction-related debris including utility pipe and metal; imported fill
Ie		SIHP # -7658; buried concrete foundation
If	100–147	Fill; 2.5Y 8/3, pale yellow; coarse gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; abrupt, wavy lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ig	120–160	Fill; 10GY 7/1; light greenish gray; silty clay; structureless (massive); moist, firm consistency; plastic; mixed origin; abrupt, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
IIa	138–180	SIHP # -7655; 2.5Y 7/3, pale yellow grading to 5Y 7/2, light gray; fine sandy clay; structureless (massive); moist, firm consistency; plastic; marine origin; abrupt, broken/discontinuous lower boundary; common, fine roots; berm associated with salt pan remnants
IIb	160–161	SIHP # -7655; organic laminations associated with salt pan remnants
III	161–180 (BOE)	Natural; 5Y 4/1, dark gray; sandy clay; structureless (massive); moist, firm consistency; plastic; marine origin; abrupt, smooth lower boundary; common, fine roots; wetland sediment containing freshwater snails
IV	165–180 (BOE)	Natural; 10Y 6/1, greenish gray; fine sandy clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; few fine roots; wetland sediment

4.2.6 Test Excavation 5 (TE 5)

Test Excavation 5 (TE 5), an exterior excavation located along the northern edge of the project area, was oriented in a north-south direction, and measured 6.10 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.80 mbs. The stratigraphy of TE 5 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), a buried asphalt surface (SIHP # -7658) (Stratum Ic), associated base course (Stratum Id), a buried concrete surface (SIHP # -7658) (Stratum Ie), and various layers of fill consisting of crushed coral fill (Stratum If), hydraulic fill (Stratum Ig), a second layer of crushed coral fill (Stratum Ih), and a second layer of hydraulic fill (Stratum Ii) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) and sandy clay wetland sediments (Stratum III) (Figure 64, Figure 65, Figure 67, and Table 7). Modern construction debris was encountered with Stratum Id (wood and nails) but not collected (Figure 66).

Three separate land surfaces were observed with TE 5, represented by the current asphalt surface (Strata Ia and Ib), a buried asphalt surface (SIHP # -7658) (Stratum Ic), and a buried concrete slab (SIHP # -7658) (Stratum Id). The buried asphalt layer (Stratum Ic) is located approximately 20 to 25 cmbs; the concrete slab is located approximately 45 to 58 cmbs. The concrete surface is directly overlying crushed coral fill and hydraulic fill associated with the 1919–1926 land reclamation. Based on historic maps and aerial photos, the buried asphalt surface likely dates between 1952 and 1976, while the underlying concrete slab likely dates between 1939 and 1952.

TE 5 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum II). A cross-section of the berm is observed within TE 5, sloping down towards each end of the trench. The missing portions of the natural underlying wetland sediments were likely removed as part of the creation of the berm. This can be seen in Figure 65, in which mottles of the natural marine clay (Stratum III) are visible near the center of the berm.

Figure 64. Photograph of the TE 5 southeast sidewall, view to southwest

Figure 65. Close-up of Stratum II (SIHP # -7655), showing mottling of the natural marine clay within the man-made berm, view to south

Figure 66. Photograph of the modern trash observed within TE 5, Stratum Id

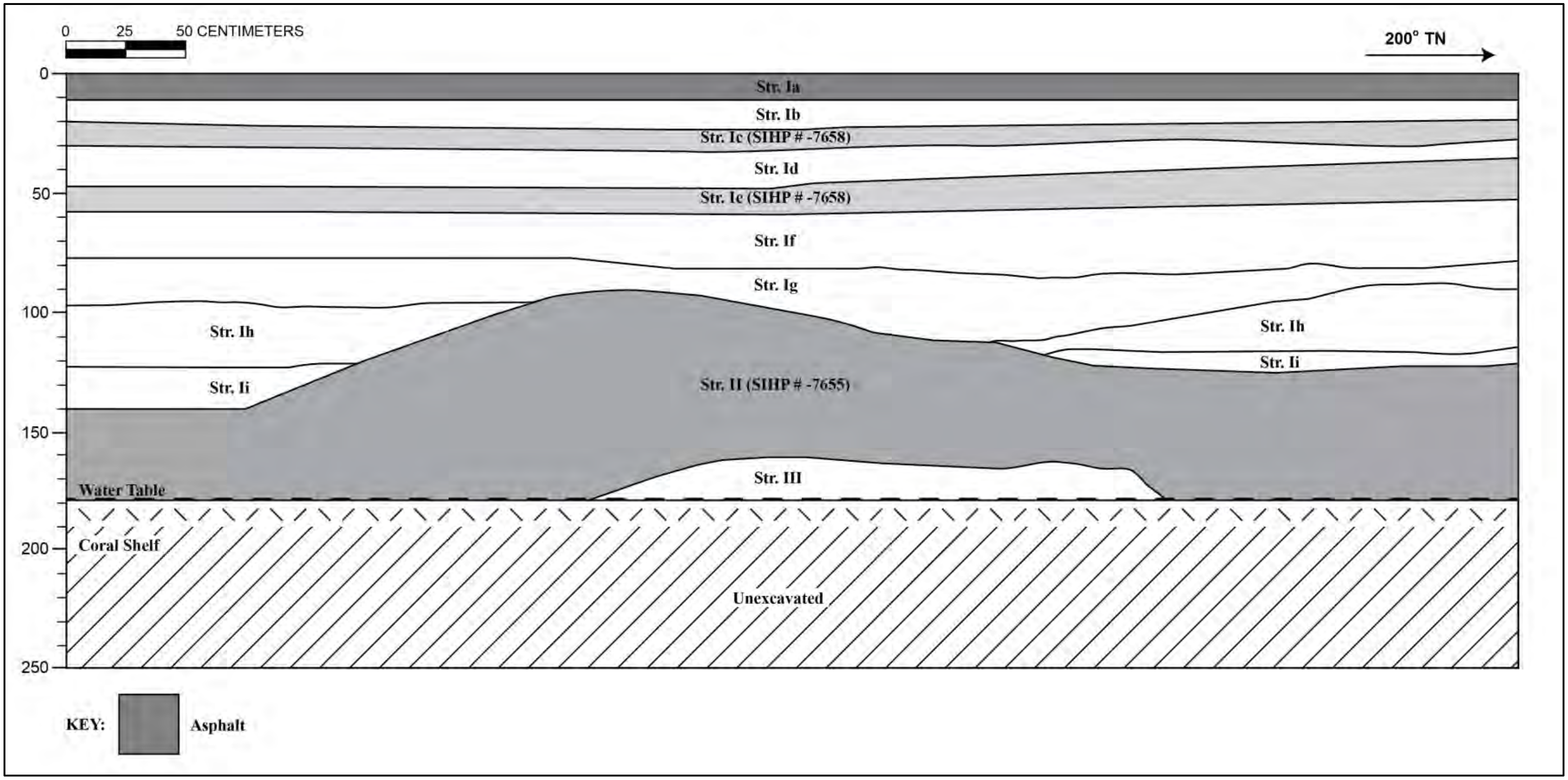

Figure 67. Profile of TE 5, southeast sidewall

Table 7. Strata Observed within Test Excavation 5

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–25	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	20–30	SIHP # -7658; buried asphalt surface
Id	30–47	Fill; 7.5YR 3/1, very dark gray; extremely gravelly sandy loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; very abrupt, smooth lower boundary; no roots observed; contained construction debris (wood and nails); base course associated with buried asphalt surface
Ie	35–58	SIHP # -7658; buried concrete surface
If	53–85	Fill; 2.5Y 8/3, pale yellow; gravelly coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ig	76–112	Fill; 2.5Y 7/2; light gray; silty clay; structureless (massive); moist, firm consistency; plastic; mixed origin; abrupt, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
Ih	89–128	Fill; 2.5Y 8/3, pale yellow; gravelly coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, broken/discontinuous lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ii	115–142	Fill; 2.5Y 7/2, light gray grading to 10GY 7/1, light greenish gray; silty clay; structureless (massive); moist, firm consistency; plastic; mixed origin; smooth, broken/discontinuous lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
II	90–180	SIHP # -7655; 2.5Y 6/3, light yellowish brown with mottles of 10Y 7/1, light greenish gray; loamy clay; structureless (massive); moist, friable, plastic; marine origin; clear lower boundary; common fine roots; slate fragments; mottled with the underlying wetland sediments; berm associated with salt pan remnants
III	160–180 (BOE)	Natural; 10Y 7/1, light greenish gray; fine sandy clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; no roots observed; wetland sediment

4.2.7 Test Excavation 6 (TE 6)

Test Excavation 6 (TE 6), and exterior excavation located along the northern edge of the project area, was oriented in an east-west direction, and measured 6.10 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.80 mbs. The stratigraphy of TE 6 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various layers of fill consisting of gravelly sandy loam (Stratum Ic), crushed coral fill (Stratum Id), and hydraulic fill (Stratum Ie), overlying a sandy clay man-made berm (SIHP # -7655) (Stratum IIa), laminated organic material (SIHP # -7655) (Stratum IIb), and silty clay wetland sediment (Stratum III) (Figure 68 through Figure 72, and Table 8). Modern construction debris was encountered with Stratum Ic (wood and nails) but not collected (Figure 70).

TE 6 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum IIa) and a thin layer of laminated organic material (Stratum IIb). The berm sediment was observed primarily in the eastern half of the trench, sloping towards the western end and transitioning into the laminated material (Stratum IIb), which extended slightly up the edge of the berm. Only a small amount of the laminated organic material was observed due to a large concrete jacket, likely associated with an existing sewer line, encountered near the west end of the trench.

A sample of Stratum IIb, laminated organic material associated with the historic salt pans (SIHP # -7655), and the underlying wetland sediment (Stratum III) were submitted to PaleoResearch Institute, Inc. for pollen and microcharcoal analysis (see Section 5.2 for detailed analysis). The majority of the observed pollen consisted of *Myrsine* (*kolea*), which is an endemic tree. Cyperaceae pollen was documented in the wetland sediment (Sample 2), but not in a concentration indicative of a sedge marsh.

Pollen from introduced species was observed within both samples, including *kiawe* (*Prosopis*), *koa haole* (*Leucaena*), and ironwood (*Casuarina*). This may indicate that both samples date to the historic period. Alternatively, the alien species within the wetland sediments (Sample 2) may be a result of contamination during recent or historic times.

Small concentrations of ferns and grasses (Poaceae) were located within both samples, suggesting these plants were growing in outlying areas. Coconut (*Cocos nucifera*) and cattails (*Typha*) were only documented in the underlying wetland sample. A larger variety of pollen was present in the wetland sample (Stratum III), while the laminated organic material (Stratum IIb) contained a higher pollen concentration value.

Figure 68. Photograph of the TE 6 northeast sidewall, view to northwest

Figure 69. Close-up of Stratum IIb laminated organic material (SIHP # -7655) within the northeast sidewall, indicated by the yellow arrow, view to east

Figure 70. Photograph of the modern trash observed within TE 6, Stratum Ic

Figure 71. Photograph of the modern trash observed within TE 6, Stratum Ic

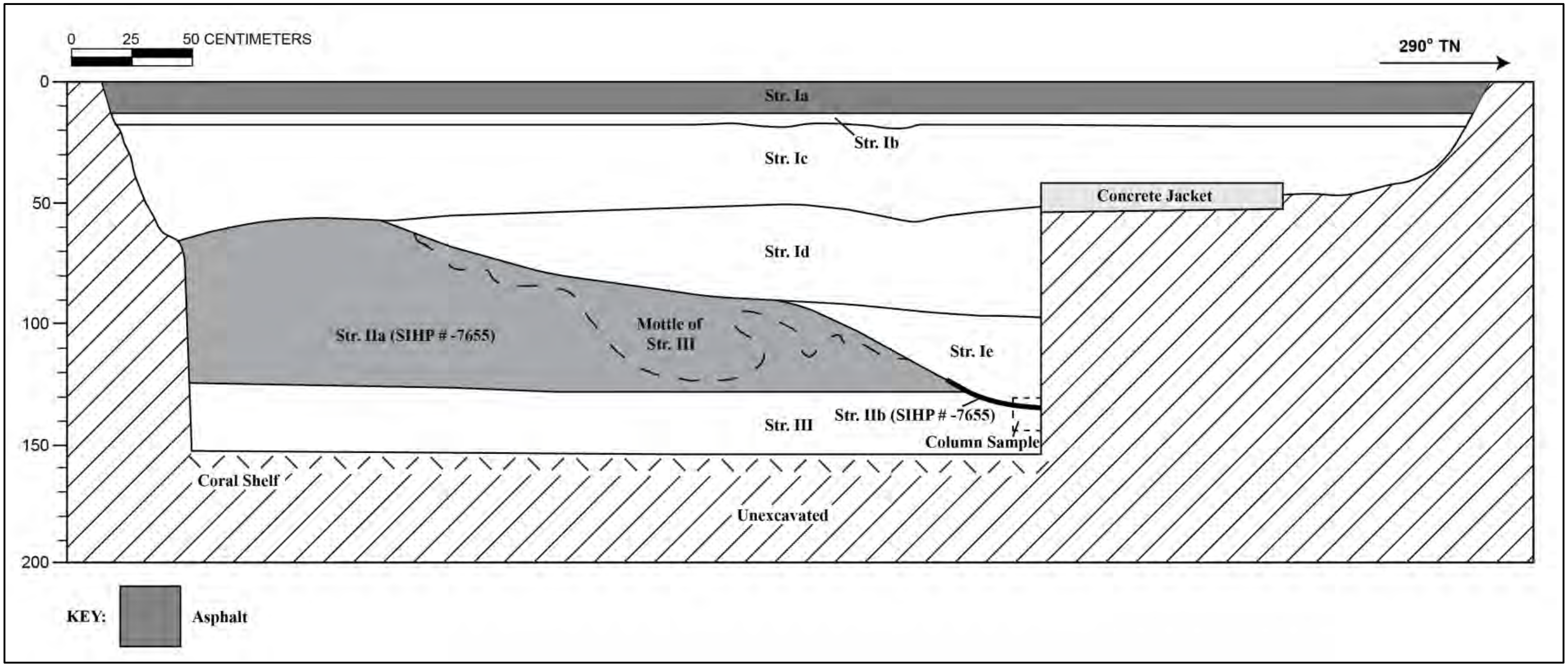

Figure 72. Profile of TE 6, northeast sidewall

Table 8. Strata Observed within Test Excavation 6

Stratum	Depth (cmbs)	Description
Ia	0–12	Asphalt surface
Ib	12–18	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	18–63	Fill; 2.5Y 4/1, dark gray; extremely gravelly sandy loam; moderate, medium, blocky structure; non-plastic; mixed origin; clear, smooth lower boundary; few, medium roots; construction debris (wood and nails) and cement observed; imported fill
Id	50–91	Fill; 2.5Y 8/3, pale yellow; coarse gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; abrupt, broken/discontinuous lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ie	90–133	Fill; 10YR 7/3, very pale brown grading to 10GY 7/1, light greenish gray; fine sandy clay; structureless (massive); moist, firm consistency; plastic; mixed origin; broken/discontinuous lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
IIa	56–120	SIHP # -7655; 2.5Y 6/3; light yellowish brown; sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; common fine roots observed; contains mottles of Stratum III; berm associated with salt pan remnants
IIb	132–135	SIHP # -7655; organic laminations associated with salt pan remnants
III	126–153 (BOE)	Natural; 10Y 6/1, greenish gray; silty clay; structureless (massive); moist, firm consistency; plastic; marine origin; abrupt, smooth lower boundary; no roots observed; wetland sediment

4.2.8 Test Excavation 7 (TE 7)

Test Excavation 7 (TE 7), an exterior excavation located in the northern portion of the project area, was oriented in a north-south direction, and measured 6.10 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.76 mbs. The stratigraphy of TE 7 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various layers of fill consisting of gravelly sandy loam (Stratum Ic), buried concrete surface (SIHP # -7658) (Stratum Id), crushed coral fill (Stratum Ie), and hydraulic fill (Stratum If), overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II), and silty clay wetland sediment (Stratum III) (Figure 73, Figure 74, and Table 9).

A thick layer of concrete observed within TE 7 was determined to be a component of SIHP # -7658 (Stratum Id). The concrete was observed between 45 and 55 cmbs, and was truncated by a utility trench in the central portion of the test excavation. The concrete surface is directly overlying crushed coral fill and hydraulic fill associated with the 1919–1926 land reclamation. Based on historic maps and aerial photos, the buried concrete slab likely dates between 1939 and 1976. The concrete slab observed within TE 7 is continuous with the slab observed within the intersecting TE 37.

TE 7 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum II). The berm sediment extended across the length of the test excavation, sloping slightly downward towards the southern end. A thin remnant of the natural wetland sediments remained overlying the coral shelf, a majority of which may have been removed during construction of the surrounding berms. An approximately 3 cm thick A horizon was observed on the upper boundary of Stratum II, suggesting the berm served as a stable ground surface for a period of time. No cultural material was observed within the A horizon.

Figure 73. Photograph of the TE 7 east sidewall, view to southeast

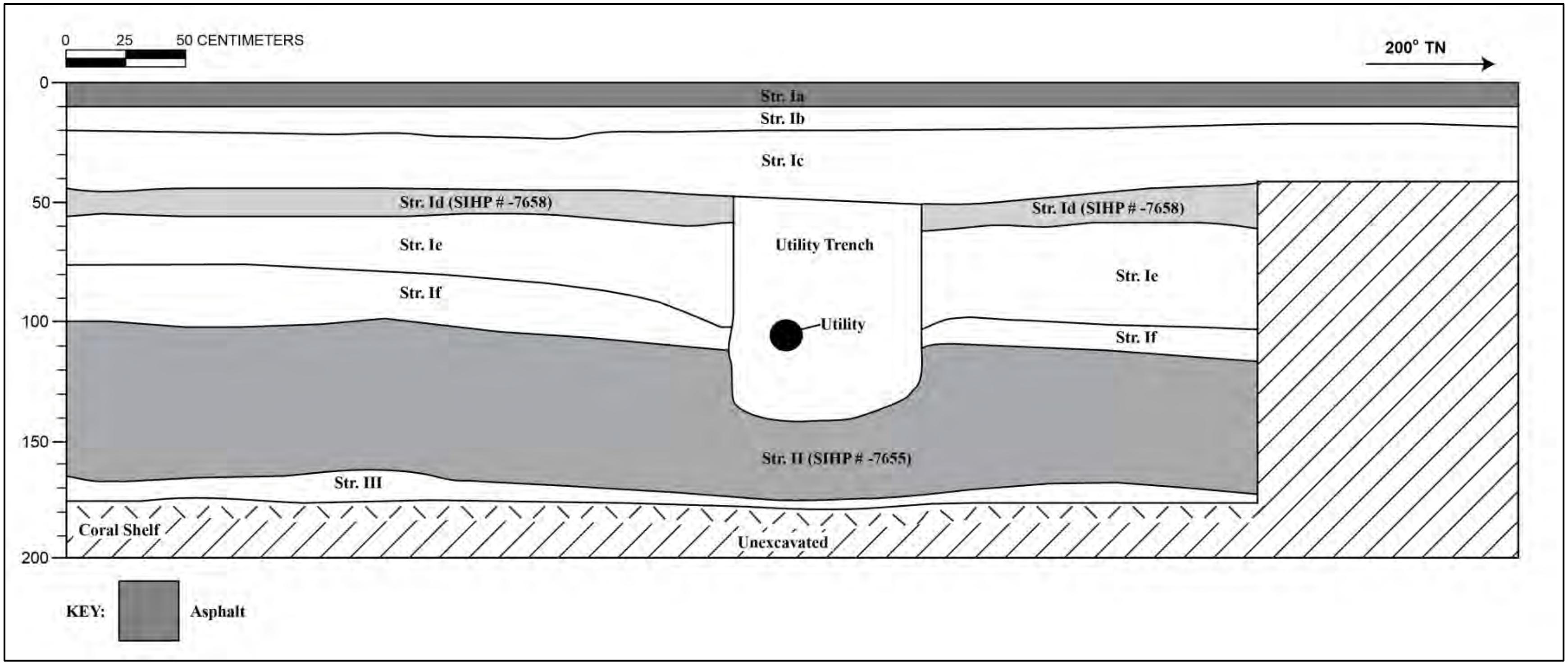

Figure 74. Profile of TE 7, east sidewall

Table 9. Strata Observed within Test Excavation 7

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–22	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	18–50	Fill; 10YR 5/3, brown; gravelly sandy loam; weak, fine, crumb structure; moist, friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill containing asphalt pieces
Id	40–60	SIHP # -7658; buried concrete surface
Ie	55–101	Fill; 10YR 6/2, light gray brown; very gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; abrupt, broken/discontinuous lower boundary; no roots observed; crushed coral fill associated with land reclamation fill
If	75–115	Fill; 10YR 6/2, light brownish gray; silty clay; structureless (massive); wet, slightly sticky to sticky consistency; plastic; marine origin; clear, broken/discontinuous lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
Utility Trench	50–125	Fill; 2.5Y 3/2, very dark grayish brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; utility trench for existing utility
II	101–173	SIHP # -7655; 10YR 6/3, pale brown; gravelly sandy clay loam; moderate, very fine to fine, crumb structure; moist, friable consistency; plastic; marine origin; abrupt, smooth lower boundary; few, very fine to fine roots; berm associated with salt pan remnants
III	163–176 (BOE)	Natural; 5PB 7/1, light blue gray; silty clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; lower boundary not visible; abrupt, smooth lower boundary; wetland sediments containing freshwater snails

4.2.9 Test Excavation 8 (TE 8)

Test Excavation 8 (TE 8), an exterior excavation located along the northern edge of the project area, was oriented in a north-south direction, and measured 6.10 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.65 mbs. The stratigraphy of TE 8 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), a buried asphalt surface (SIHP # -7658) (Stratum Ic), associated base course (Stratum Id), and various layers of fill consisting of gravelly sandy loam (Stratum Ie), a buried concrete surface (SIHP # -7658) (Stratum If), sandy clay loam (Stratum Ig), crushed coral fill (Stratum Ih), and hydraulic fill (Stratum Ii), overlying a sandy clay man-made berm (SIHP # -7655) (Stratum IIa), laminated organic material (SIHP # -7655) (Stratum IIb), and gravelly silty clay wetland sediments (Stratum III) (Figure 75, Figure 76, and Table 10).

Three separate land surfaces were observed with TE 8, represented by the current asphalt surface (Strata Ia and Ib), a buried asphalt surface (SIHP # -7658) (Stratum Ic), and a buried concrete slab (SIHP # -7658) (Stratum If). The buried asphalt layer (Stratum Ic) is located approximately 20 to 30 cmbs; the concrete slab is located approximately 52 to 65 cmbs. The concrete surfaces is directly overlying a crushed coral fill and hydraulic fill associated with land reclamation (1919-1926). Based on historic maps and aerial photos, the buried asphalt surface likely dates between 1952 and 1976, while the underlying concrete slab likely dates from 1927 and 1976.

TE 8 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum IIa), and a thin layer of laminated organic material (Stratum IIb). The man-made berm sediments (Stratum IIa) were not observed in the western sidewall, suggesting TE 8 is located at the beginning of a berm extending to the east. Construction of the berm appeared to have removed the underlying natural wetland, although the wetland sediments remained in place when underlying the laminated organic material associated with the salt pan bed.

Figure 75. Photograph of the TE 8 east sidewall, view to south

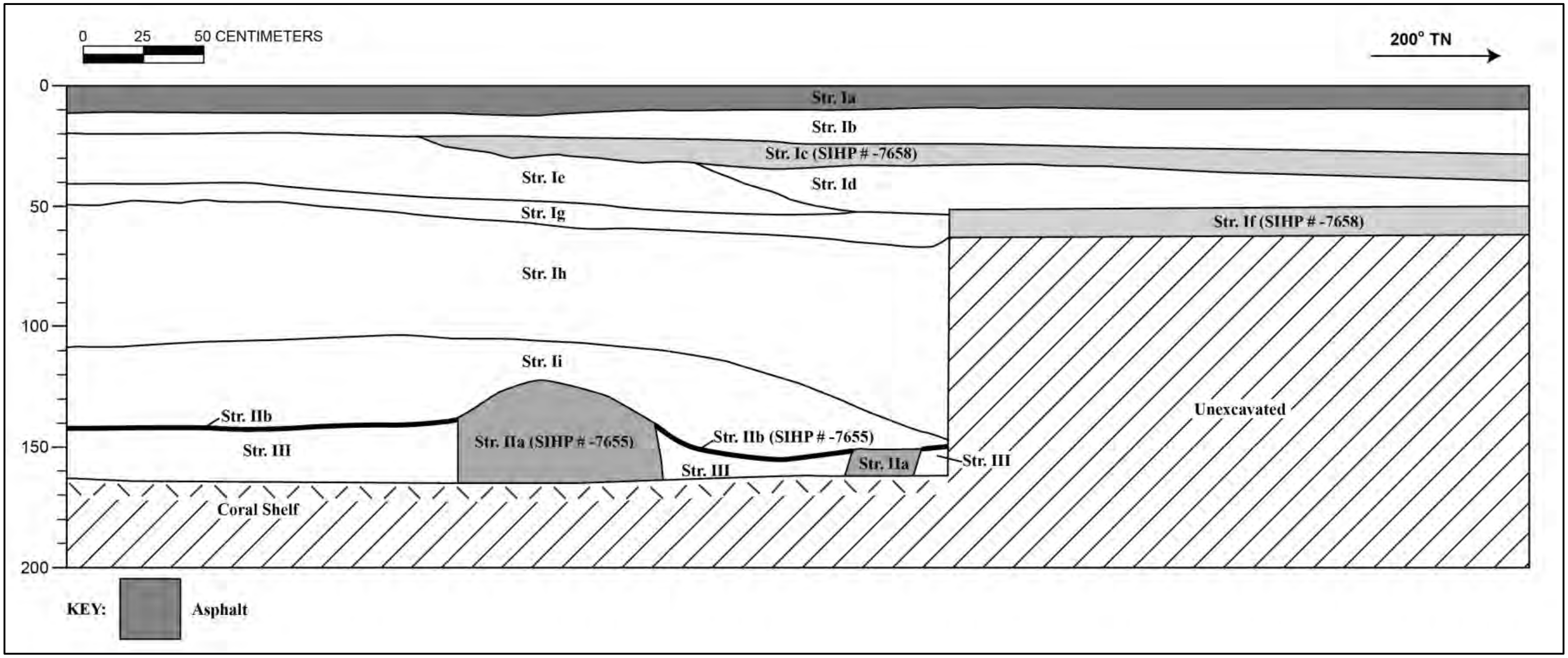

Figure 76. Profile of TE 8, east sidewall

Table 10. Strata Observed within Test Excavation 8

Stratum	Depth (cmbs)	Description
Ia	0–12	Asphalt surface
Ib	12–55	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	20–30	SIHP # -7658; buried asphalt surface
Id	30–40	Fill; 7.5YR 3/1, very dark gray; extremely gravelly sandy loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; very abrupt, smooth lower boundary; no roots observed; base course associated with buried asphalt surface
Ie	20–55	Fill; 10YR 7/3, brown; very gravelly medium sandy loam; weak, medium, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill
If	52–65	SIHP # -7658; buried concrete surface
Ig	40–70	Fill; 10YR 6/2, light brown gray; very gravelly sandy clay loam; moderate, fine, crumb structure; moist, friable consistency; mixed origin; abrupt, smooth lower boundary; no roots observed; imported fill consisting of an asphalt, concrete, and sand stone mix
Ih	50–142	Fill; 10YR 7/3, pale brown; very gravelly coarse sand; structureless (single-grain); moist, firm consistency; non-plastic; marine origin; abrupt, smooth lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ii	108–155	Fill; 10YR 7/3; very pale brown; gravelly sandy clay; structureless (massive); moist firm consistency; very plastic; mixed origin; abrupt, wavy lower boundary; few fine to medium roots observed; hydraulic (dredge) fill associated with land reclamation events
IIa	122–165 (BOE)	SIHP # -7655; 2.5Y 6/2, light brown gray; slightly gravelly to gravelly sandy clay; structureless (massive); moist, friable to firm consistency; very plastic; marine origin; abrupt, smooth lower boundary; contains some small rootlets; berm associated with the salt pan remnants small rootlets and small shells
IIb	140–143	SIHP # -7655; organic laminations associated with salt pan remnants
III	143–165 (BOE)	Natural; 10B 7/1, light blue grey; gravelly silty clay; structureless (massive); moist, firm consistency; plastic; marine origin; abrupt smooth lower boundary; no roots observed; natural wetland sediment

4.2.10 Test Excavation 9 (TE 9)

Test Excavation 9 (TE 9), an exterior excavation located near the northeastern corner of the project area, was oriented in an east-west direction, and measured 6.10 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.80 mbs. The stratigraphy of TE 9 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly sandy loam (Stratum Ic), a buried asphalt surface (SIHP # -7658) (Stratum Id), associated base course (Stratum Ie), a buried concrete surface (SIHP # -7658) (Stratum If), crushed coral fill (Stratum Ig), and hydraulic fill (Stratum Ih) overlying a large sandy clay man-made berm (SIHP # -7655) (Stratum IIa), laminated organic material (SIHP # -7655) (Stratum IIb), and gravelly sandy clay wetland sediments (Stratum III) (Figure 77 through Figure 80, and Table 11).

Three separate land surfaces were observed within TE 9, represented by the current asphalt surface (Strata Ia and Ib), a buried asphalt surface (SIHP # -7658) (Stratum Id), and a buried concrete slab (SIHP # -7658) (Stratum If). The asphalt layer is located approximately 50 to 62 cmbs; the concrete slab is located approximately 65 to 77 cmbs and is only located in the northwest end of the test excavation. The concrete surface is overlying a crushed coral fill and hydraulic fill associated with land reclamation (1919-1926). Based on historic maps and aerial photos, the buried asphalt surface likely dates between 1952 and 1976, while the underlying concrete slab likely dates from 1927 and 1976.

TE 9 documented the presence of salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a large structural feature (man-made berm) (Stratum IIa) and a thin layer of laminated organic material (Stratum IIb). The berm was observed in the eastern half of the test excavation, sloping steeply towards the center of the test excavation and transitioning to the flat laminated organic layer observed in the western half. Construction of the berm appeared to have removed the underlying natural wetland sediments (Stratum III), as well as a majority of the adjacent sediments. Construction-related debris and abandoned sewer lines were observed within the modern and historic fill layers (Strata Ib–Ie) but not collected (Figure 79).

Figure 77. Photograph of the TE 9 north sidewall, view to southeast

Figure 78. Overview photograph of the TE 9 north sidewall, view to east

Figure 79. Photograph of the modern trash observed within TE 9, Strata Ib–Ie

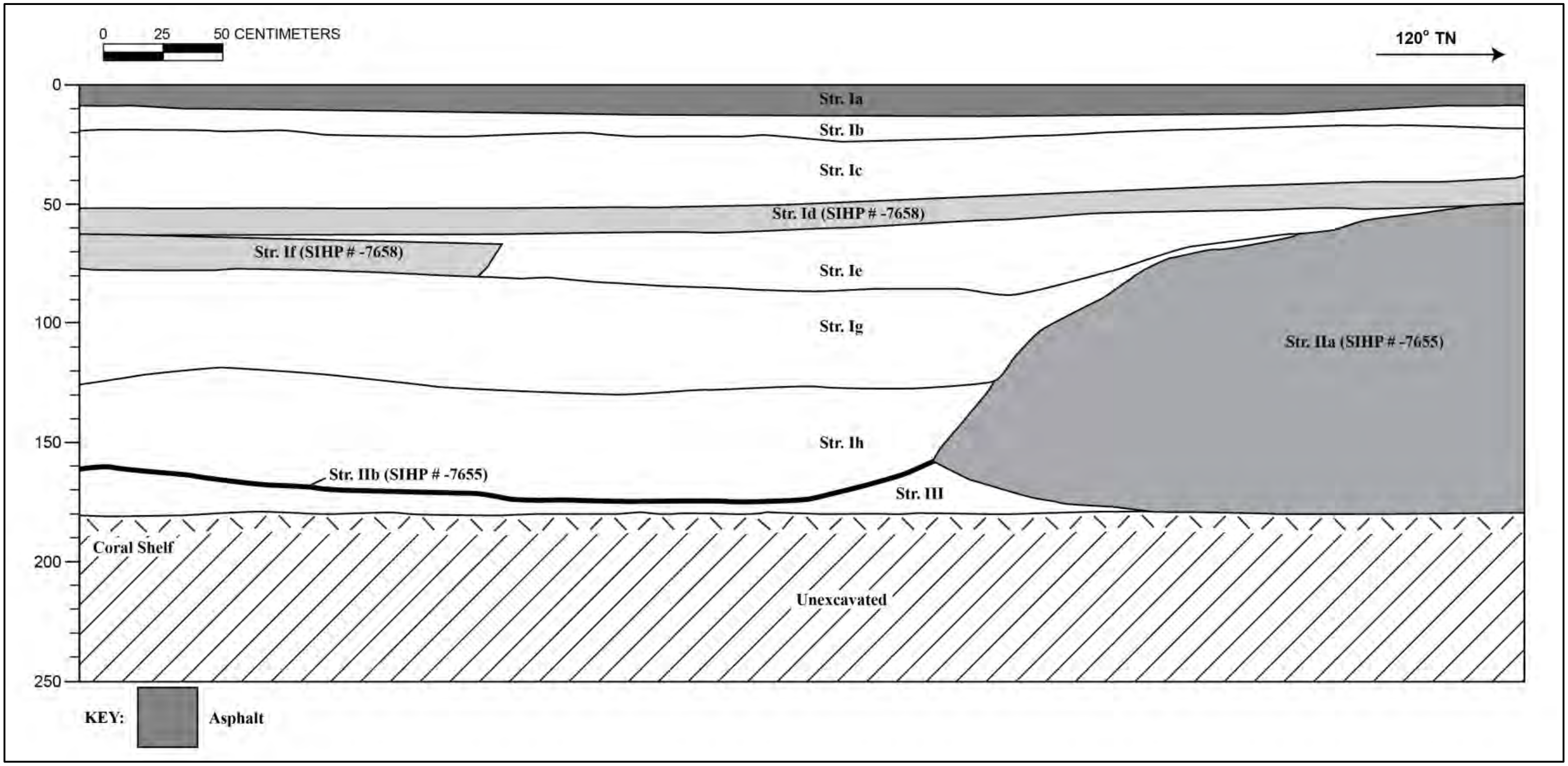

Figure 80. Profile of TE 9, north sidewall

Table 11. Strata Observed within Test Excavation 9

Stratum	Depth (cmbs)	Description
Ia	0–15	Asphalt surface
Ib	10–26	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with the asphalt surface
Ic	20–53	Fill; 5Y 4/1, dark gray; very gravelly sandy loam; wet, slightly sticky consistency; mixed origin; abrupt, smooth lower boundary; no roots observed; imported fill containing coral cobbles
Id	40–60	SIHP # -7658; buried asphalt surface
Ie	52-87	Fill; 10YR 3/4, brown mottled with 7.5YR 5/3, strong brown; extremely compacted loamy sand; strong, medium, blocky structure; moist extremely firm consistency; non-plastic; terrigenous origin; very abrupt, smooth lower boundary; common, fine roots; base course associated with buried asphalt surface
If	65–80	SIHP # -7658; buried concrete surface
Ig	63–130	Fill; 2.5Y 7/2, light gray; gravelly medium sand; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, wavy lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ih	118–174	Fill; 10YR 7/3, very pale brown; silty clay; structureless (massive); moist friable consistency; plastic; mixed origin; abrupt, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
IIa	50–180 (BOE)	SIHP # -7655; 2.5Y 6/3, light yellowish brown; sandy clay; moderate, medium, crumb structure; moist, friable consistency; slightly plastic; marine origin; abrupt, wavy lower boundary; few, fine roots; berm associated with salt pan remnants
IIb	158–160	SIHP # -7655; organic laminations associated with salt pan remnants
III	160–180 (BOE)	Natural; 10Y 6/1, greenish gray; very gravelly sandy clay; moderate, medium, crumb structure; wet, sticky consistency; slightly plastic; marine origin; abrupt, smooth lower boundary; natural wetland sediments

4.2.11 Test Excavation 10 (TE 10)

Test Excavation 10 (TE 10), an exterior excavation located in the northern corner of the project area, was oriented in a north-south direction, and measured 6.50 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.60 mbs. The stratigraphy of TE 10 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of sandy clay (Stratum Ic), a buried asphalt surface (SIHP # -7658) (Stratum Id), crushed coral fill (Stratum Ie), and hydraulic fill (Stratum If) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum IIa), laminated organic material (SIHP # -7655) (Stratum IIb), and sandy clay wetland sediments (Strata III and IV) (Figure 81 through Figure 85, and Table 12). A utility trench was observed running diagonally through the test excavation, extending through the buried asphalt surface (Stratum Id) into Stratum Ie. A large quantity of construction debris and trash was observed within the utility trench. Two items were collected, a ceramic fragment (Acc. # 3), a marble (Acc. # 4), and an Old Spice bottle (Acc. # 25) (see Section 5).

A buried asphalt surface (SIHP # -7658) (Stratum Id) observed within TE 10 was observed in the north and south portions of the test excavation and was disturbed by a utility trench in the central portion. The former land surface was 60 cmbs with a thickness of 15 cm, overlying a crushed coral fill and hydraulic dredge fill associated with land reclamation (1919-1926). Based on historic maps and aerial photos, the buried asphalt surface likely dates from 1939 and 1976.

TE 10 documented the presence of salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum IIa) and a thin layer of laminated organic material (Stratum IIb). The edge of the berm (Stratum IIa) was observed in the northern end of the test excavation, sloping slightly towards the south and transitioning to the laminated organic layer (Stratum IIb) observed across the remainder of TE 10. Two distinct layers of natural wetland sediments containing freshwater snails and rootlets were observed (Strata III and IV). The lower boundary of the berm (Stratum IIa) was mottled with the underlying wetland deposit (Stratum III) likely a result of disturbance caused by the creation of the berm.

Figure 81. Photograph of the TE 10 west sidewall, view to southwest

Figure 82. Photograph of the man-made berm (SIHP # -7655) within the northeast end of TE 10, view to northeast

Figure 83. Photograph of modern trash observed within the utility trench

Figure 84. Photograph of modern trash observed within the utility trench

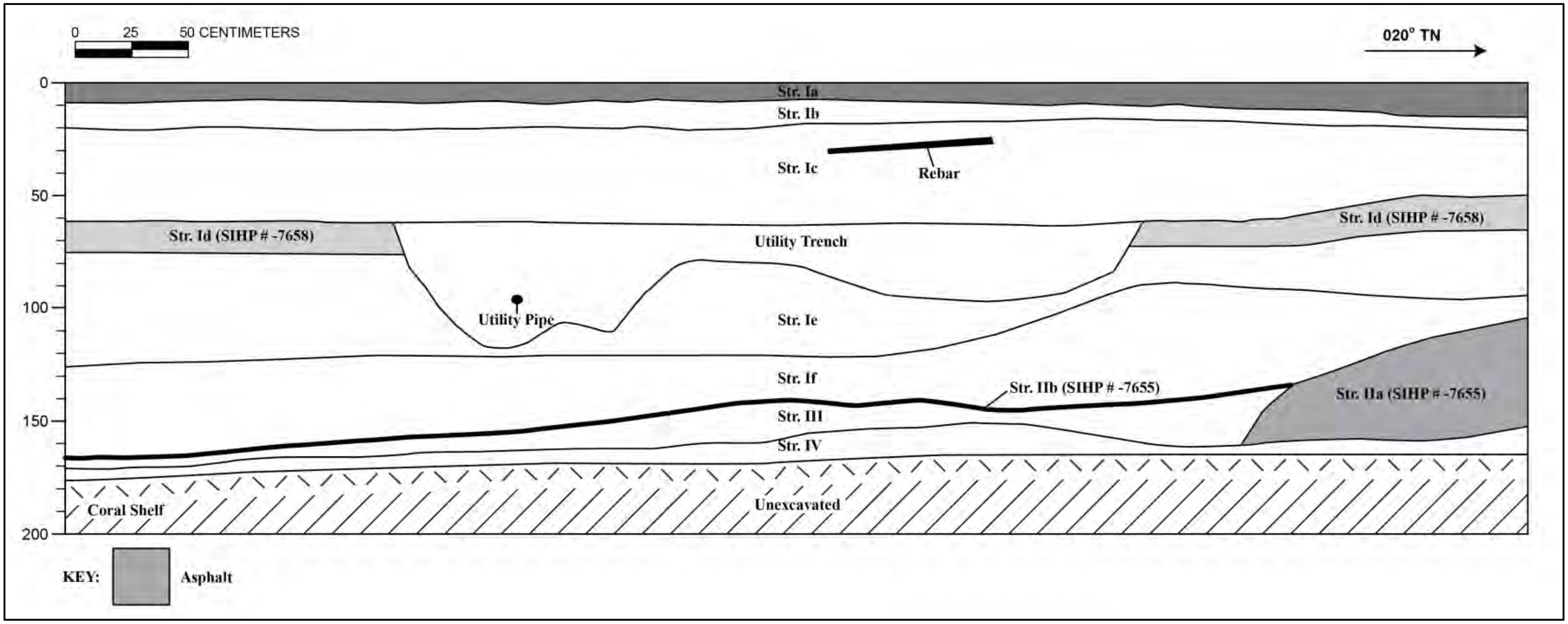

Figure 85. Profile of TE 10, west sidewall

Table 12. Strata Observed within Test Excavation 10

Stratum	Depth (cmbs)	Description
Ia	0–11	Asphalt surface
Ib	10–21	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	17–63	Fill; 10YR 5/3, brown; very gravelly sandy clay; moderate, medium crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, wavy lower boundary; common, fine roots; contains construction debris (i.e., nails, brick, construction debris, glass barbell, rebar); imported fill
Id	47–75	SIHP # -7658; buried asphalt surface
Utility Trench	75–115	Fill; 10YR 3/4, brown; extremely compacted loamy sand; strong, medium, blocky structure; moist, extremely firm consistency; non-plastic; terrigenous origin; clear, broken/discontinuous lower boundary; common, medium roots; utility trench backfill cutting through the buried asphalt layer; contains construction debris and trash (i.e., terra cotta, glass, asphalt chunks)
Ie	62–125	Fill; 2.5Y 7/2, light gray; very gravelly medium sand; structureless (single-grain); moist, loose consistency, non-plastic; marine origin; abrupt, irregular lower boundary; no roots observed; crushed coral fill associated with land reclamation events
If	125–165	Fill; 10GY 7/1, light greenish gray; silty clay; structureless (massive); moist, firm consistency; plastic; mixed origin; clear, wavy lower boundary; few, medium roots; hydraulic (dredge) fill associated with land reclamation events; grades from 10YR 7/3, fine sandy clay to 10GY 7/1 silty clay
IIa	105–154	SIHP # -7655; 2.5Y 6/3, light yellowish brown, mottled with 10Y 6/1, greenish gray; sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, wavy lower boundary; common, fine roots; berm associated with salt pan remnants
IIb	140–142	SIHP # -7655; organic laminations associated with salt pan remnants
III	142–163	Natural; 10Y 6/1, greenish gray; fine sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; natural wetland sediments
IV	147–175 (BOE)	Natural; 10Y 4/1, light greenish gray; gravelly sandy clay; structureless (massive); wet, sticky consistency; slightly plastic; marine origin; abrupt, smooth lower boundary; no roots observed; natural wetland sediments

4.2.12 Test Excavation 11 (TE 11)

Test Excavation 11 (TE 11), an exterior excavation located along the northwestern edge of the *mauka* Ward Warehouse building, was oriented in a northeast-southwest direction, and measured 6.0 m long by 0.75 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.74 mbs. The stratigraphy of TE 11 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of silty loam (Stratum Ic), loamy sand (Stratum Id), and hydraulic fill (Stratum Ie) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) and natural wetland sediments (Stratum III) (Figure 86, Figure 87, Figure 88, and Table 13). Two structural footings were observed at each end of TE 11.

TE 11 documented the presence of salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a low structural feature (man-made berm) (Stratum II). The berm extended across the length of the test excavation, with the upper boundary roughly level. Although Stratum II remained level, it was consistent with the anthropogenic altered materials from which the man-made berms are constructed. A bottle was collected from within Stratum Ic (Acc. # 5) (see Section 5 below).

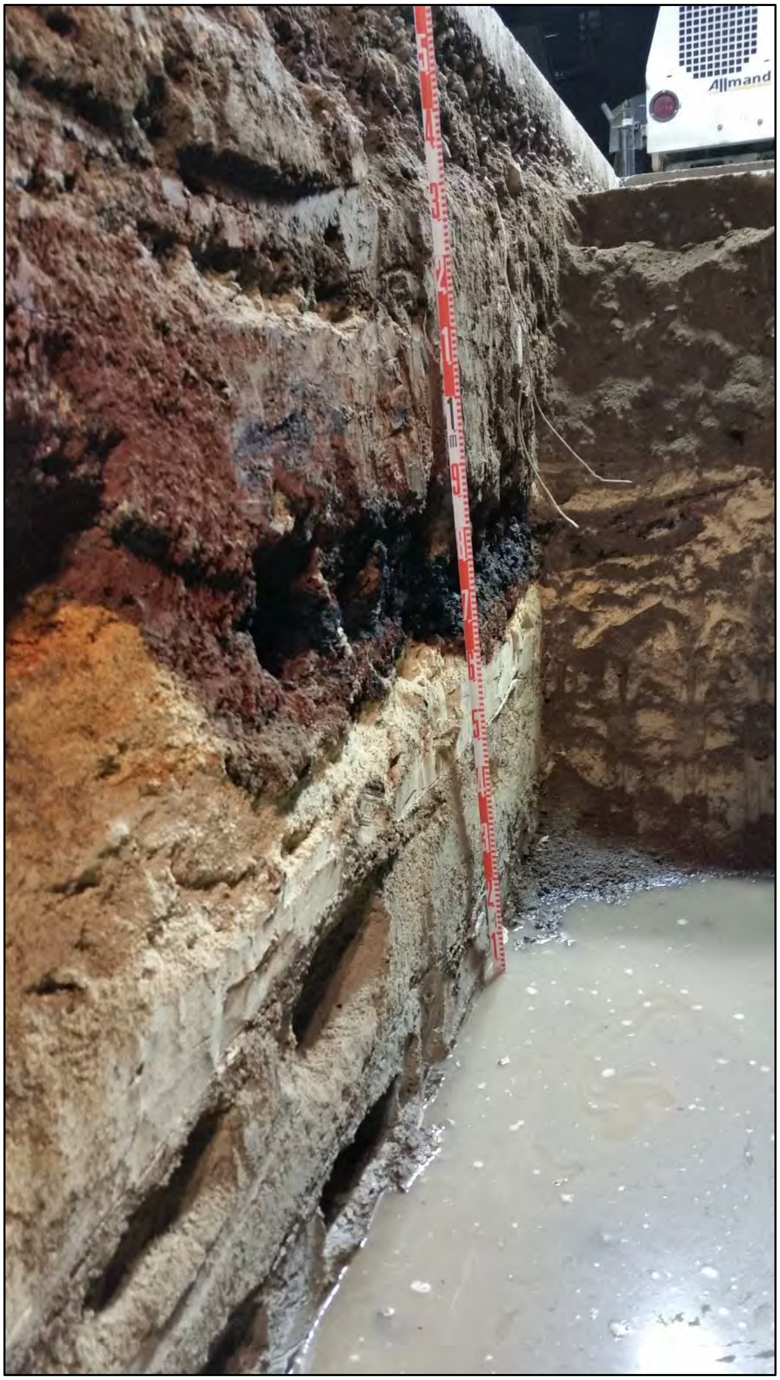

Figure 86. Photograph of the TE 11 southeast sidewall, view to south

Figure 87. Photograph of the modern trash observed within TE 11, Stratum Ic

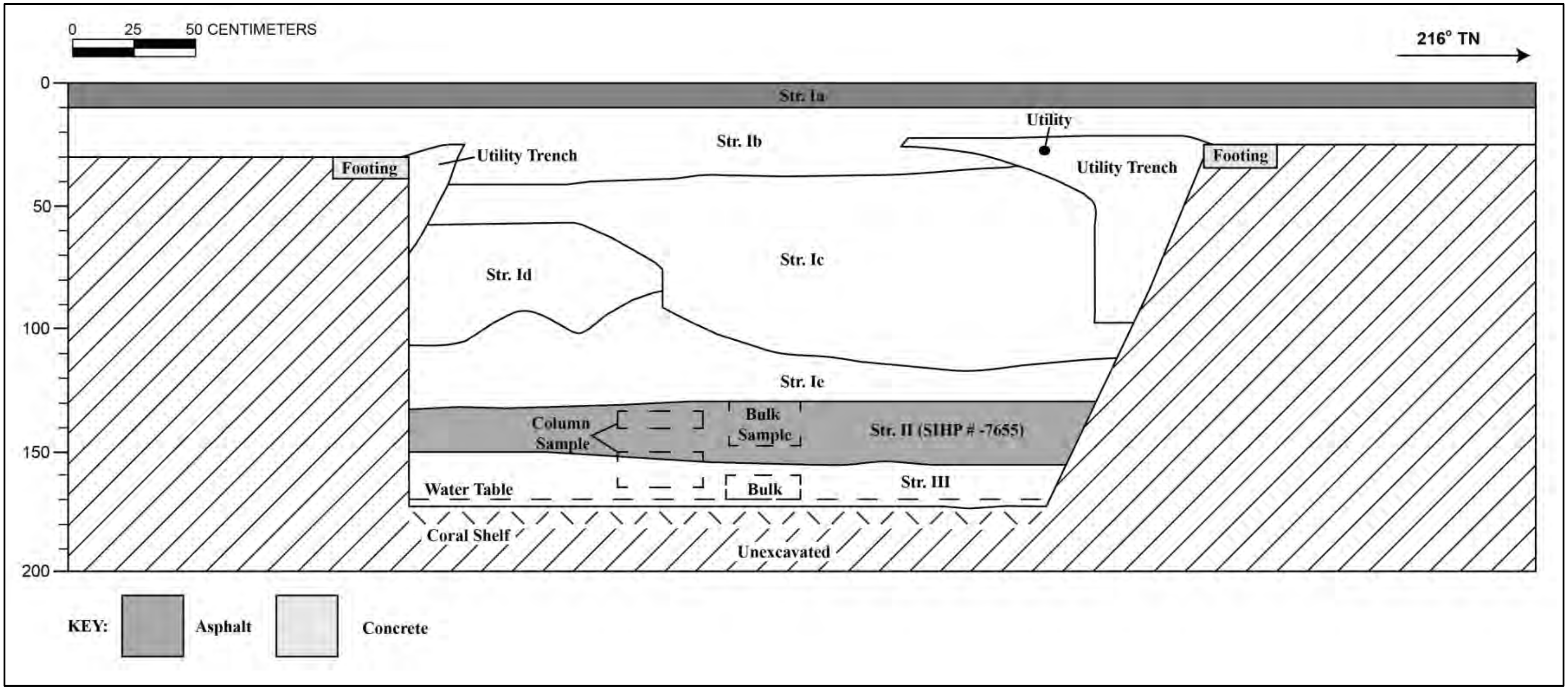

Figure 88. Profile of TE 11, southeast sidewall

Table 13. Strata Observed within Test Excavation 11

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–41	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	33–117	Fill; 5YR 3/4, dark reddish brown, mottled with 10YR 2/1 black; silty sandy loam; moderate, medium, crumb structure; moist, very friable consistency; slightly plastic; terrigenous origin; clear, wavy lower boundary; no roots observed; contains trash (i.e., glass bottle, metal fragments); imported fill with mottles of cinder
Id	57–107	Fill; 2.5Y 3/3, dark olive brown; loamy sand; structureless (single-grain); moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; imported fill
Ie	85–130	Fill; 2.5Y 7/2, light gray; coarse sandy clay; weak, very fine, platy structure; moist, friable consistency; very plastic; marine origin; clear, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
II	130–155	SIHP # -7655; 5Y 6/2, light olive gray; sandy clay; moderate, fine, granular structure; moist, very friable consistency; plastic; marine origin; clear, wavy lower boundary; no roots observed; berm associated with salt pan remnants
III	155–174 (BOE)	Natural; 10Y 6/1, greenish gray; clay; structureless (massive); wet, slightly sticky consistency; very plastic; marine origin; abrupt, smooth lower boundary; natural wetland sediments

4.2.13 Test Excavation 12 (TE 12)

Test Excavation 12 (TE 12), an interior excavation located in the northeast end of the *mauka* Ward Warehouse building, was oriented in a northwest-southeast direction, and measured 6.0 m long by 0.54 m wide. The base of excavation was determined by the presence of the hard coral shelf at 2.10 mbs. The stratigraphy of TE 12 consisted of the concrete surface (Stratum Ia), and various fill layers consisting of cinder fill (Stratum Ib), gravelly sandy clay loam (Stratum Ic), gravelly sandy clay loam (Stratum Id), hydraulic fill (Stratum Ie), crushed coral fill (Stratum If), and hydraulic fill (Stratum Ig) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) and sandy clay wetland sediments (Stratum III) (Figure 89, Figure 90, and Table 14). A concrete jacket was encountered in each end of the test excavation.

TE 12 documented the presence of salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a low structural feature (man-made berm) (Stratum II). The berm extended across the length of the test excavation with the upper boundary roughly level. Although Stratum II remained level, it was consistent with the anthropogenic altered materials from which the man-made berms were constructed.

Figure 89. Photograph of the TE 12 southwest sidewall, view to southeast

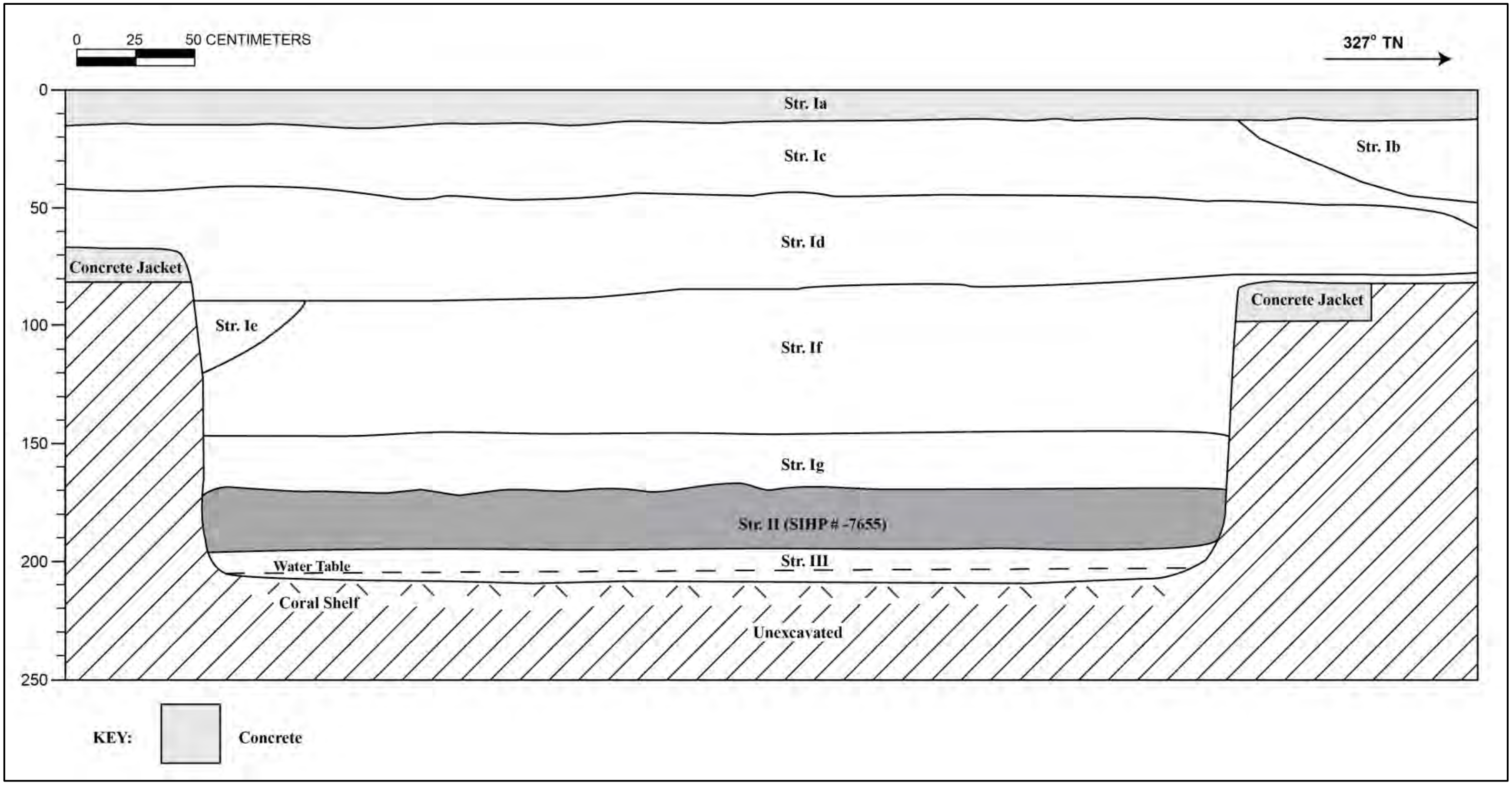

Figure 90. Profile of TE 12, southwest sidewall

Table 14. Strata Observed within Test Excavation 12

Stratum	Depth (cmbs)	Description of Sediment
Ia	0–15	Concrete surface
Ib	15–50	Fill; 10YR 3/2, black; coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; abrupt, broken/discontinuous lower boundary; no roots observed; imported cinder fill
Ic	15–60	Fill; 10YR 2/1, brown; gravelly sandy clay loam; weak, medium, crumb structure; moist, friable consistency; slightly plastic; mixed origin; abrupt, smooth lower boundary; no roots observed; imported fill
Id	40–90	Fill; 10YR 4/2, dark gray brown; gravelly sandy clay loam; weak, medium, crumb structure; moist, friable consistency; slightly plastic; mixed origin; abrupt, smooth lower boundary; no roots observed; imported fill
Ie	40–120	Fill; 10YR 8/2, very pale brown; loamy sand; weak, medium, blocky structure; moist, loose consistency; non-plastic; marine origin; abrupt, smooth lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
If	80–147	Fill; 10YR 8/3, very pale brown; gravelly sandy loam; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; abrupt, smooth lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ig	145–170	Fill; 10YR 8/3, very pale brown; coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; abrupt, smooth lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events associated with land reclamation events
II	170–195	SIHP # -7655; 10YR 7/2, light gray; sandy clay; moderate, medium, blocky structure; moist; firm consistency; plastic; mixed origin; clear, smooth lower boundary; common, fine roots; berm associated with salt pan remnants
III	195–210 (BOE)	Natural; 5GY 7/1, light greenish gray; sandy clay; structureless (massive); wet, very sticky consistency; very plastic; marine origin; abrupt, smooth lower boundary; no roots observed; wetland sediments

4.2.14 Test Excavation 13 (TE 13)

Test Excavation 13 (TE 13), an exterior excavation located along the eastern edge of the project area, was oriented in a northwest-southeast direction, and measured 6.0 m long by 0.7 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.43 mbs. The stratigraphy of TE 13 consisted of the current grassy land surface and associated landscaping fill (Stratum Ia), and various fill layers consisting of gravelly sand (Stratum Ib), sandy loam (Stratum Ic), hydraulic fill (Stratum Id), and sandy loam (Stratum Ie) overlying natural marine sandy clay (Stratum II) and the natural wetland sediments (Stratum III) (Figure 91, Figure 92, and Table 15). An irrigation line associated with landscaping was observed in the southeastern edge of the test excavation.

TE 13 was placed to further test northwest of an isolated human cranial fragment (SIHP # -7656) encountered within TE 31. TE 13 documented two layers of natural sediments, including sandy marine clay (Stratum II) and sandy clay wetland sediments (Stratum III). Stratum II appears to represent an in situ remnant of the sandy clay utilized to construct the man-made berms associated with SIHP # -7655. Stratum III appears consistent with the wetland sediments observed throughout the project area directly overlying the coral shelf. Sediments within TE 13 were heavily disturbed, primarily due to root activity associated with the adjacent coconut tree. The reworked sand observed within the adjacent test excavations was not encountered within TE 13. A bottle was collected from within Stratum Ic (Acc. # 6) (see Section 5 below). No human skeletal fragments were encountered.

Figure 91. Photograph of the TE 13 southwest sidewall, view to west; note the large quantity of roots associated with the adjacent coconut tree

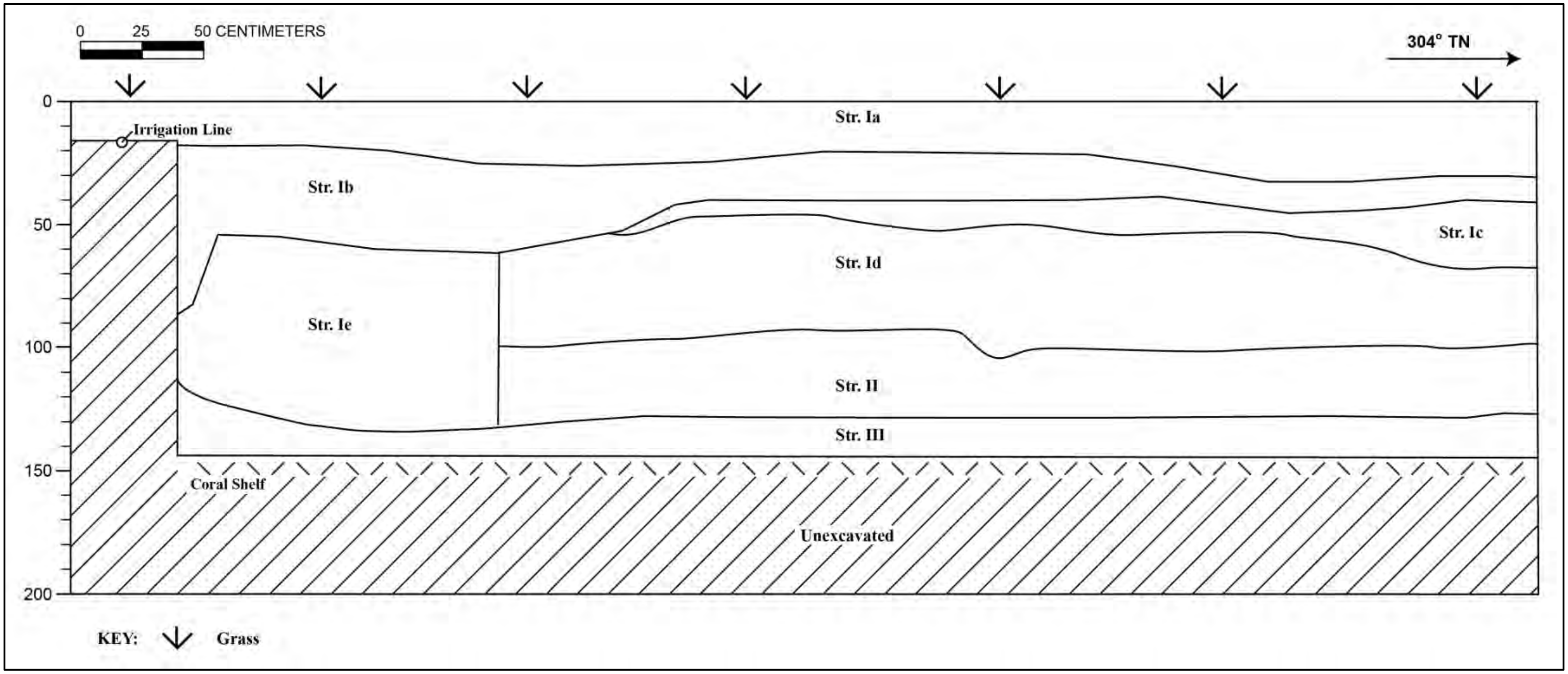

Figure 92. Profile of TE 13, southwest sidewall

Table 15. Strata Observed within Test Excavation 13

Stratum	Depth (cmbs)	Description of Sediment
Ia	0–32	Fill; 10YR 3/3, dark brown; sandy clay loam; moderate, medium, crumb structure; moist, friable consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; many medium to coarse roots; landscape fill with grassy surface
Ib	18–61	Fill; 10YR 7/2, light gray; very gravelly sand; weak, fine to medium, crumb structure; moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; common, medium roots; imported fill
Ic	40–68	Fill; 10YR 2/2, very dark brown; sandy loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; common, medium roots; contains a large quantity of roots associated with adjacent coconut tree; imported fill
Id	46–104	Fill; 10YR 7/2, light gray; silty clay; structureless (massive); wet, non-sticky consistency; plastic; marine origin; clear, smooth lower boundary; few, medium roots; previously disturbed hydraulic (dredge) fill associated with land reclamation events
Ie	54–144	Fill; 10YR 3/2, very dark grayish brown; sandy loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; few, medium roots; imported fill
II	90–128	Natural; 10YR 7/2, light gray; sandy clay; structureless (massive); moist, firm consistency; plastic; marine origin; clear, wavy lower boundary; common, medium roots; natural marine sediments
III	128–143 (BOE)	Natural; 10Y 6/1, greenish gray; sandy clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; common, medium roots; wetland sediments

4.2.15 Test Excavation 14 (TE 14)

Test Excavation 14 (TE 14), an exterior excavation located along the eastern edge of the project area, was oriented in a northwest-southeast direction, and measured 6.0 m long by 0.65 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.34 mbs. The stratigraphy of TE 14 consisted of the current grassy land surface and associated landscaping fill (Stratum Ia) overlying two layers of disturbed and reworked sand (Strata IIa and IIb) and the natural wetland sediment (Stratum III) (Figure 93 through Figure 96, and Table 16). An existing sewer line was encountered parallel to the test excavation in the northeast sidewall, extending across the test excavation in the northwest end. A second existing utility was encountered within the opposite sidewall at the same level as the sewer line, obliterating the upper boundary of Stratum IIa within both sidewalls.

A wooden post (SIHP # -7658) was observed along the southeast portion of the trench and was found between 55 and 135 cmbs. The post sits 5 cm above the coral shelf and is capped by a utility trench. The wooden post may be associated with a fence running along the beach road, now Ala Moana Blvd. Although, it is possible that the wooden post remnant is associated with a wooden post prior to or after the beach road was utilized (see Section 6.3 for comparative analysis of the wooden posts in Block B East and Block C West).

TE 14 was placed to further test southeast of an isolated human cranial fragment (SIHP # -7656) encountered within TE 31. TE 14 documented the presence of two reworked sand layers (Strata IIa and IIb) (see Figure 94). These layers of reworked sediment likely represent local materials, disturbed and leveled due to the surrounding urban development. Stratum IIa is located in the southeast end of the test excavation and appears to be lightly disturbed. Stratum IIb, located in the northwest end of the test excavation, is heavily disturbed, primarily due to root disturbance associated with the adjacent coconut tree, and contained coral cobbles, utilities, sub-angular basalt, asphalt, and a bottle (Acc. # 7). No human skeletal fragments were encountered.

Figure 93. Photograph of the TE 14 northeast sidewall, view to northwest

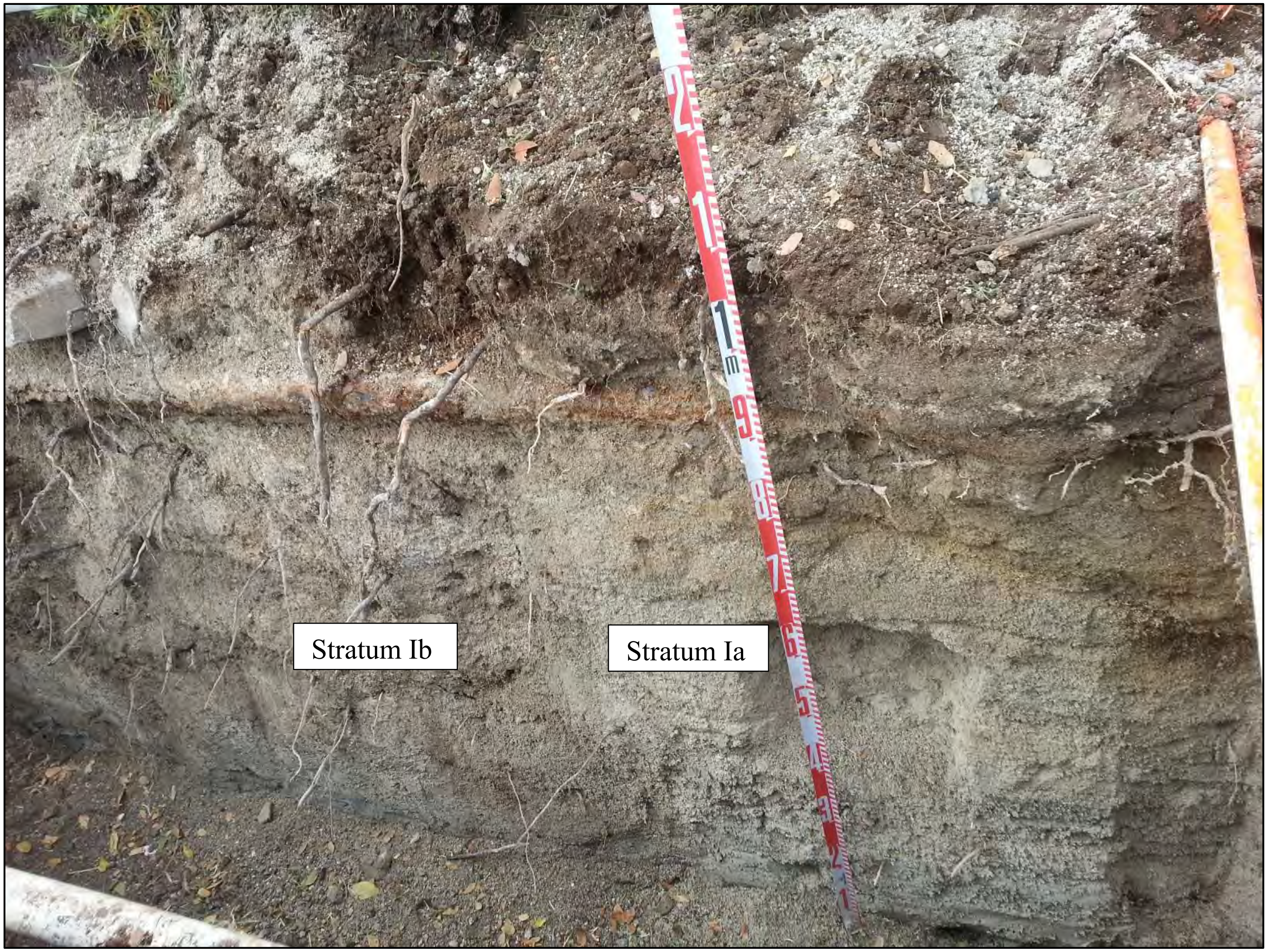

Figure 94. Photograph of the stratigraphy within the TE 14 southeast sidewall, including the transition from Stratum IIa to Stratum IIb and the existing utility within their upper boundary, view to north

Figure 95. Photograph of the posthole associated with the SIHP # -7658 buried historic surfaces, view to southeast

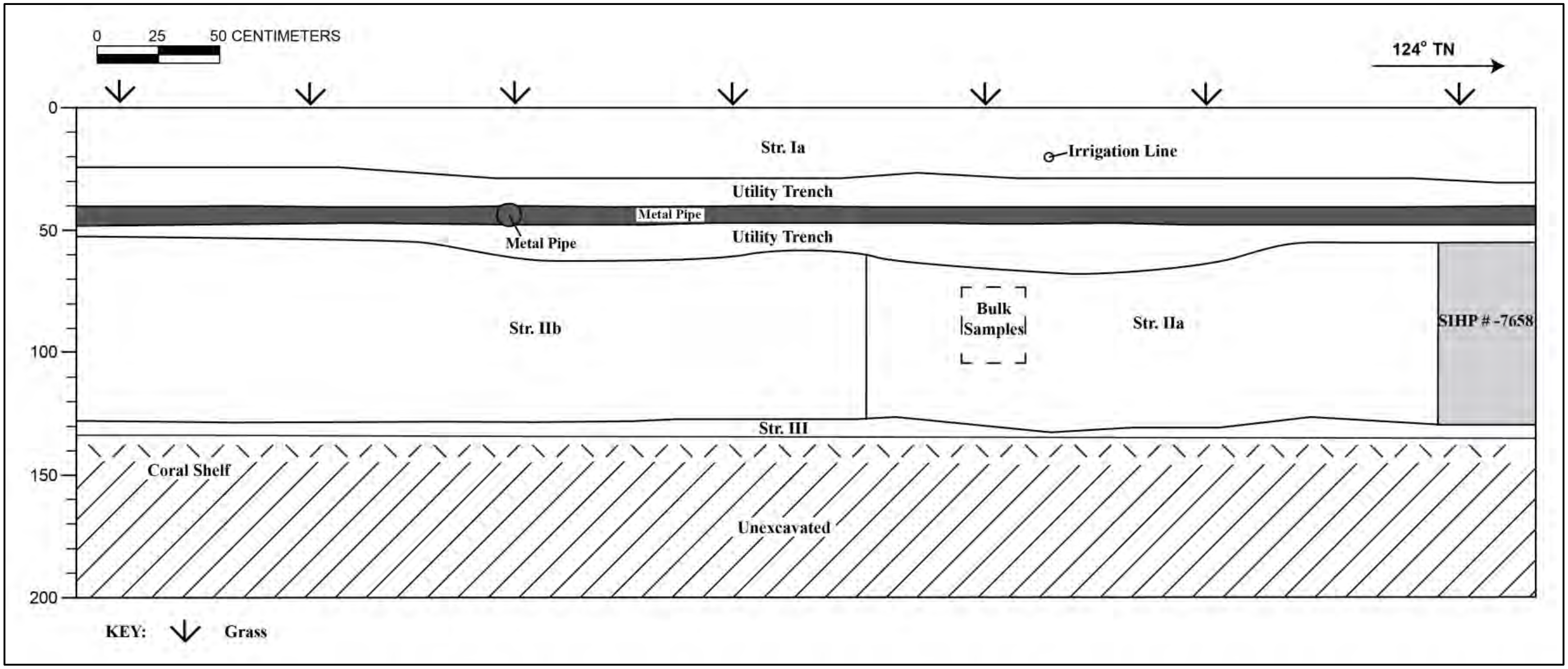

Figure 96. Profile of TE 14, northeast sidewall

Table 16. Strata Observed within Test Excavation 14

Stratum	Depth (cmbs)	Description of Sediment
Ia	0–30	Fill; 10YR 2/2, very dark brown; sandy clay loam; moderate, medium, crumb structure; moist, friable consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; common, fine to medium roots; contains a large quantity of roots associated with adjacent coconut tree; landscape fill with grassy surface
Utility Trench	25–68	Fill; 10YR 4/4, dark, yellowish brown; sandy loam; structureless (single-grain); moist, loose consistency; non-plastic; mixed origin; clear, wavy lower boundary; common, medium roots; contains a large quantity of roots associated with adjacent coconut tree; utility fill associated with existing sewer line
IIa	55–132	Disturbed natural; 10YR 6/2, light greenish gray; medium sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; few, fine to medium roots; contains a large quantity of roots associated with adjacent coconut tree; a modern milled wooden post (SIHP # -7658) observed in southeast end; disturbed and reworked natural sand layer
IIb	48–127	Disturbed natural; 10YR 6/2, light brownish gray; coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; common, medium roots observed, associated with adjacent coconut tree; disturbed and reworked natural sand layer
III	127–134 (BOE)	Natural; 5GY 7/1, greenish gray; gravelly sandy clay; weak, medium, crumb structure; wet, slightly sticky consistency; slightly plastic; marine origin; clear, smooth lower boundary; no roots observed; wetland sediments

4.2.16 Test Excavation 15 (TE 15)

Test Excavation 15 (TE 15), an exterior excavation located in the western portion of the project area, adjacent to TE 17, was oriented in a southeast-northwest direction, and measured 4.7 m long by 0.73 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.59 mbs. The stratigraphy of TE 15 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly loam (Stratum Ic), gravelly sandy clay loam (Stratum Id), gravelly loamy sand (Stratum Ie), loamy sand (Stratum If), and gravelly loam (Stratum Ig) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum IIa), natural marine sandy clay (Stratum IIb), and silty clay wetland sediments (Stratum III) (Figure 97 through Figure 101, and Table 17).

A large utility line was observed within the southwest sidewall of TE 15, extending through a large concrete structure determined to be a remnant of the concretized Ward Estate *ʻauwai* (SIHP # -7659) (see Figure 98). The *ʻauwai* runs diagonally through the southeast end of the test excavation, the top and sides formed to create a formal structure that extends to, and possibly below, the coral shelf. The *ʻauwai* can be seen on historic maps and aerial photos extending through the project area near the location of TE 15. A portion of the *ʻauwai* was removed for installation of the existing utility, leaving a retainment buffer extending approximately 40 cm above the coral shelf (see Figure 99). An additional pad of concrete was observed at 64 cmbs, likely placed to protect the utility at its junction with the *ʻauwai*, preventing breakage and possible contamination of the channel. Fill material overlying the concretized channel was heavily disturbed, likely associated with exposing the channel for utility installation. A concrete grade beam was encountered in the northwest end of TE 15.

The location of TE 15 was selected to further explore the sediments encountered within TE 17, which is fully documented below. TE 15 documented the presence of salt pan remnants (SIHP # -7655), consisting of locally procured natural sediment modified slightly into a structural feature (man-made berm) (Stratum IIa). Directly underlying the man-made berm in the northwestern half of the test excavation, a layer of naturally level, tabular limestone boulders were observed within the northeastern sidewall (SIHP # -7655, Feature 1) (see Figure 100). These boulders were only noted within the northern corner of the test excavation, defining the southern boundary of what appears to be a man-made level surface. The limestone boulders are likely associated with historic land modification activities prevalent within the surrounding area and were determined to be a feature of the salt pan remnants (SIHP # -7655, Feature 1), buried during subsequent modifications for the formation of a man-made berm (Stratum IIa). The limestone boulders were observed within the upper boundary of natural sandy marine clay sediments (Stratum IIb), which appear to represent in situ remnants of the sandy clay utilized to construct the man-made berms associated with SIHP # -7655. The sediments within TE 15 were consistent with TE 17.

Figure 97. Photograph of the TE 15 northeast sidewall, view to north; note the structural grade beam (orange arrow), limestone boulders (SIHP # -7655, Feature 1) (yellow arrow), and the concretized Ward Estate *‘auwai* (SIHP # -7659) (red arrow)

Figure 98. Overview of the Ward Estate *‘auwai* (SIHP # -7659) (red arrow) located at the far end of the test excavation, and the adjacent concrete slab (yellow arrow) placed to protect the existing utility

Figure 99. Close-up of the Ward Estate *'auwai* (SIHP # -7659) (red arrow) showing the opening through the *'auwai* for the existing utility (yellow arrow) and the retainment buffer extending to 40 cm above the coral shelf (blue arrow)

Figure 100. Close-up of the tabular limestone boulders (SIHP # -7655, Feature 1) (Stratum IIb) underlying the man-made berm (SIHP # -7655) (Stratum IIa)

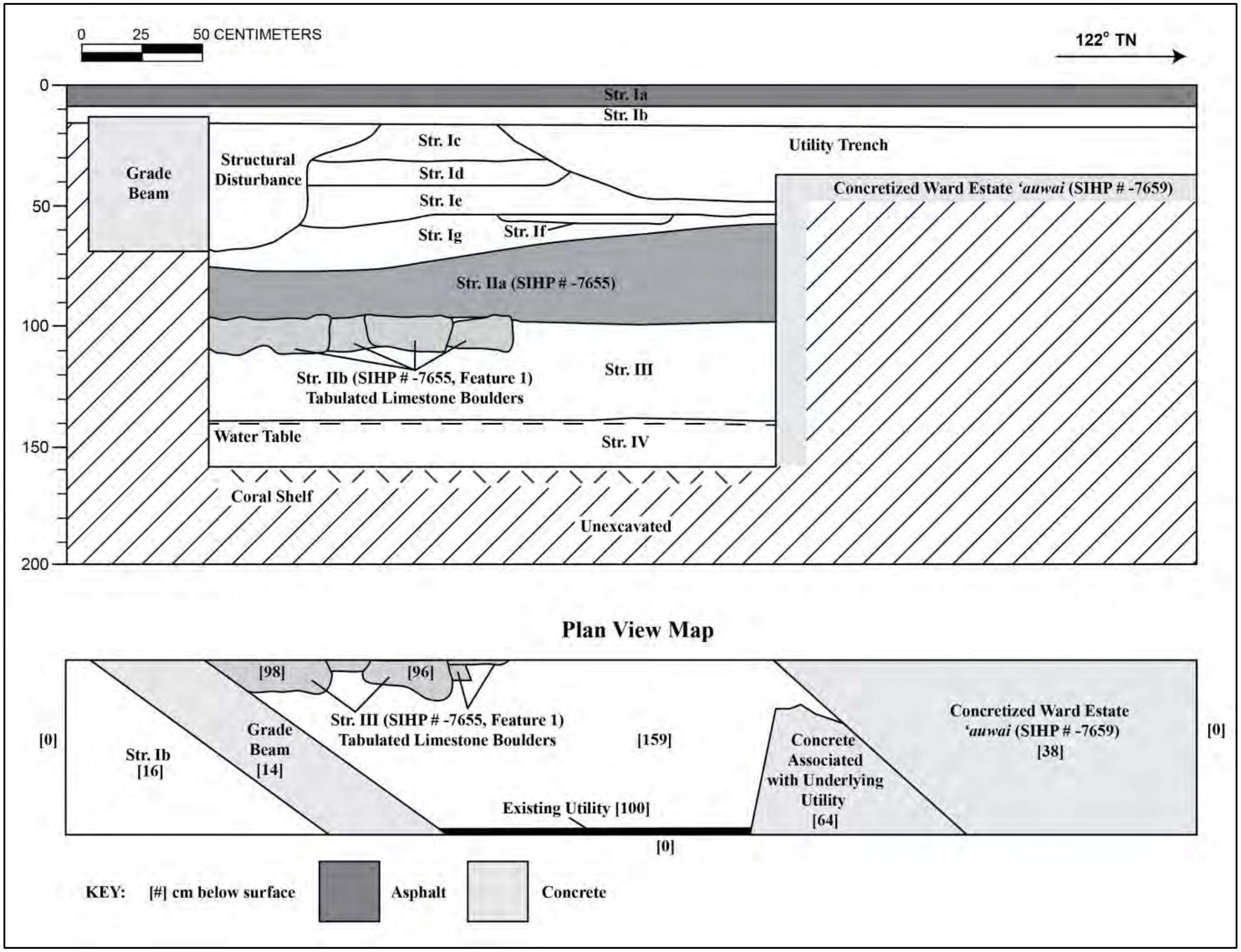

Figure 101. Profile of TE 15, northeast sidewall

Table 17. Strata Observed within Test Excavation 15

Stratum	Depth (cmbs)	Description
Ia	0–4	Asphalt surface
Ib	9–19	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	16–32	Fill; 10YR 2/2, very dark brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill
Id	31–42	Fill; 10YR 5/2, grayish brown; gravelly sandy clay loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; marine origin; clear, smooth lower boundary; imported crushed coral fill
Ie	41–59	Fill; 5Y 3/3, dark reddish brown; very gravelly loamy sand; weak, medium, blocky structure; moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported fill
If	54–58	Fill; 10YR 2/1, black; loamy sand; weak, fine to medium, crumb structure; moist, friable consistency; non-plastic; terrigenous origin; clear, broken/discontinuous lower boundary; imported fill
Ig	54–78	Fill; 10YR 3/2, very dark grayish brown; gravelly loam; weak, fine, crumb structure; moist, friable consistency; non-plastic; mixed origin; clear, wavy lower boundary; imported fill
Structural disturbance	16–69	Fill; 2.5Y 3/2, very dark grayish brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; fill material for utility or structural concrete
Utility trench	16–50	Fill; 2.5Y 3/2, very dark grayish brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; fill material for utility installation
IIa	58–100	SIHP # -7655; 10YR 7/2, light gray; sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; no roots observed; naturally occurring *Nerita* sp. observed; berm associated with salt pan remnants
IIb	97–115	SIHP # -7655, Feature 1; 10YR 7/2, light gray; tabular limestone boulders
III	96–140	Natural; 10YR 7/2, light gray; sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; naturally occurring *Nerita* sp. observed; natural marine sediment

Stratum	Depth (cmbs)	Description
IV	140–159 (BOE)	Natural; 10Y 6/1, greenish gray; silty clay; structureless (massive); wet, slightly sticky to sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; natural wetland sediments

4.2.17 Test Excavation 16 (TE 16)

Test Excavation 16 (TE 16), an exterior excavation located near the center of the western end of the project area, was oriented in a northeast-southwest direction, and measured 6.0 m long by 0.75 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.65 mbs. The stratigraphy of TE 16 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly clay loam (Stratum Ic), crushed coral fill (Stratum Id), and hydraulic fill (Stratum Ie), overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) and sandy clay wetland sediments (Stratum III) (Figure 102 through Figure 105, and Table 18). A structural footing was encountered near the center of the test excavation. Modern construction debris was encountered within Stratum Ic (i.e., wire, glass, metal fragments) but not collected (see Figure 104).

TE 16 documented the presence of salt pan remnants (SIHP # -7655), consisting of locally procured natural sediment modified slightly into a low structural feature (man-made berm) (Stratum II). The berm extended across the length of the test excavation, with the upper boundary roughly level. Although Stratum II remained level, it was consistent with the anthropogenic altered materials from which the man-made berms were constructed.

Figure 102. Photograph of the TE 16 southeast sidewall, view to northeast

Figure 103. Close-up of the berm feature (SIHP # -7655) (Stratum II) overlying the wetland sediments (Stratum III) within the TE 16 southeast sidewall, view to southeast

Figure 104. Photograph of modern trash observed within TE 16, Stratum Ic

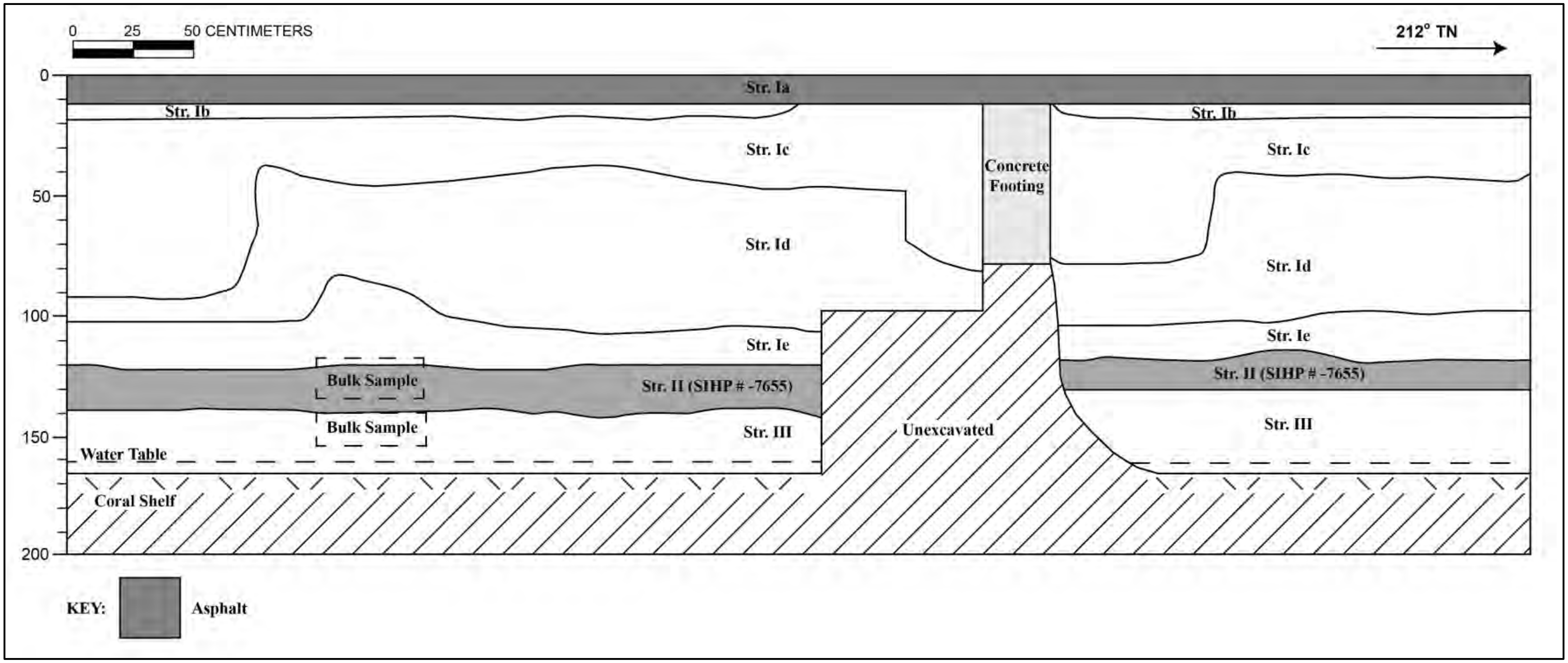

Figure 105. Profile of TE 16, southeast sidewall

Table 18. Strata Observed within Test Excavation 16

Stratum	Depth (cmbs)	Description
Ia	0–12	Asphalt surface
Ib	12–18	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	12–93	Fill; 10YR 2/2, very dark brown; extremely gravelly clay loam; moderate, fine, crumb structure; moist, very friable consistency; slightly plastic; mixed origin; abrupt, wavy lower boundary; no roots observed; contained construction debris (i.e., wire, glass, metal fragments); imported fill
Id	37–107	Fill; 10YR 8/3, very pale brown; very gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ie	81–121	Fill; 10YR 8/1, white; very fine sand; structureless (single-grain); wet, non-sticky consistency; non-plastic; marine origin; clear, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
II	120–141	SIHP # -7655; 2.5Y 7/1, light gray; sandy clay; structureless (massive); moist, firm consistency; plastic; mixed origin; clear, smooth lower boundary; no roots observed; berm associated with salt pan remnants
III	130–165 (BOE)	Natural; N 5/, gray; silty sandy clay; structureless (massive); wet, slightly sticky; plastic; mixed origin; abrupt, smooth lower boundary; no roots observed; natural wetland sediments

4.2.18 Test Excavation 17 (TE 17)

Test Excavation 17 (TE 17), an exterior excavation located near the center of the project area, was oriented in a northwest-southeast direction, and measured 6.00 m long by 0.67 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.67 mbs. The stratigraphy of TE 17 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly loam (Stratum Ic), crushed coral fill (Stratum Id), gravelly loamy sand (Stratum Ie), and gravelly loam (Stratum If) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum IIa), large tabular limestone boulders creating a level surface (SIHP # -7655, Feature 1) (Stratum IIb), natural marine sandy clay (Stratum III), and silty clay wetland sediments (Stratum IV) (Figure 106 through Figure 109, and Table 19). Large concrete structures were observed at each end of the test excavation.

As with TE 15, a remnant of the concretized Ward Estate *'auwai* (SIHP # -7659) was observed within TE 17, running diagonally through the southeast end (see Figure 106). The top and sides of the *'auwai* were formed, creating a formal structure that extends to, and possibly below, the coral shelf. The *'auwai* is visible on historic maps and aerial photos extending through the project area near the location of Test Excavations 15 and 17. Fill material overlying the concretized channel was heavily disturbed, likely associated with exposing the channel for utility installation within the adjacent TE 15. A concrete grade beam was encountered in the northwest end of TE 17.

TE 17 documented the presence of salt pan remnants (SIHP # -7655), consisting of locally procured natural sediment modified slightly into a structural feature (man-made berm) (Stratum IIa). Directly underlying the man-made berm in the northwestern half of the test excavation, a layer of naturally level, tabular limestone boulders forming a cohesive and level surface were observed extending across the entire length of the test excavation (Stratum IIb) (see Figure 107 and Figure 108). The limestone boulders are likely associated with historic land modification activities prevalent within the surrounding area, and were determined to be a feature of the salt pan remnants (SIHP # -7655, Feature 1), buried during subsequent modifications for the formation of a man-made berm (Stratum IIa). The limestone boulders were observed within the upper boundary of natural sandy marine clay sediments (Stratum III), which appear to represent in situ remnants of the sandy clay utilized to construct the man-made berms associated with SIHP # -7655.

Figure 106. Photograph of the TE 17 southwest sidewall, view to south; note the concretized Ward Estate *ʻauwai* (SIHP # -7659) at the far end of the excavation

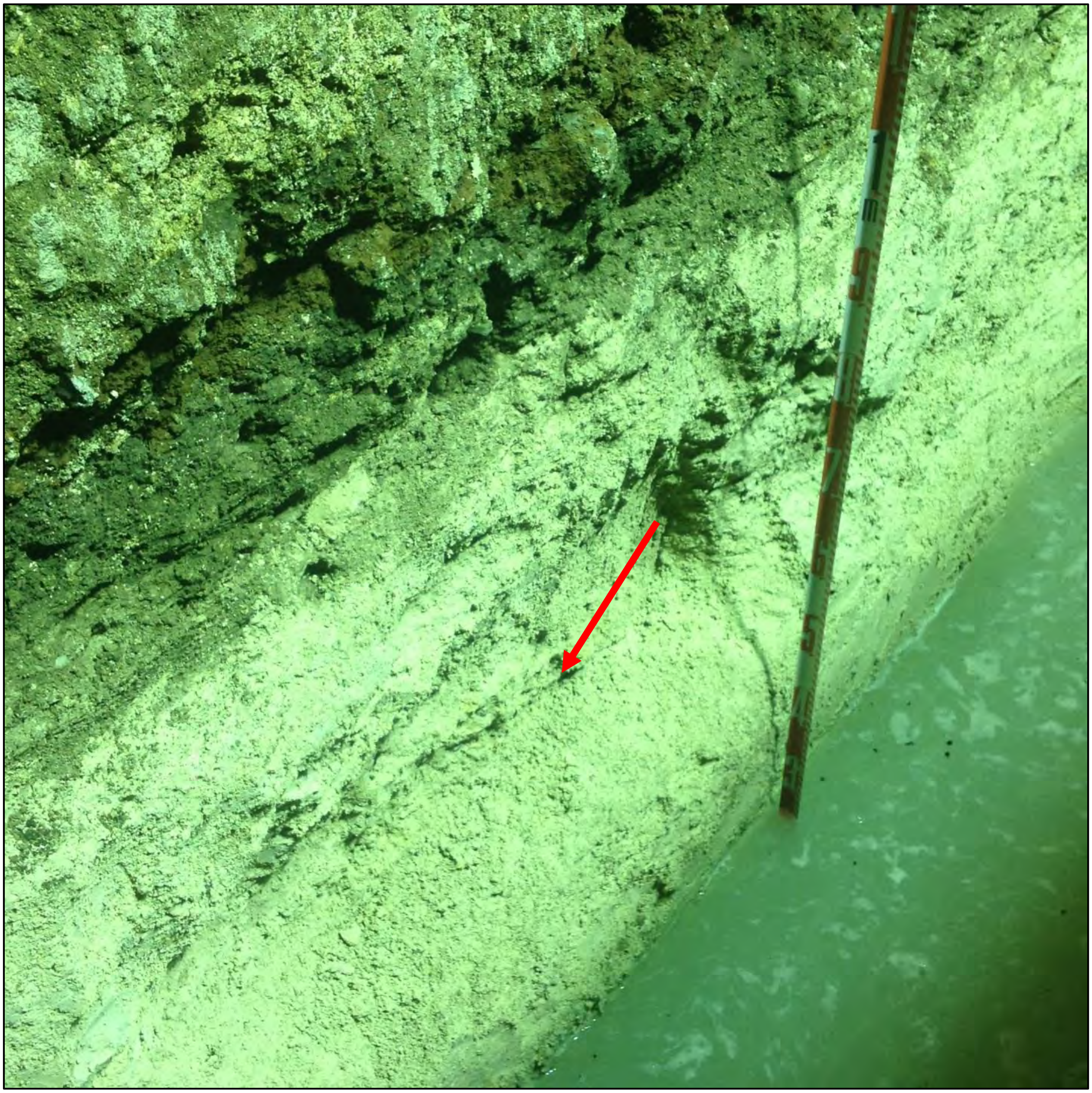

Figure 107. Close-up of the in situ limestone boulder (SIHP # -7655, Feature 1) (red arrow) underlying the man-made berm (SIHP # -7655) (Stratum IIa)

Figure 108. Photograph of the tabular limestone boulders (SIHP # -7655, Feature 1) observed extending across TE 17

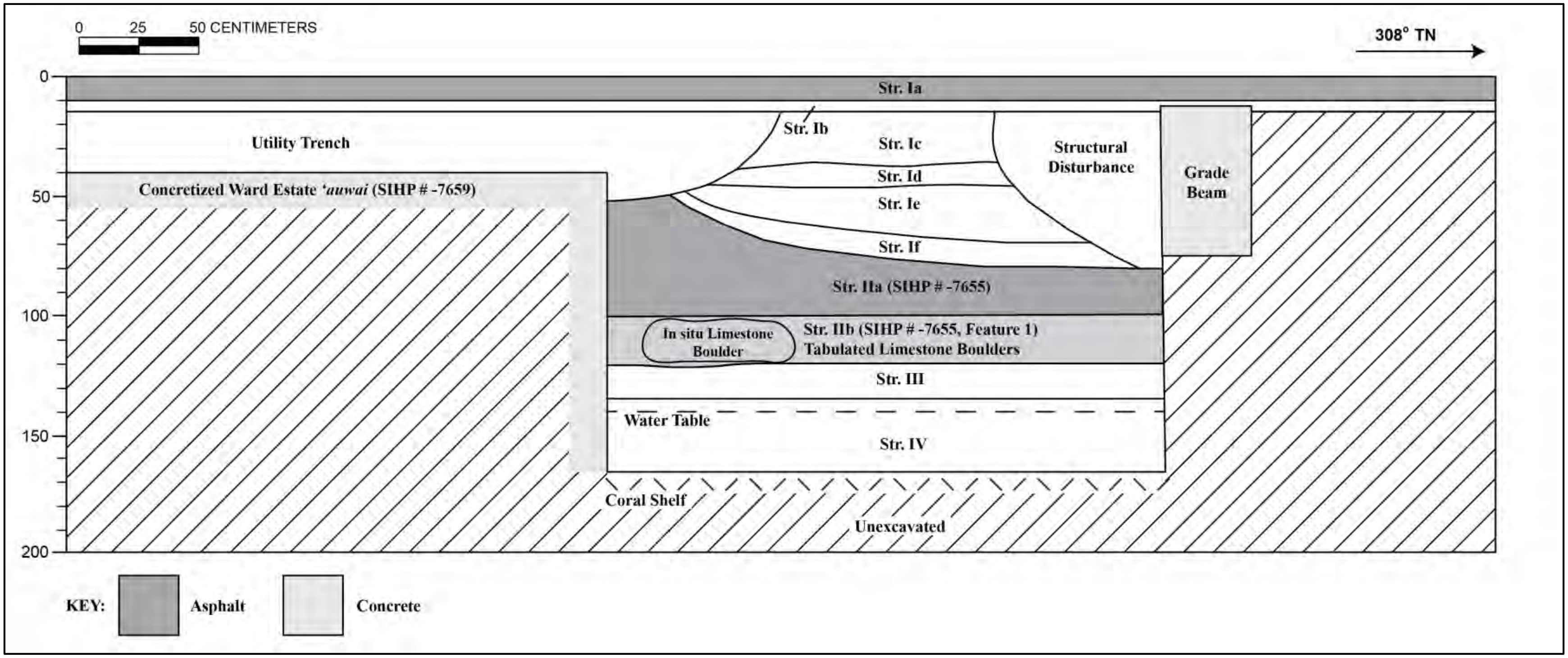

Figure 109. Profile of TE 17, southwest sidewall

Table 19. Strata Observed within Test Excavation 17

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–15	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	15–37	Fill; 10YR 2/2, very dark brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill
Id	37–45	Fill; 10YR 5/2, grayish brown; gravelly sandy clay loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; marine origin; clear, smooth lower boundary; imported crushed coral fill
Ie	45–70	Fill; 5Y 3/3, dark reddish brown; very gravelly loamy sand; weak, medium, blocky structure; moist, loose wavy lower boundary; no roots observed; imported fill
If	50–80	Fill; 10YR 3/2, very dark grayish brown; gravelly loam; weak, fine, crumb structure; moist, friable consistency; non-plastic; mixed origin; clear, wavy lower boundary; no roots observed; imported fill
Structural disturbance	15–80	Fill; 2.5Y 3/2, very dark grayish brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; abrupt, broken/discontinuous lower boundary; no roots observed; fill material associated with existing structure
Utility trench	15–50	Fill; 2.5Y 3/2, very dark grayish brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; abrupt, broken/discontinuous lower boundary; no roots observed; fill material associated with utility in adjacent Test Excavation 15
IIa	50–100	SIHP # -7655; 10YR 7/2, light gray; sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; no roots observed; berm associated with salt pan remnants
IIb	100–120	SIHP # -7655, Feature 1; 10YR 7/2, light gray; tabular limestone boulders
III	120–135	Natural; 10YR 7/2, light gray; sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; no roots observed; natural marine sediments
IV	135–165 (BOE)	Natural; 10Y 6/1, greenish gray; silty clay; structureless (massive); wet, slightly sticky to sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; natural wetland sediments

4.2.19 Test Excavation 18 (TE 18)

Test Excavation 18 (TE 18), an exterior excavation located in the western portion of the project area, was oriented in a northeast-southwest direction, and measured 6.00 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.55 mbs. The stratigraphy of TE 18 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly loam (Stratum Ic), gravelly clay (Stratum Id), an oil-rolled buried land surface (SIHP # -7658) (Stratum Ie), crushed coral fill (Stratum If), and hydraulic fill (Stratum Ig) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II), and the clay wetland sediments (Stratum III) (Figure 110, Figure 111, and Table 20). Two disturbances were encountered within TE 18, likely representing a building footing and an adjacent pylon associated with the existing structure.

An oil-rolled former land surface (SIHP # -7658) (Stratum Ie) was only observed within the southwest end of TE 18. The former land surface was a petroleum based layer observed 45 cmbs, overlying a crushed coral fill and hydraulic fill associated with the 1919–1926 land reclamation. Based on historic maps and aerial photos, the oil-rolled surface likely dates between 1939 and 1952.

TE 18 documented the presence of salt pan remnants (SIHP # -7655), consisting of locally procured natural sediment modified slightly into a low structural feature (man-made berm) (Stratum II). The berm extended across the length of the test excavation with the upper boundary remaining roughly level. Although Stratum II remained level, it was consistent with the anthropogenic altered materials from which the man-made berms were constructed. The natural wetland sediments overlying the coral shelf were not observed within the southwest portion of TE 18, a majority of which may have been removed during construction of the surrounding berms.

Figure 110. Photograph of the TE 18 northwest sidewall, view to north

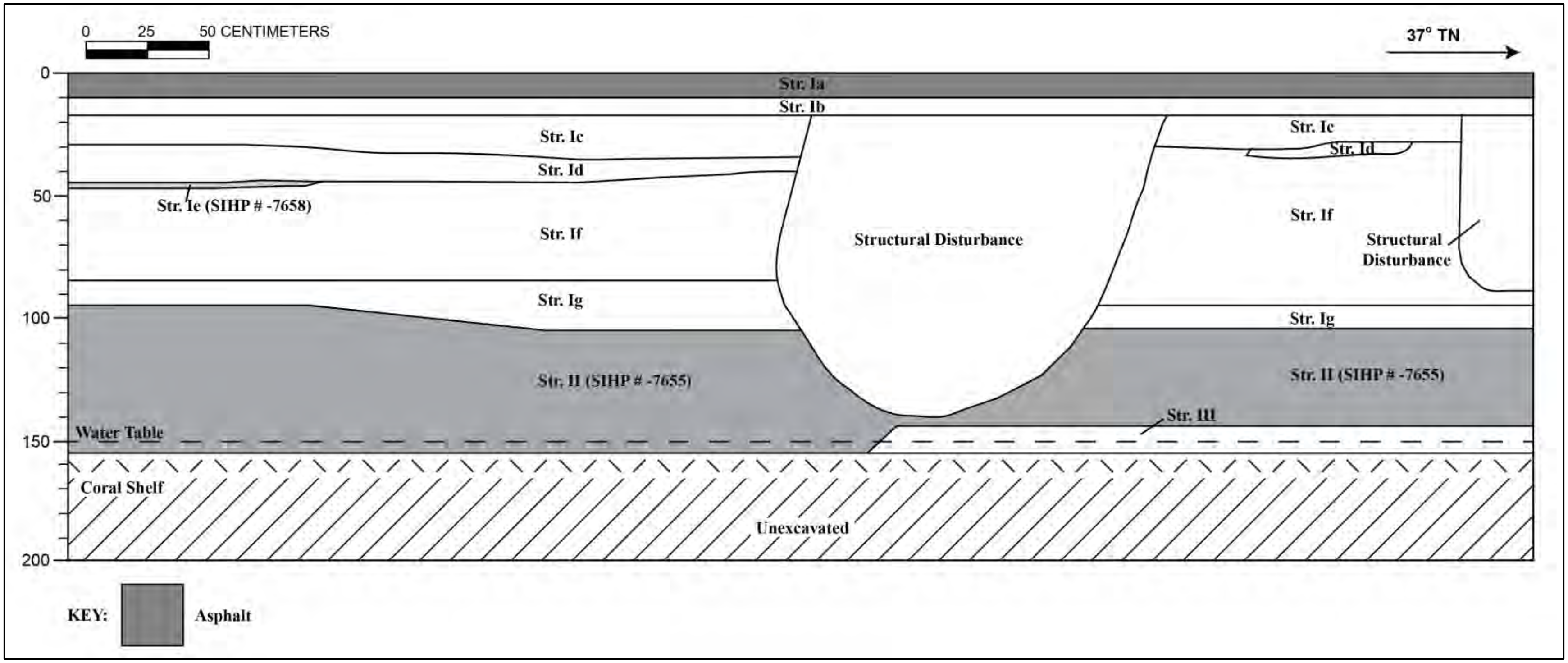

Figure 111. Profile of TE 18, northwest sidewall

Table 20. Strata Observed within Test Excavation 18

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–15	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	15–35	Fill; 10YR 2/2, very dark brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill with coral cobbles
Id	30–45	Fill; 10YR 3/6, dark yellowish brown; very gravelly clay; weak, fine, crumb structure; moist, loose consistency; plastic; terrigenous origin; clear, broken/discontinuous lower boundary; no roots observed; imported fill
Ie	45–47	SIHP # -7658; 10YR 2/1, black; sandy clay loam; structureless (single-grain); moist, loose consistency, non-plastic; terrigenous origin; clear, broken/discontinuous lower boundary; no roots observed; oiled and compacted former land surface
If	30–95	Fill; 10YR 8/1, white; very gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ig	85–105	Fill; 10YR 8/2, very pale brown; silt; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
Structural disturbance	15–140	Fill; 10YR 2/2, very dark brown, mottled with 10YR 8/2; texture gravelly sandy loam; clear, broken/discontinuous lower boundary; contained construction debris (i.e., nails, glass, metal fragments); disturbances associated with building foundation; mix of Strata Ic–If
II	95–155 (BOE)	SIHP # -7655; 10YR 7/2, light gray; sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; no roots observed; berm associated with salt pan remnants, containing snails
III	145–155 (BOE)	Natural; 10Y 6/1, greenish gray; clay; structureless (massive); moist, firm consistency; plastic; marine origin; lower boundary not visible; natural wetland sediment

4.2.20 Test Excavation 19 (TE 19)

Test Excavation 19 (TE 19), an exterior excavation located in the center of the project area, was oriented in a northwest-southeast direction and measured 6.00 m long by 0.67 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.65 mbs. The stratigraphy of TE 19 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly loam (Stratum Ic), a layer of buried asphalt (SIHP # -7658) (Stratum Id), associated base course (Stratum Ie), crushed coral fill (Stratum If), and hydraulic fill (Stratum Ig) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) and clay wetland sediments (Stratum III) (Figure 112, Figure 113, Figure 114, and Table 21). An existing utility trench was observed in the southeast end of the test excavation, extending through the coral shelf. The final depth of the utility trench was not determined.

A thin buried asphalt surface (Stratum Id) was determined to be a component of SIHP # -7658. The former land surface was observed in the northwest end wall of TE 19 at 35 cmbs with a thickness of 5 cm (see Figure 113). This historic property overlies a possibly associated base course, a crushed coral fill and hydraulic dredge associated with land reclamation in this area from 1919-1926. Based on historic maps and aerial photos, the buried asphalt surface likely dates from 1939 and 1976.

TE 19 documented the presence of salt pan remnants (SIHP # -7655) consisting of locally procured natural sediment modified slightly into a low structural feature (man-made berm) (Stratum II). The berm extended across a majority of the test excavation, with a slightly wavy upper boundary which slopes toward the east. The eastern end of the trench encountered the utility trench, which removed all evidence of the natural sediments.

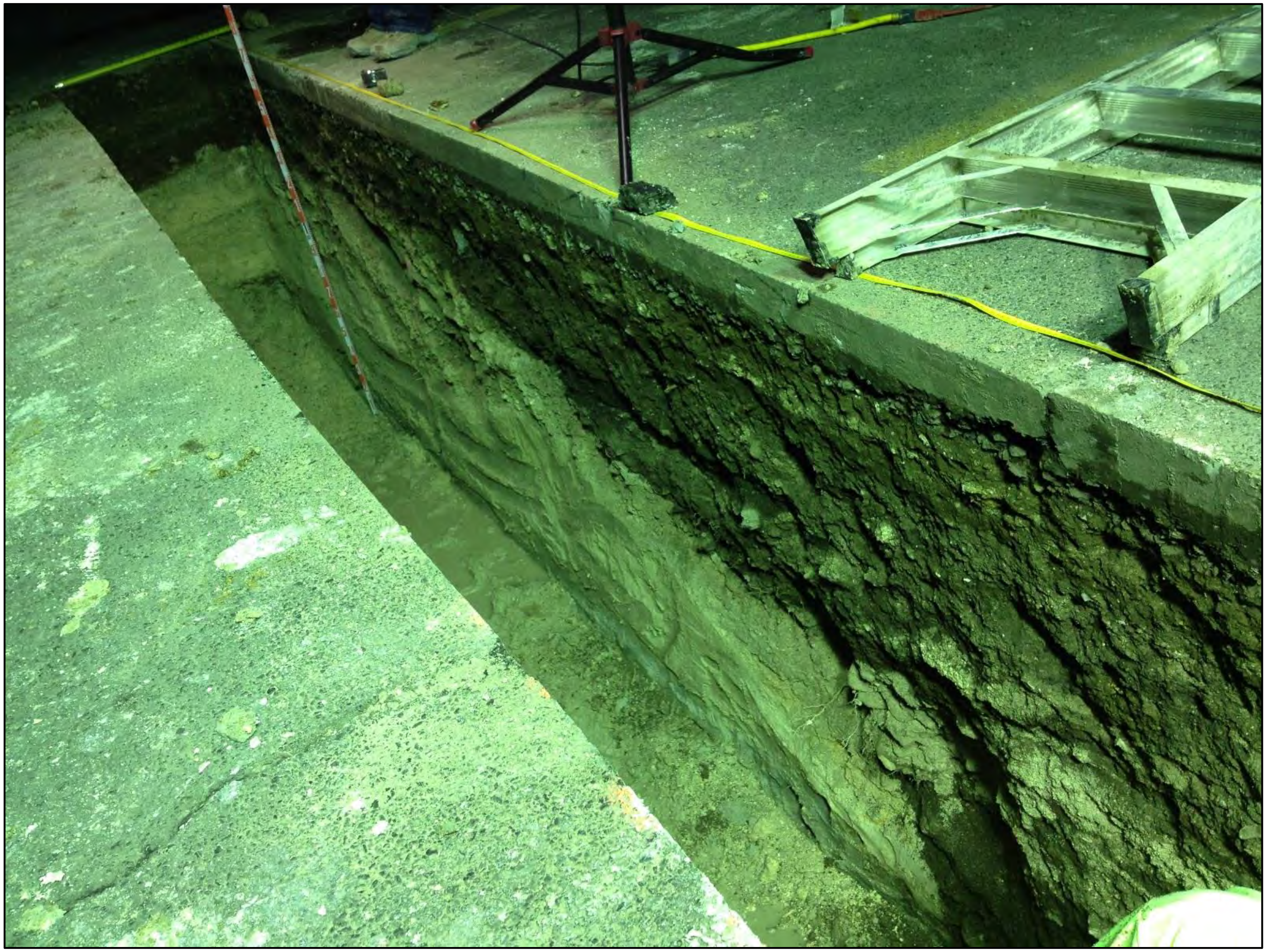

Figure 112. Photograph of the TE 19 northeast sidewall, view to north

Figure 113. Photograph of the northwest end of TE 19 showing the buried asphalt (red arrow) (SIHP # -7658) (Stratum Id), view to northwest

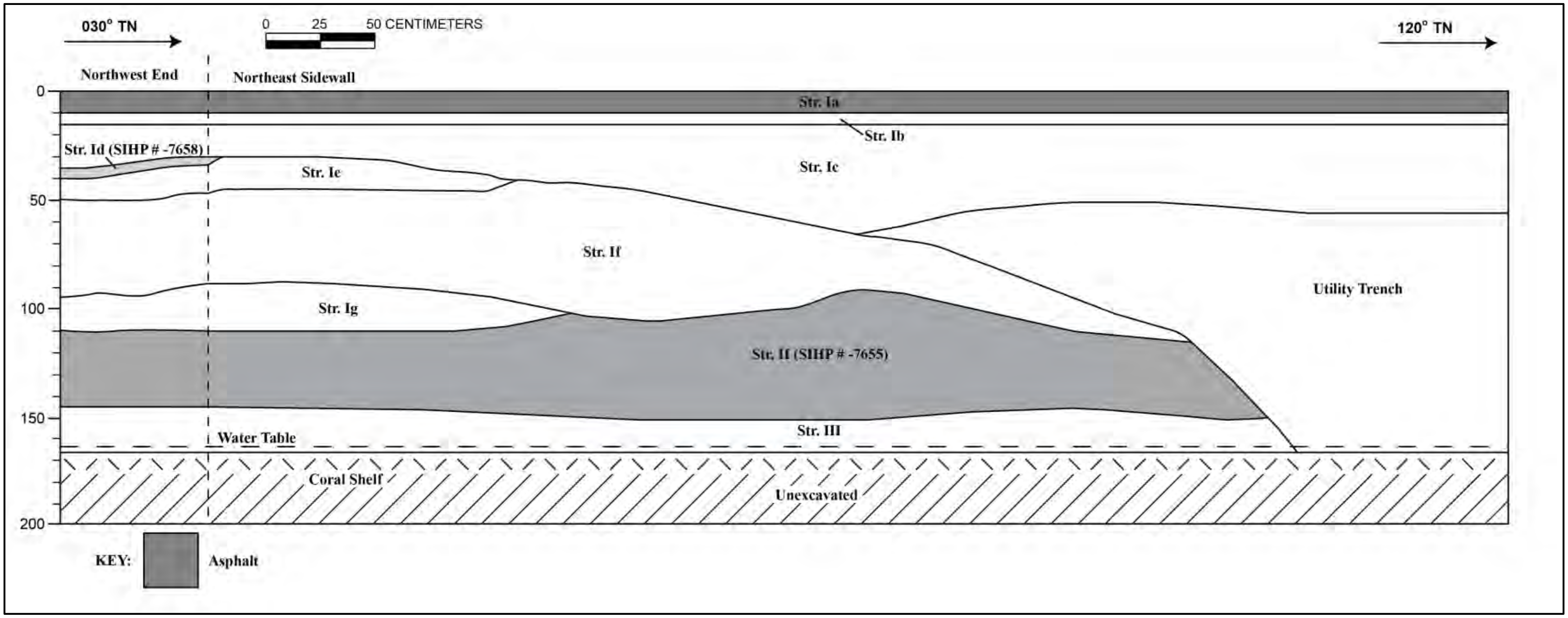

Figure 114. Profile of TE 19, northeast sidewall

Table 21. Strata Observed within Test Excavation 19

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–15	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	15–65	Fill; 10YR 2/2, very dark brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill with coral cobbles
Id	30–40	SIHP # -7658; buried asphalt surface
Ie	30–45	Fill; 10YR 3/6, dark yellowish brown; very gravelly clay; structureless (massive); moist, loose consistency; plastic; terrigenous origin; clear, broken/discontinuous lower boundary; no roots observed; clay fill
If	40–105	Fill; 10YR 8/1, white; very gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ig	90–110	Fill; 10YR 8/2, very pale brown; silt; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, broken/discontinuous lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
Utility trench	50–165 (BOE)	Fill; 10YR 2/2, very dark brown; gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; lower boundary not visible; no roots observed; utility trench
II	90–150	SIHP # -7655; 10YR 7/2, light gray; loamy clay; structureless (massive); moist, firm consistency; slightly plastic; marine origin; clear, smooth lower boundary; no roots observed; berm associated with salt pan remnants
III	145–165 (BOE)	Natural; 10Y 6/1, greenish gray; clay; structureless (massive); moist, firm consistency; plastic; marine origin; abrupt, smooth lower boundary; few, fine roots; wetland sediments containing freshwater snails

4.2.21 Test Excavation 20 (TE 20)

Test Excavation 20 (TE 20), an exterior excavation located near the center of the project area, was oriented in a northwest-southeast direction, and measured 6.00 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.65 mbs. The stratigraphy of TE 20 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly loam (Stratum Ic), gravelly clay (Stratum Id), an oiled and compacted buried land surface (SIHP # -7658) (Stratum Ie), crushed coral fill (Stratum If), and hydraulic fill (Stratum Ig) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II), and clay wetland sediments (Stratum III) (Figure 115 through Figure 118, and Table 22). Two drain lines were pedestaled in the southeast half of test excavation.

A thin oil-rolled former land surface (SIHP # -7658) (Stratum Ic) located in TE 20 was disturbed by a utility trench in the central portion of the test excavation. The surface was observed 50 cmbs with a thickness of 2 cm. The surface contains high amounts of petroleum, which set it apart from conventional asphalt. This oil-rolled surface overlies a crushed coral fill and hydraulic fill associated with 1919-1926 land reclamation. Based on historic maps and aerial photos, the oil-rolled surface likely dates from 1939 and 1952.

TE 20 documented the presence of salt pan remnants (SIHP # -7655) consisting of locally procured natural sediment modified into a low structural feature (man-made berm) (Stratum II). The berm extended across a majority of the test excavation, with a slightly wavy upper boundary.

Figure 115. Photograph of the TE 20 southwest sidewall, view to south

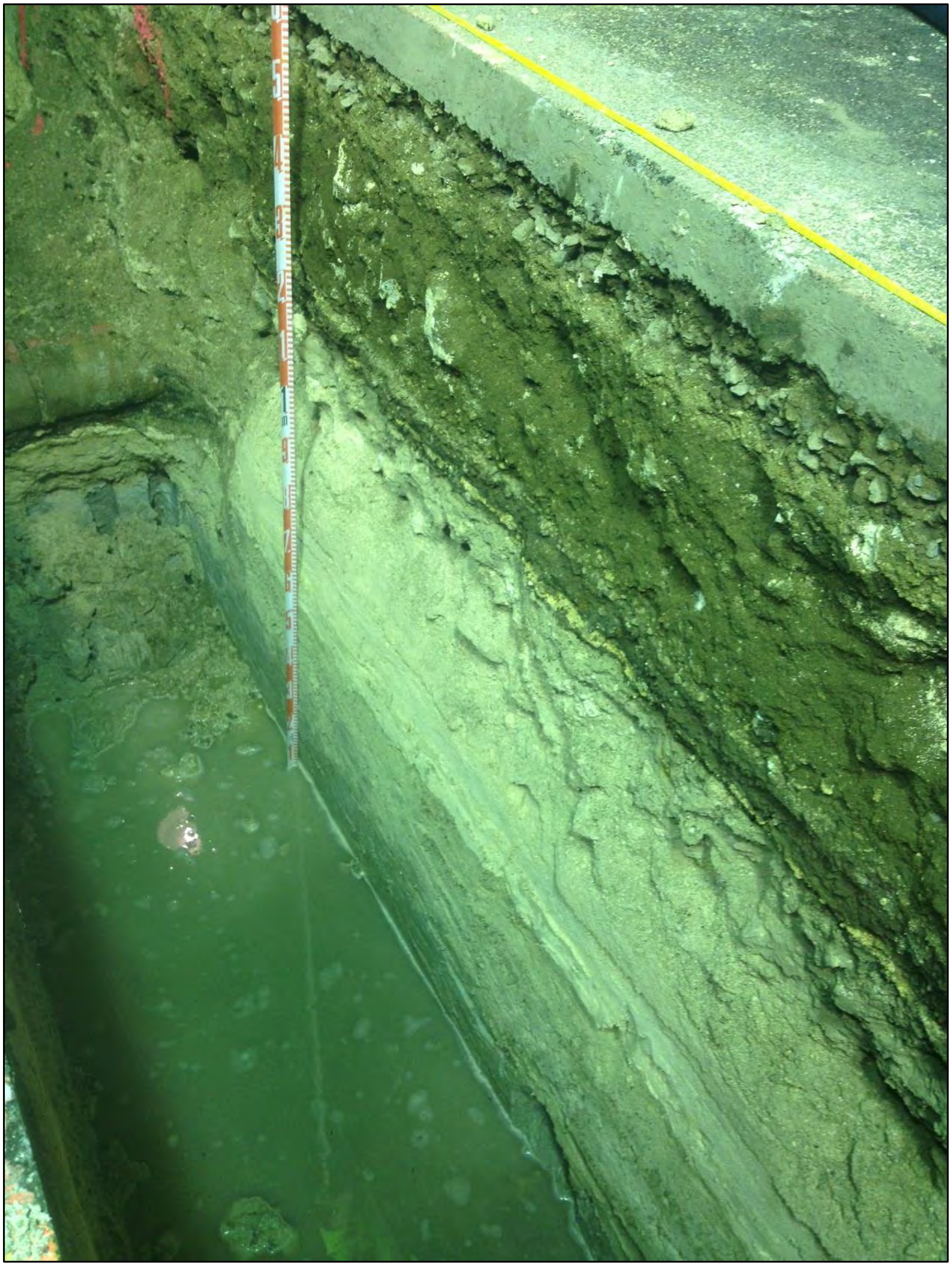

Figure 116. Close-up of the southwest wall stratigraphy in the northwest half of TE 20, view to southwest

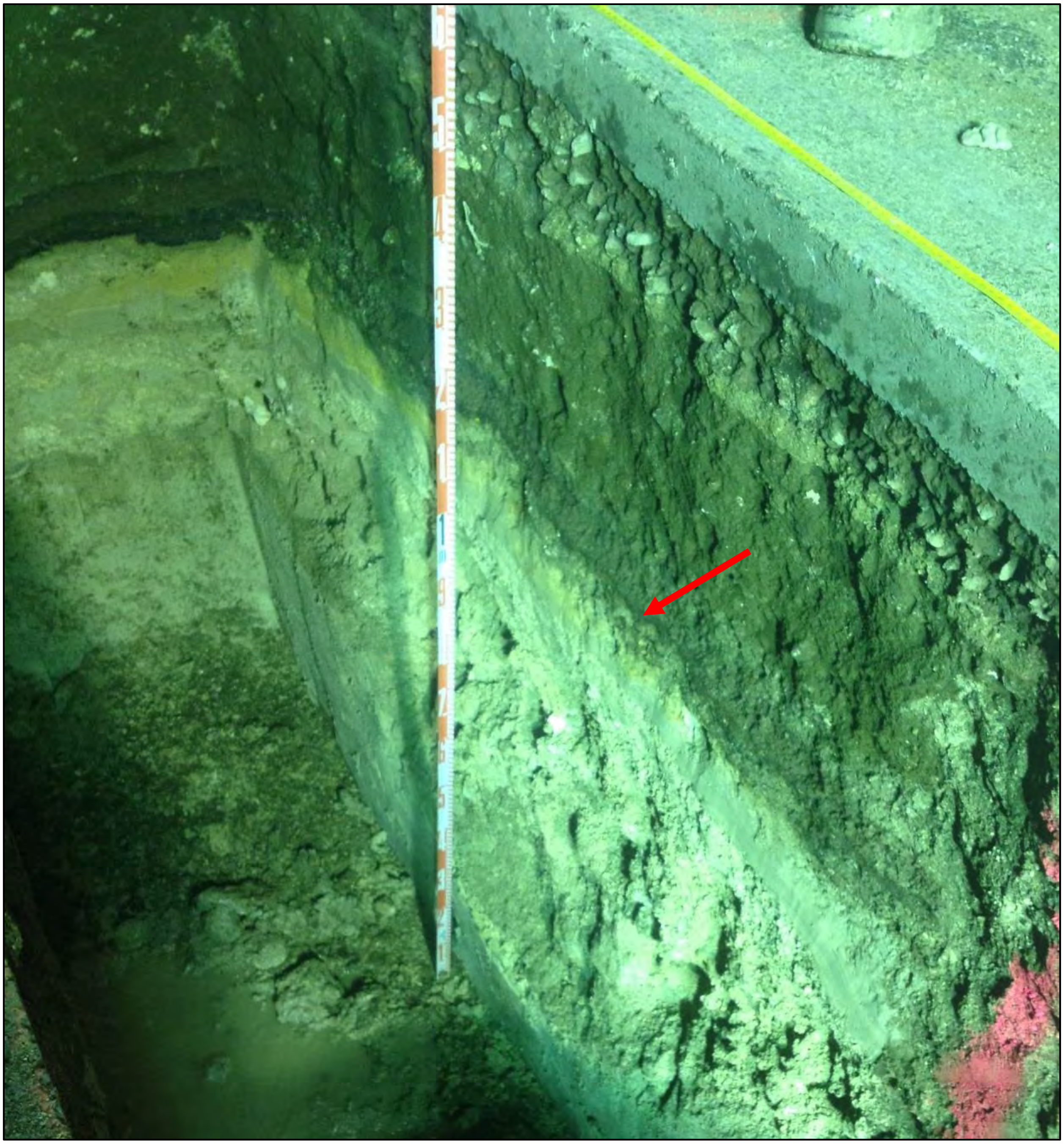

Figure 117. Close-up of the southwest wall stratigraphy in the southeast half of TE 20, view to southwest; note oiled and compacted former land surface (SIHP # -7658), indicated by red arrow

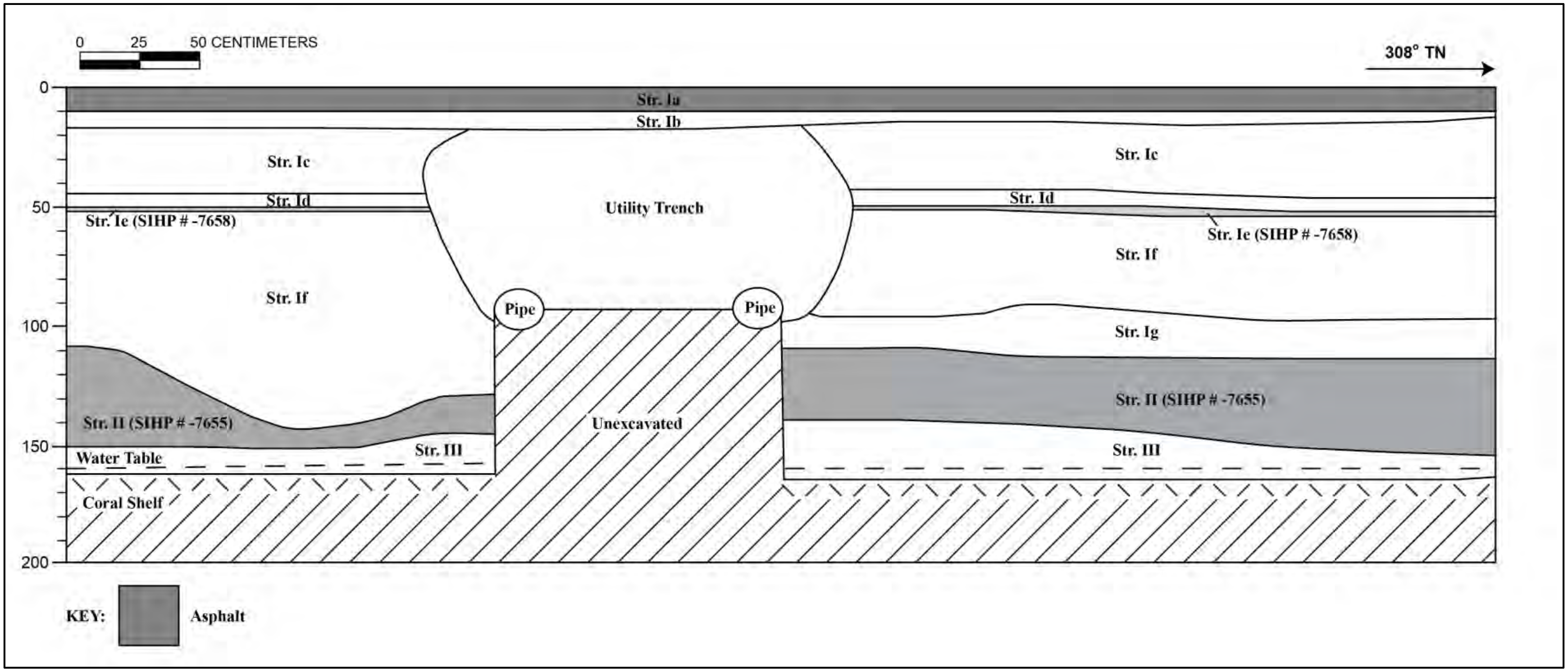

Figure 118. Profile of TE 20, southwest sidewall

Table 22. Strata Observed within Test Excavation 20

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–17	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with the asphalt surface
Ic	15–47	Fill; 10YR 2/2, very dark brown; very gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill
Id	39–53	Fill; 10YR 3/6, dark yellowish brown; extremely gravelly clay; structureless (massive); moist, loose consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported fill
Ie	50–56	SIHP # -7658; 10YR 2/1, black; oil-rolled surface; structureless (single-grain); moist, loose consistency, non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; oil-rolled former land surface
If	52–143	Fill; 10YR 8/1, white; very gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ig	92–115	Fill; 10YR 8/2, very pale brown; silt clay; structureless (massive); moist, loose to firm consistency; non-plastic; marine origin; clear, smooth lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events, grading from silt to clay
Utility trench	16–98	Fill; 10YR 2/2, very dark brown; gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; terrigenous origin; clear, broken/discontinuous lower boundary; no roots observed; utility trench
II	110–155	SIHP # -7655; 10YR 7/2, light gray; sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; no roots observed; berm associated with salt pan remnants
III	140–165	Natural; 10Y 6/1, greenish gray; clay; structureless (massive); moist, firm consistency; plastic; marine origin; lower boundary not visible; no roots observed; wetland sediments

4.2.22 Test Excavation 21 (TE 21)

Test Excavation 21 (TE 21), an exterior excavation located near the center of the project area, was oriented in a northwest-southeast direction, and measured 6.00 m long by 0.80 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.65 mbs. The stratigraphy of TE 21 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of loamy sand (Stratum Ic), loamy sand (Stratum Id), crushed coral fill (Stratum Ie), and hydraulic fill (Stratum If) overlying laminated organic material (SIHP # -7655) (Stratum II) and clay wetland sediments (Stratum III) (Figure 119 through Figure 122, and Table 23). Two drain lines were encountered near the northwest end of the test excavation.

TE 21 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of a thin layer of laminated organic material (Stratum II) overlying a thin (3 cm) layer of wetland sediments (Stratum III). No evidence of the man-made berms associated with the salt pan remnants was encountered; however, due to the utilities present in the northwest end of the trench, full exploration of the trench did not take place.

A sample of Stratum II, laminated organic material associated with the historic salt pans (SIHP # -7655), and the underlying wetland sediment (Stratum III) were submitted to PaleoResearch Institute, Inc. for pollen and microcharcoal analysis (see Figure 121) (see Section 5.2 for detailed analysis). The majority of the observed pollen consisted of *Myrsine* (*kolea*), which is an endemic tree. Cyperaceae pollen was documented in both samples, but not in a concentration indicative of a sedge marsh.

Pollen from introduced species were observed within both samples, including *kiawe* (*Prosopis*) and *koa haole* (*Leucaena*). This may indicate that both samples date to the historic period. Alternatively, the alien species within the wetland sediments (Sample 4) may be a result of contamination during recent or historic times.

Small concentrations of ferns and grasses (Poaceae) were located within both samples, suggesting these plants were growing in outlying areas. A larger variety of pollen was present in the wetland sample (Stratum III), while the laminated organic material (Stratum II) contained a higher pollen concentration value.

Figure 119. Photograph of the TE 21 southwest sidewall, view to west

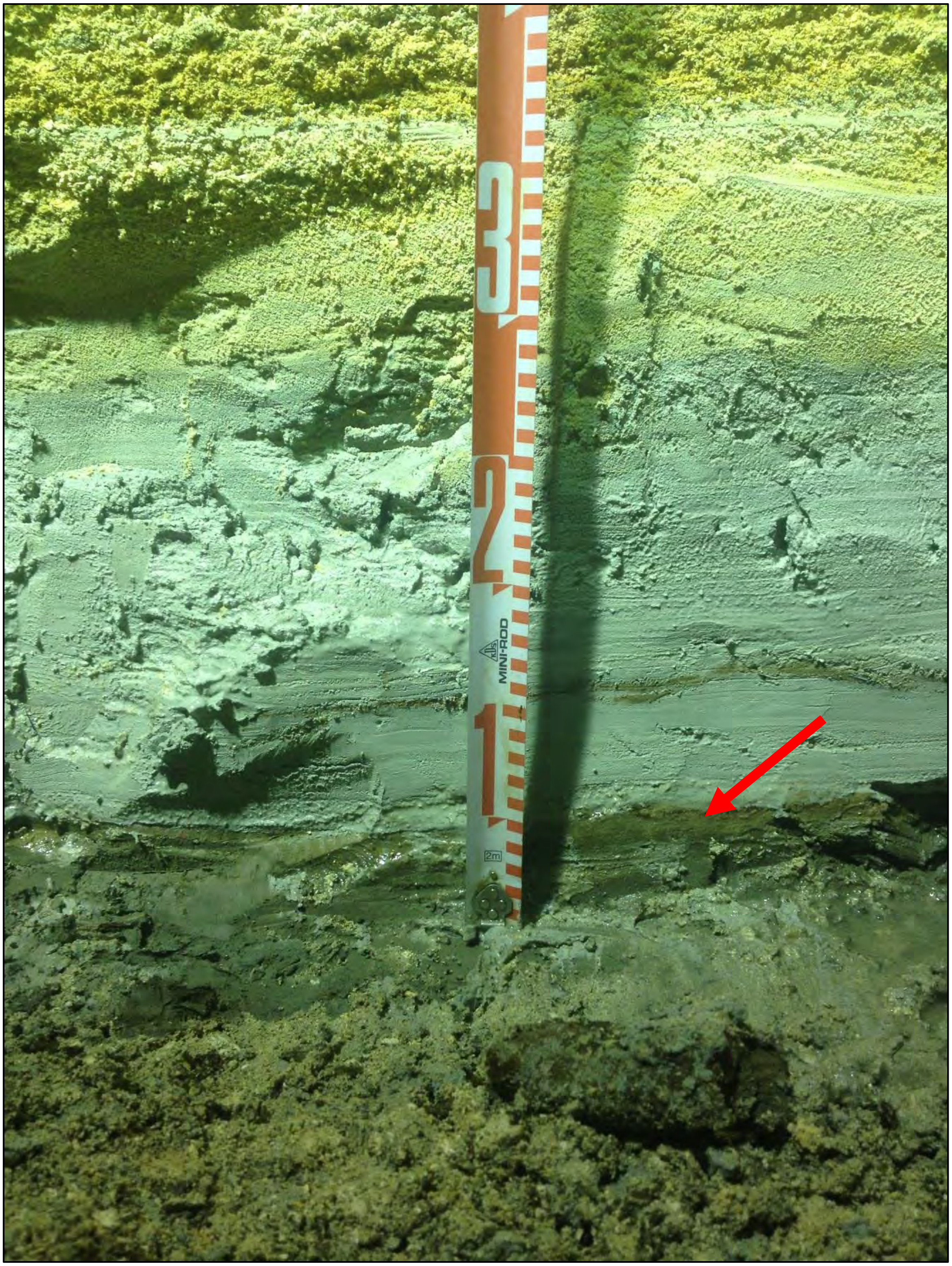

Figure 120. Close-up of laminated organic material (SIHP # -7655) (red arrow) located 5 cm above the coral shelf within the TE 21 southwest sidewall, view to southwest

Figure 121. Close-up of the laminated organic material (SIHP # -7655) (Stratum II) and the wetland sediment (Stratum III)

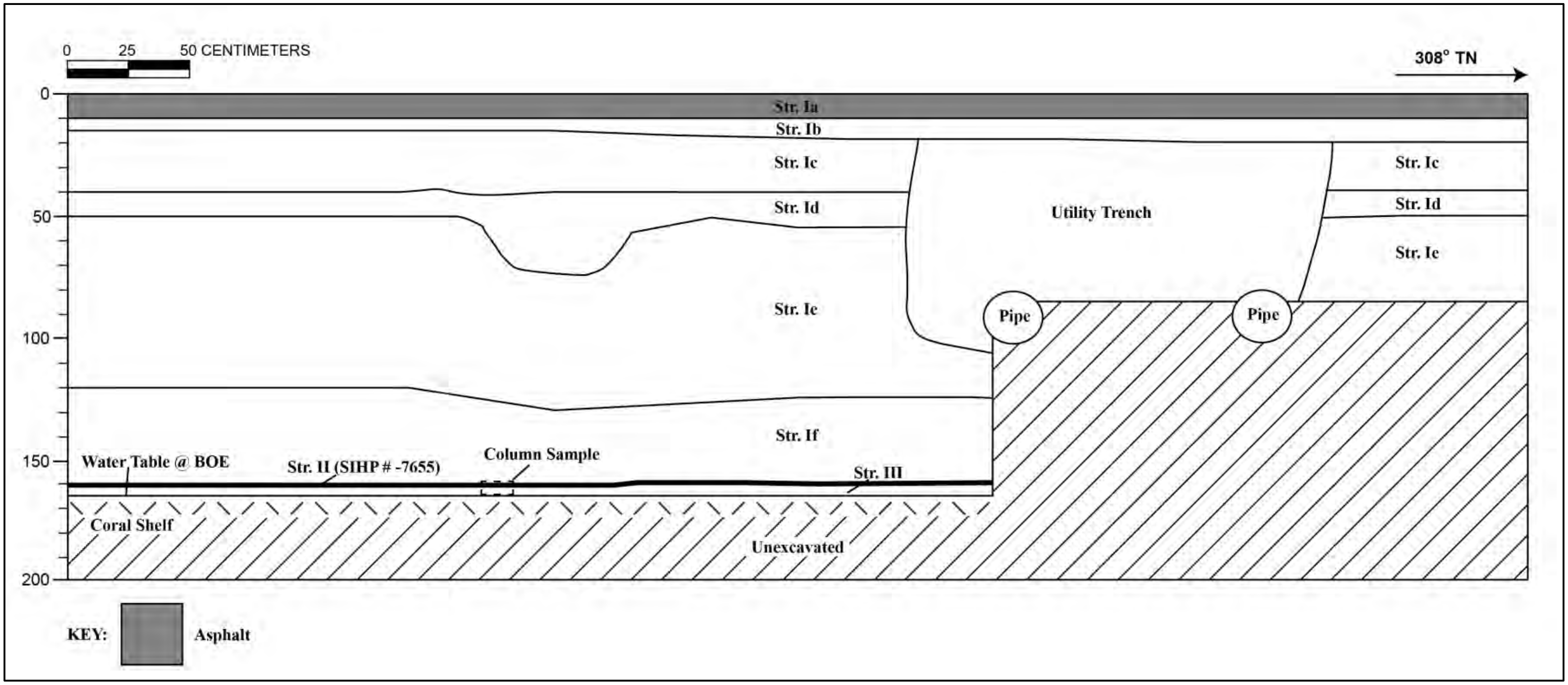

Figure 122. Profile of TE 21, southwest sidewall

Table 23. Strata Observed within Test Excavation 21

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–20	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	15–41	Fill; 10YR 3/3, dark olive brown; loamy sand; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, wavy lower boundary; no roots observed; imported fill
Id	40–76	Fill; 10YR 4/1, dark gray; loamy sand; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, wavy lower boundary; no roots observed; imported fill
Ie	47–130	Fill; 10YR 8/2, very pale brown; very gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; smooth, clear lower boundary; no roots observed; crushed coral fill associated with land reclamation events
If	120–160	Fill; 10YR 8/6, yellow, grading to 10G 7/1, light greenish gray; coarse sand to silty clay; structureless (massive); moist, friable consistency; non-plastic; marine origin; clear, smooth lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events, grading from sand to silty clay
Utility Trench	18–106	Fill; 2.5YR 4/1, olive brown; gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; utility trench
II	160–162	SIHP # -7655; organic laminations associated with salt pan remnants
III	162–165 (BOE)	Natural; 7.5Y 3/2, dark brown; clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; clear, smooth lower boundary; many, very fine roots; wetland sediment

4.2.23 Test Excavation 22 (TE 22)

Test Excavation 22 (TE 22), an exterior excavation located in the eastern portion of the project area, was oriented in a northeast-southwest direction and measured 6.00 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.72 mbs. The stratigraphy of TE 22 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of hydraulic fill (Stratum Ic), crushed coral fill (Stratum Id), and hydraulic fill (Stratum Ie) overlying laminated organic material (SIHP # -7655) (Stratum II) and the natural wetland sediments (Stratum III) (Figure 123 through Figure 126, and Table 24). A previous disturbance was encountered in the center of TE 22, likely associated with the adjacent pylon. In addition, a concrete jacket was observed within the northeastern portion of the test excavation and a second jacket was observed parallel within the southeast sidewall (not profiled).

TE 22 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of a thin layer of laminated organic material (Stratum II). No evidence of the man-made berms associated with the salt pan remnants was encountered; however, mixing between the wetland sediments and natural marine sandy clay consistent with the man-made berm was observed and is most likely a result of disturbance caused by creation of the man-made berms. A second, very thin layer of laminated organic material was observed within a sample collected from the northeast end of the test excavation, but was not observed within the excavation sidewall during exploration. This second layer of laminated material appeared to be located approximately 5 cm below Stratum II, with portions of Stratum III present between the two layers (see Figure 125). Similar to the multiple berm events observed within the adjacent Test Excavation 23, this may indicate some reconstruction of the salt pan beds and associated man-made berms.

A sample of Stratum II, laminated organic material associated with the historic salt pans (SIHP # -7655), and the underlying wetland sediment (Stratum III) were submitted to PaleoResearch Institute, Inc. for pollen and microcharcoal analysis (see Section 5.2 for detailed analysis). The majority of the observed pollen consisted of *Myrsine* (*kolea*), which is an endemic tree. Cyperaceae pollen was documented in the both samples, but not in a concentration indicative of a sedge marsh

Pollen from introduced species were observed within both samples, including *kiawe* (*Prosopis*), *koa haole* (*Leucaena*), and Ironwood (*Casuarina*). This may indicate that both samples date to the historic period. Alternatively, the alien species within the wetland sediments (Sample 6) may be a result of contamination during recent or historic times..

A small concentration of fern spores were identified within both samples, suggesting a few of these species were growing in outlying areas. *Chenopodium*, possibly *‘aheahea* or *ahea*, a native shrub, was observed within Stratum II (Sample 5). Sugarcane pollen (*Saccharum*) was present within both samples, suggesting sugar cane may have been cultivated nearby. Coconut (*Cocos nucifera*) was only documented in the underlying wetland sample. A larger variety of pollen was present in the wetland sample (Stratum III), while the laminated organic material (Stratum II) contained a higher pollen concentration value.

Figure 123. Photograph of the southwest end of the TE 22 northwest sidewall, view to northeast

Figure 124. Photograph of the northeast end of the TE 22 northwest sidewall, view to southwest

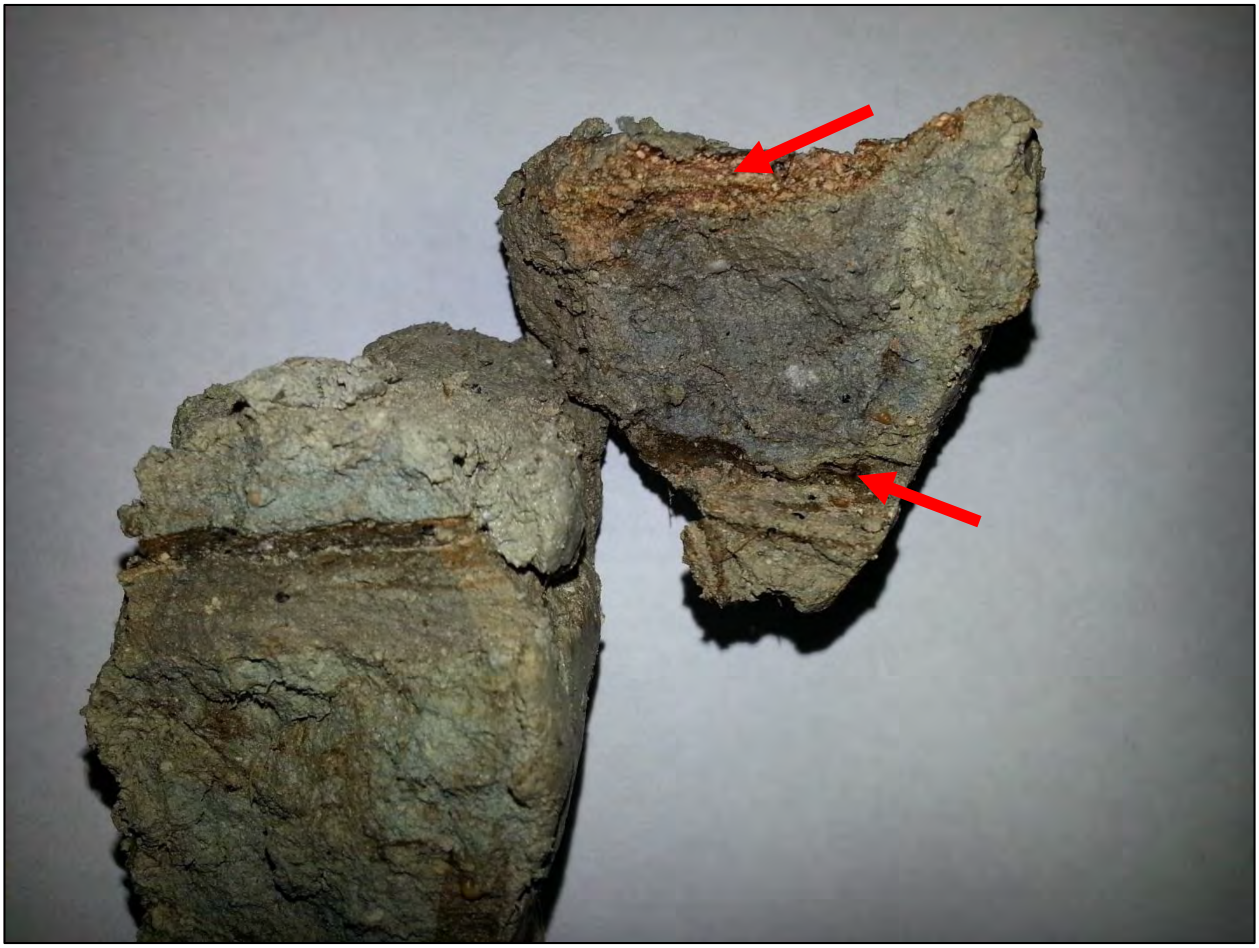

Figure 125. Close-up of the two layers of laminated organic material (SIHP # -7655) (Stratum II) photographed in the laboratory

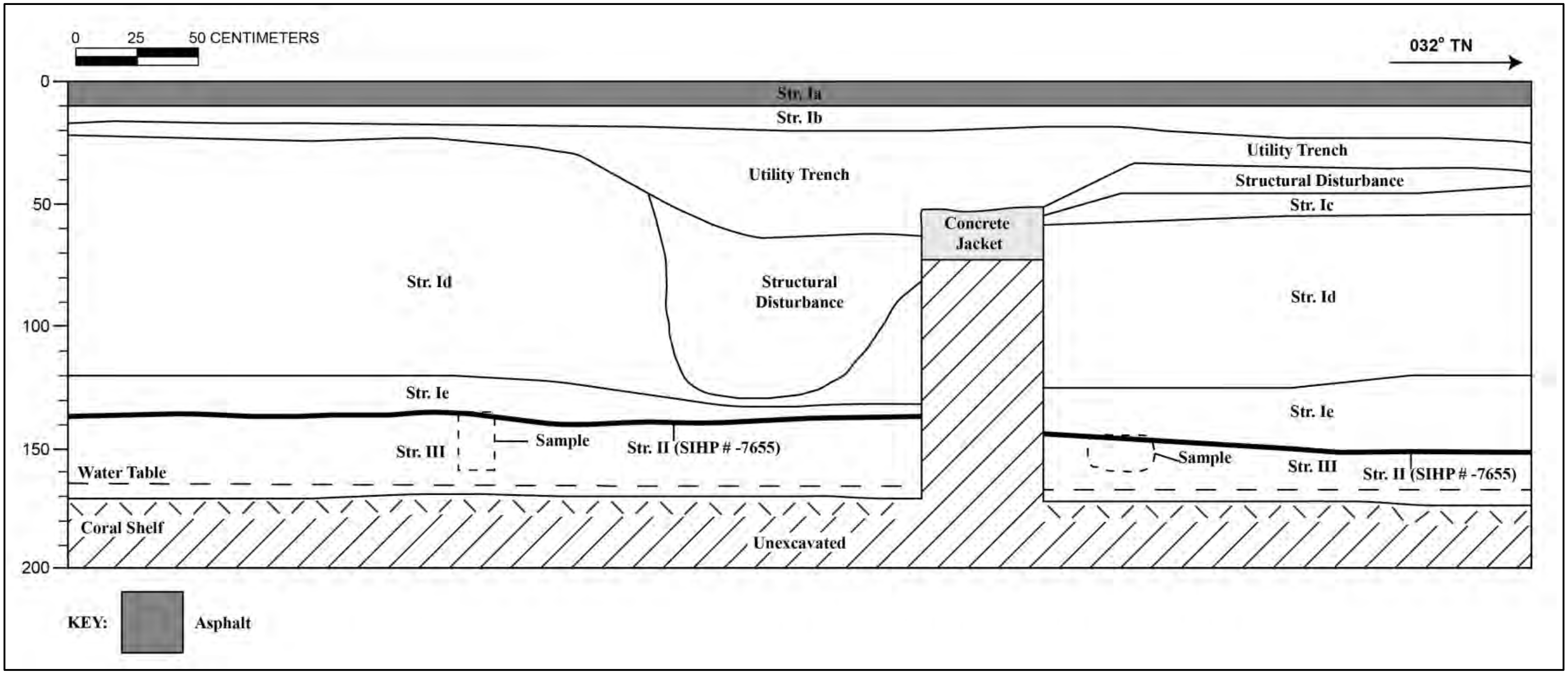

Figure 126. Profile of TE 22, northwest sidewall

Table 24. Strata Observed within Test Excavation 22

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–24	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	37–58	Fill; 2.5YR 6/4, light yellowish brown; silt; structureless (single-grain); moist, loose, firm consistency; non-plastic; marine origin; clear, broken/discontinuous lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
Id	23–133	Fill; 10YR 2/3, very pale brown; gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; no roots observed; crushed coral fill associated with land reclamation events
1e	120-151	Fill; 10YR 2/3, very pale brown; silt grading to clay; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
Utility trench	20–63	Fill; 2.5YR 4/2, dark grayish brown; gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; terrigenous origin; clear, broken/discontinuous lower boundary; no roots observed; utility trench
Structural disturbance	24–180	Fill; 10YR 2/1, black; gravelly coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; disturbance associated with building foundation
II	135–137	SIHP # -7655; organic laminations associated with salt pan remnants
III	137–172 (BOE)	Natural; 2.5Y 5/1, gray; silty clay; structureless (massive); moist, friable consistency; plastic; marine origin; abrupt, clear lower boundary; few, fine roots; wetland sediments containing freshwater snails

4.2.24 Test Excavation 23 (TE 23)

Test Excavation 23 (TE 23), an exterior excavation located in the eastern portion of the project area, was oriented in a northwest-southeast direction, and measured 6.0 m long by 0.75 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.65 mbs. The stratigraphy of TE 23 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly silty loam (Stratum Ic), hydraulic fill (Stratum Id), crushed coral fill (Stratum Ie), and hydraulic fill (Stratum If) overlying a silty clay man-made berm (SIHP # -7655) (Stratum IIa), a sandy clay man-made berm (SIHP # -7655) (Stratum IIb), laminated organic material (SIHP # -7655) (Stratum IIc), and silty clay wetland sediments (Stratum III) (Figure 127 through Figure 130, and Table 25). Two drain lines were encountered in the northwest half of the trench.

TE 23 documented the presence of salt pan remnants (SIHP # -7655), consisting of two layers of locally procured natural sediment modified into a structural feature (man-made berm) (Strata IIa and IIb) and a thin layer of laminated organic material (Stratum IIc). The two man-made berm layers (Strata IIa and IIb) were observed in the northwestern half of the test excavation, sloping slightly toward the southeast (see Figure 127). The second berm event (Stratum IIa) added approximately 25 cm in height to the existing berm (Stratum IIb). The transition to the laminated organic material (Stratum IIb) within the southeastern half of the trench was not observed due to existing utilities preventing full excavation of the transitional zone. The two layers of man-made berm sediments (Strata IIa and IIb) likely represent two separate structural events. The wetland sediments (Stratum III) were not present beneath the man-made berm, likely removed during construction of the berm.

Figure 127. Photograph of the northwest end of the TE 23 northeast sidewall showing the two berm building events (Strata IIa and IIb), view to south

Figure 128. Photograph of the southeast half of the TE 23 northeast sidewall showing varying layers of fill overlying laminated organic material (SIHP # -7655) near the BOE, view to southeast

Figure 129. Close-up of laminated organic material (SIHP # -7655) (Stratum II) within TE 23; note the abundance of freshwater snails

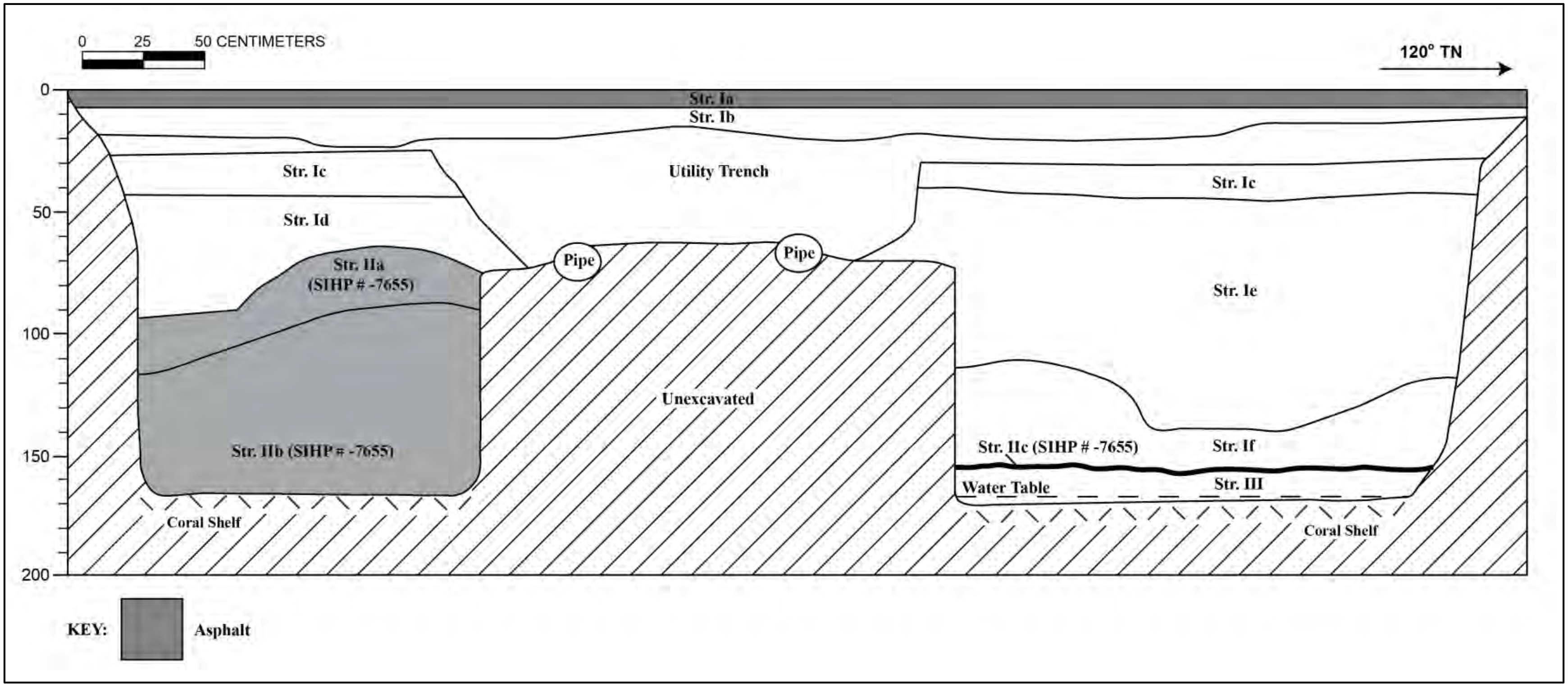

Figure 130. Profile of TE 23, northeast sidewall

Table 25. Strata Observed within Test Excavation 23

Stratum	Depth (cmbs)	Description
Ia	0–8	Asphalt surface
Ib	8–20	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	30–45	Fill; 7.5YR 3/3, dark brown; gravelly silty loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; abrupt, broken/discontinuous lower boundary; no roots observed; imported fill
Id	44–94	Fill; 10YR 7/2, light gray; silt; structureless (single-grain); moist, loose, consistency; non-plastic; marine origin; clear, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events
Ie	45–138	Fill; 10YR 5/1, gray; very gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; no roots observed; crushed coral fill associated with land reclamation events
If	110–153	Fill; 10YR 7/3, very pale brown; fine sand; structureless (single-grain); wet, non-sticky consistency ; non-plastic; marine origin; clear, smooth lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events, grades from silt to clay
Utility trench	18–61	Fill; 10YR 4/3, brown; gravelly loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; utility trench
IIa	65–116	SIHP # -7655; 2.5Y 6/4, light yellowish brown; silty clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, wavy lower boundary; no roots observed; berm associated with salt pan remnants
IIb	88–167 (BOE)	SIHP # -7655; 2.5Y 6/3, light yellowish brown; sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; abrupt, smooth lower boundary; no roots observed; berm associated with salt pan remnants
IIc	153–156	SIHP # -7655; organic laminations associated with salt pan remnants
III	156–167 (BOE)	Natural; 5Y 5/1, gray; silty clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; few, fine roots; wetland sediments containing freshwater snails

4.2.25 Test Excavation 24 (TE 24)

Test Excavation 24 (TE 24), an exterior excavation located near the southeastern edge of the project area, was oriented in a northwest-southeast direction, and measured 6.00 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.70 mbs. The stratigraphy of TE 24 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly loam (Stratum Ic), gravelly sandy loam (Stratum Id), gravelly clay loam (Stratum Ie), gravelly sand (Stratum If), and hydraulic fill (Stratum Ig) overlying laminated organic material (SIHP # -7655) (Stratum II), natural marine sandy clay (Stratum III), and silty clay wetland sediments (Stratum IV). Four separate utilities were observed within TE 24: two active drain lines (similar to TE 20 and TE 21) in the northwest end, a small utility near the center, and two abandoned utilities near the southeast end.

TE 24 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of a thin layer of laminated organic material (Stratum II). No evidence of the man-made berms associated with the salt pan remnants was encountered; however, the natural sandy marine clay sediments (Stratum IIII) appear to represent in situ remnants of the sandy clay utilized to construct the man-made berms associated with SIHP # -7655. The underlying wetland sediments (Stratum IV) were consistent with the material typically observed underlying the laminated organic material.

Figure 131. Photograph of TE 24 southwest sidewall, view to northwest

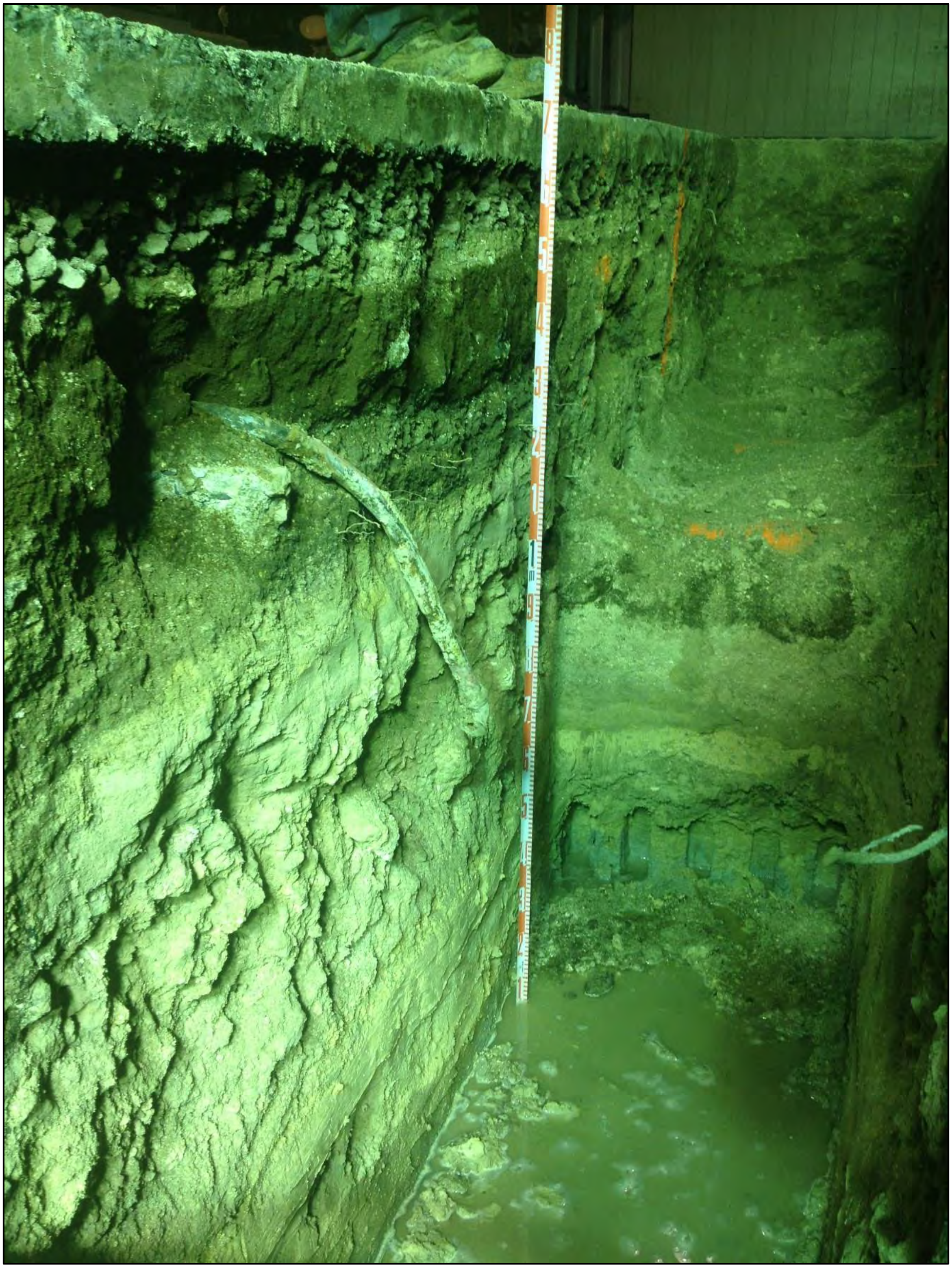

Figure 132. Close-up of the stratigraphy in the center of the TE 24 southwest sidewall, view to west

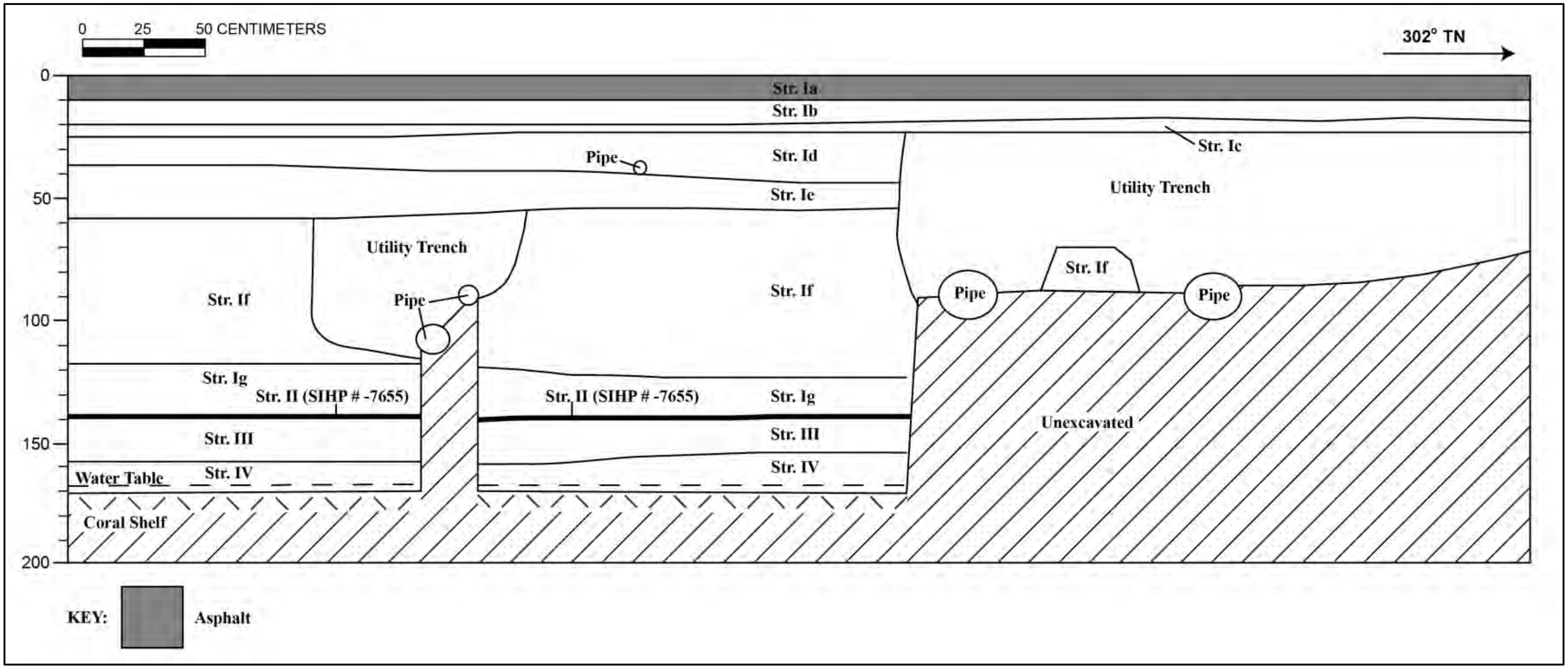

Figure 133. Profile of TE 24, southwest sidewall

Table 26. Strata Observed within Test Excavation 24

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–20	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	16–25	Fill; 2.5YR 4/2, dark grayish brown; gravelly loam; weak, fine crumb structure; moist, friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill
Id	22–43	Fill; 10YR 2/2, very dark brown; gravelly sandy loam; weak, fine, crumb structure; moist, loose consistency; plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported fill with a lens of cinder at lower boundary
Ie	35–57	Fill; 10YR 4/3, brown; gravelly clay loam; weak, fine, crumb structure; moist, very friable consistency; slightly plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported fill
If	54–124	Fill; 10YR 7/3, very pale brown; gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; no roots observed; crushed coral fill associated with land reclamation events
Ig	47–124	Fill; 10YR 7/3, very pale brown; silty clay; structureless (massive); moist, friable consistency; slightly plastic; marine origin; clear, smooth lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events, grading from silt to clay
Utility trench	22–87	Fill; 2.5YR 2/3, olive brown; silty loam; weak, fine, crumb structure; moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; utility backfill
II	143–145	SIHP # -7655; organic laminations associated with salt pan remnants
III	139–156	Natural; 2.5Y 6/3, light yellowish brown; fine, sandy clay; structureless (massive); moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; common, fine roots; natural marine sediments
IV	154–170 (BOE)	Natural; 5G 6/1, greenish gray; silty clay; structureless (massive); moist, friable consistency; plastic; marine origin; abrupt, smooth lower boundary; no roots observed; wetland sediments

4.2.26 Test Excavation 25 (TE 25)

Test Excavation 25 (TE 25), an exterior excavation located along the southeastern edge of the project area, was oriented in a northeast-southwest direction and measured 6.0 m long by 0.72 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.75 mbs. The stratigraphy of TE 25 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly silty loam (Stratum Ic), silty clay (Stratum Id), crushed coral fill (Stratum Ie), and hydraulic fill (Stratum If) overlying laminated organic material (SIHP # -7655) (Stratum II) and silty clay wetland sediments (Stratum III) (Figure 134 through Figure 137, and Table 27). A disturbance associated with a grade beam for the existing structure was encountered within the center of TE 25.

TE 25 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of a thin layer of laminated organic material (Stratum II). No evidence of the man-made berms associated with the salt pan remnants was observed within this test excavation.

Figure 134. Photograph of the northeast end of the TE 25 southeast sidewall, view to southeast

Figure 135. Photograph of the southwest end of the TE 25 southeast sidewall, view to southwest

Figure 136. Close-up of laminated organic material (red arrow) (SIHP # -7655) (Stratum II), located between hydraulic fill and natural wetland sediments (Stratum III)

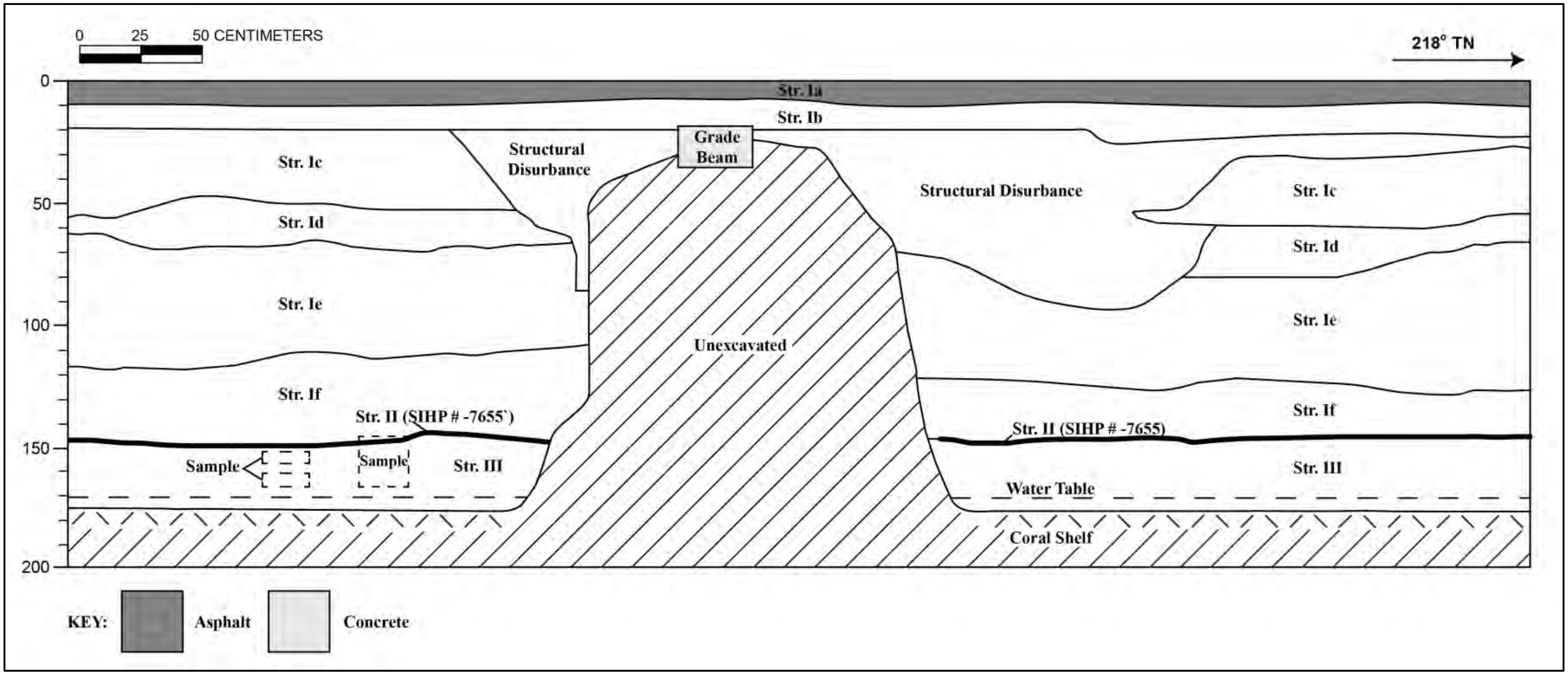

Figure 137. Profile of TE 25, southeast sidewall

Table 27. Strata Observed within Test Excavation 25

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–20	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	20–53	Fill; 7.5YR 3/3, dark brown; gravelly silty loam; weak, fine, crumb structure; moist, loose consistency; slightly plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; imported cinder fill
Id	47–80	Fill; 10YR 5/1, gray; silty clay; structureless (massive); moist, firm consistency; plastic; marine origin; clear, broken/discontinuous lower boundary; no roots observed; imported fill
Ie	68–130	Fill; 10YR 5/1, gray; very gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; no roots observed; crushed coral fill associated with land reclamation events
If	120–138	Fill; 10YR 2/3, very pale brown; fine sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; no roots observed; hydraulic (dredge) fill associated with land reclamation events, grading from sand to clay
Structural disturbance	20–75	Fill; 10YR 4/3, brown; gravelly loam; weak, fine crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; no roots observed; utility trench, mix of Strata Ic–Ie
II	148–149	SIHP # -7655; organic laminations associated with salt pan remnants
III	145–175 (BOE)	Natural; 5Y 5/1, gray; silty clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; common, fine roots; wetland sediments

4.2.27 Test Excavation 26 (TE 26)

Test Excavation 26 (TE 26), an exterior excavation located near the western corner of the project area, was oriented in a northeast-southwest direction, and measured 6.15 m long by 0.63 m wide. The base of excavation was determined by the presence of the hard coral shelf at 2.01 mbs. The stratigraphy of TE 26 consisted of the concrete surface (Stratum Ia) and various fill layers consisting of gravelly sandy clay loam (Stratum Ib), gravelly loamy sand (Stratum Ic), gravelly sandy loam (Stratum Id), a thin layer of hydraulic fill (Stratum Ie), gravelly loamy sand (Stratum If), a thin layer of crushed coral fill (Stratum Ih), and hydraulic fill (Stratum Ih) overlying laminated organic material (SIHP # -7655) (Stratum II) and silty clay wetland sediments (Stratum III) (Figure 138, Figure 139, Figure 140, and Table 28).

TE 26 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of a thin layer of laminated organic material (Stratum II). The wetland sediments underlying the organic material were 1–4 cm thick, in some cases completely removed with the organic material directly overlying the coral shelf. No evidence of the man-made berms associated with the salt pan remnants was observed within this test excavation.

Figure 138. Photograph of the northeast end of the TE 26 northwest sidewall, view to west

Figure 139. Photograph of the northeast end of the TE 26 northwest sidewall, view to north

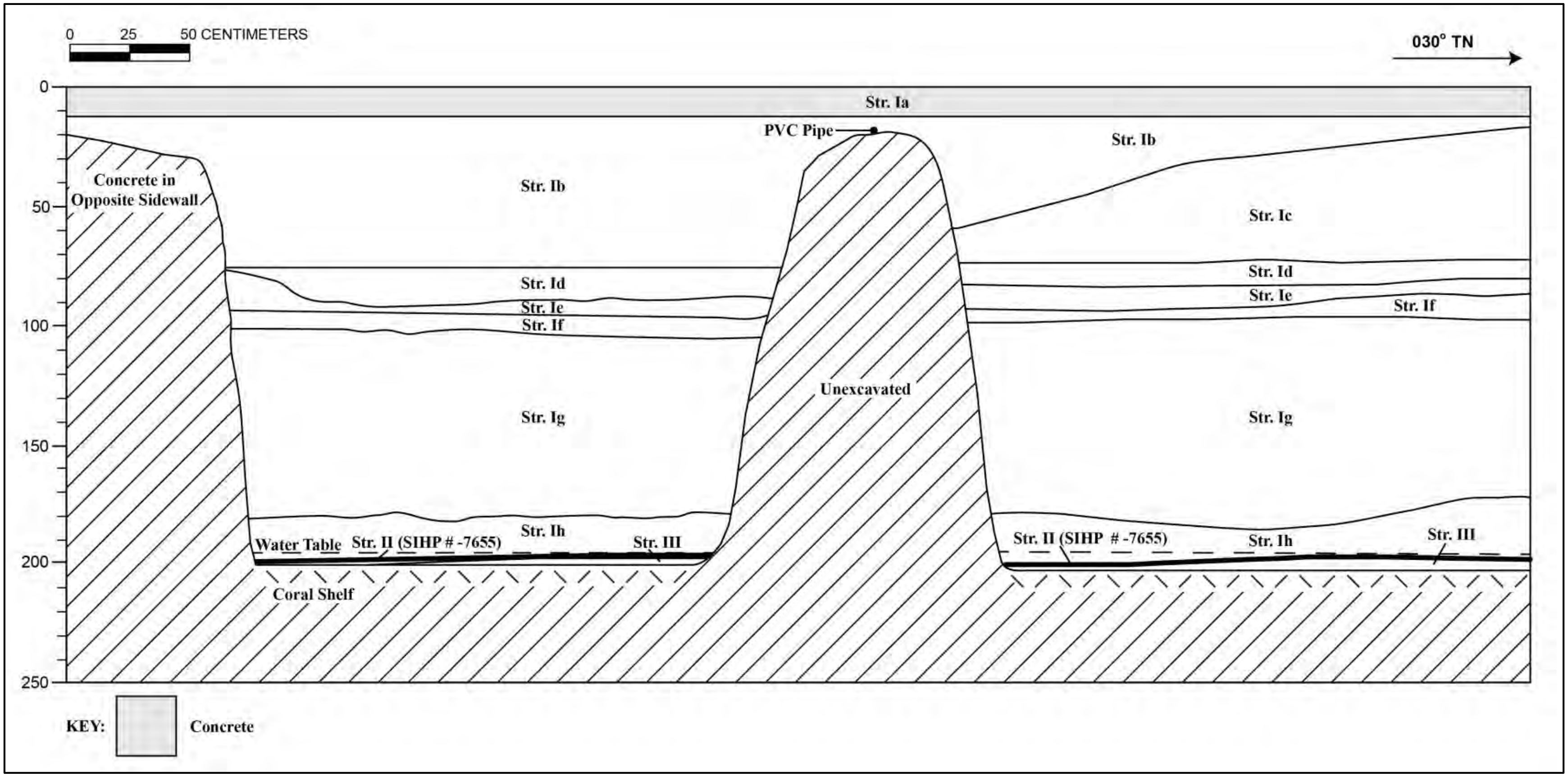

Figure 140. Profile of TE 26, northwest sidewall

Table 28. Strata Observed within Test Excavation 26

Stratum	Depth (cmbs)	Description
Ia	0–12	Concrete surface
Ib	12–76	Fill; 10YR 2/2, very dark brown; gravelly sandy clay loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; few, fine roots; imported fill
Ic	16–73	Fill; 10YR 3/2, very dark grayish brown; gravelly loamy sand; weak, medium, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, broken/discontinuous lower boundary; few, medium roots; imported fill
Id	73–92	Fill; 10YR 4/2, dark grayish brown; gravelly sandy loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, wavy lower boundary; imported fill
Ie	76–98	Fill; 10YR 7/1, light gray; silty clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; clear, smooth lower boundary; hydraulic (dredge) fill associated with land reclamation events
If	87–105	Fill; 10YR 3/3, dark brown; gravelly loamy sand; weak, fine to medium, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; imported fill with a thin upper boundary of imported cinder
Ig	97–185	Fill; 10YR 7/3, very pale brown; medium sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; imported crushed coral fill
Ih	173–200	Fill; 5GY 7/1, light greenish gray; fine sandy loam; moderate, very fine, blocky structure; wet, non-sticky consistency; slightly plastic; marine origin; clear, smooth lower boundary; hydraulic (dredge) fill associated with land reclamation events
II	195–201 (BOE)	SIHP # -7655; organic laminations associated with salt pan remnants
III	197–201 (BOE)	Natural; 10GY 4/1, dark greenish gray; silty clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin, lower boundary not visible; wetland sediment

4.2.28 Test Excavation 27 (TE 27)

Test Excavation 27 (TE 27), an interior excavation located within the west half of the *makai* Ward Warehouse building, was oriented in a northeast-southwest direction, and measured 6.02 m long by 0.61 m wide. The base of excavation was determined by the presence of the hard coral shelf at 2.11 mbs. The stratigraphy of TE 27 consisted of the concrete surface (Stratum Ia), associated cinder fill (Stratum Ib), and various fill layers consisting of gravelly sand (Stratum Ic), gravelly sandy loam (Stratum Id), and crushed coral fill (Stratum Ie) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II), and sandy clay wetland sediments (Stratum III) (Figure 142, Figure 143, and Table 29).

TE 27 documented the presence of salt pan remnants (SIHP # -7655), consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum II). The berm extended across the length of the test excavation, with a roughly level upper boundary. Although Stratum II remained level, it was consistent with the anthropogenic altered materials from which the man-made berms were constructed.

Figure 141. Photograph of the TE 26 northwest sidewall, view to southwest

Figure 142. Close-up of man-made berm (SIHP # -7655) (Stratum II) within the northwest sidewall

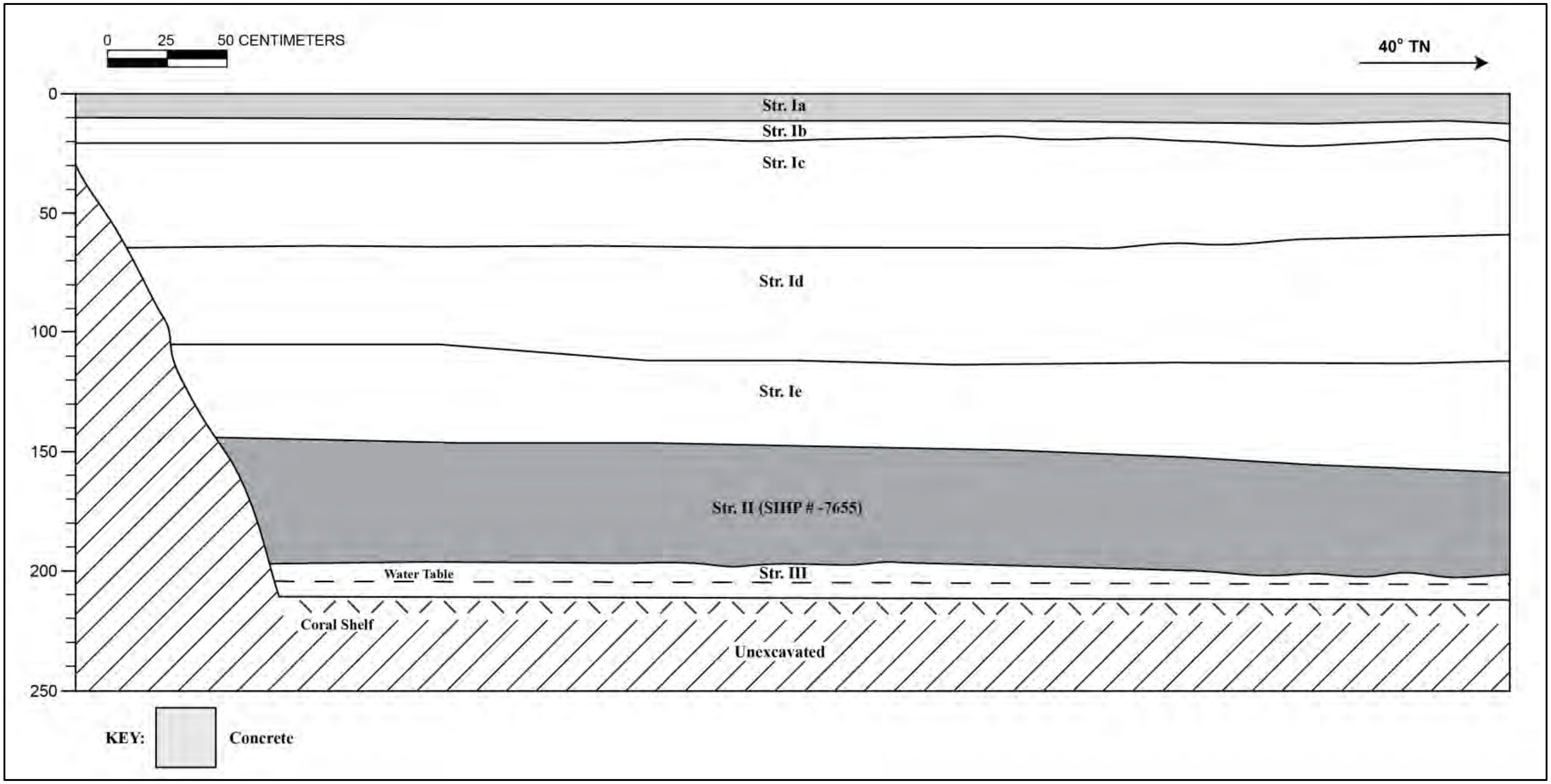

Figure 143. Profile of TE 27, northwest sidewall

Table 29. Strata Observed within Test Excavation 27

Stratum	Depth (cmbs)	Description
Ia	0–11	Concrete surface
Ib	11–20	Fill; 10YR 2/1, black; medium sand; structureless (single-grain); dry, loose consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; imported cinder associated with concrete surface
Ic	16–65	Fill; 10YR 4/4, dark yellowish brown; gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, abrupt lower boundary; imported crushed coral fill
Id	109–112	Fill: 7.5YR 2.5/2, very dark brown; extremely gravelly sandy loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; contained debris including wood, glass, and metal fragments; mixed imported fill consisting of sand, clay, and gravel
Ie	105–158	Fill; 10YR 8/3, very pale brown; extremely gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; crushed coral fill associated with land reclamation events
II	95–201	SIHP # -7655; 10YR 7/2, light gray; sandy clay; structureless (massive); moist, firm consistency; slightly plastic; marine origin; clear, smooth lower boundary; berm associated with salt pan remnants
III	198–211	Natural; 2.5Y 6/1, gray; sandy clay; structureless (massive); moist, firm consistency; plastic; marine origin; abrupt, smooth lower boundary; natural wetland sediments

4.2.29 Test Excavation 28 (TE 28)

Test Excavation 28 (TE 28), an interior excavation located within the east half of the *makai* Ward Warehouse building, was oriented in a northeast-southwest direction, and measured 6.1 m long by 0.63 m. The base of excavation was determined by the presence of the hard coral shelf at 2.15 mbs. The stratigraphy of TE 28 consisted of the concrete surface (Stratum Ia), associated cinder fill (Stratum Ib), and various fill layers consisting of gravelly sand (Stratum Ic), gravelly loamy sand (Stratum Id), clay (Stratum Ie), gravelly sandy loam (Stratum If), a layer of compacted cinder (SIHP # -7658) (Stratum Ig), associated basalt gravel base course (Stratum Ih), associated gravelly sand (Stratum Ii), crushed coral fill (Stratum Ij), and hydraulic fill (Stratum Ik) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) and silty clay wetland sediments (Stratum III) (Figure 144 through Figure 147, and Table 30).

A thin highly compacted cinder layer was determined to be a component of SIHP # -7658 (Stratum Ig). The cinder layer was observed 87 cmbs with an average thickness of 3 cm in TE 28. This historic property (SIHP # -7658) overlies associated basalt base course, and crushed coral fill and hydraulic dredge fill associated with land reclamation in this area from 1919-1926. Based on historic maps and aerial photos, the highly compacted cinder surface likely dates from 1927 to 1976.

TE 28 documented the presence of salt pan remnants (SIHP # -7655), consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum II). Two berm features were observed within TE 28, each sloping steeply towards the center of the test excavation, which appears to be a transition to the corner of a salt pan bed (see Figure 146). The wetland sediments within the salt pan bed contained evidence of organic material; however, the partially decomposed, laminated organic material representing the salt pan bed was not observed.

Figure 144. Photograph of the TE 28 northwest sidewall, view to west

Figure 145. Photograph of the northeast end of the TE 28 northwest sidewall, showing the edge of the *mauka* berm feature, view to northwest

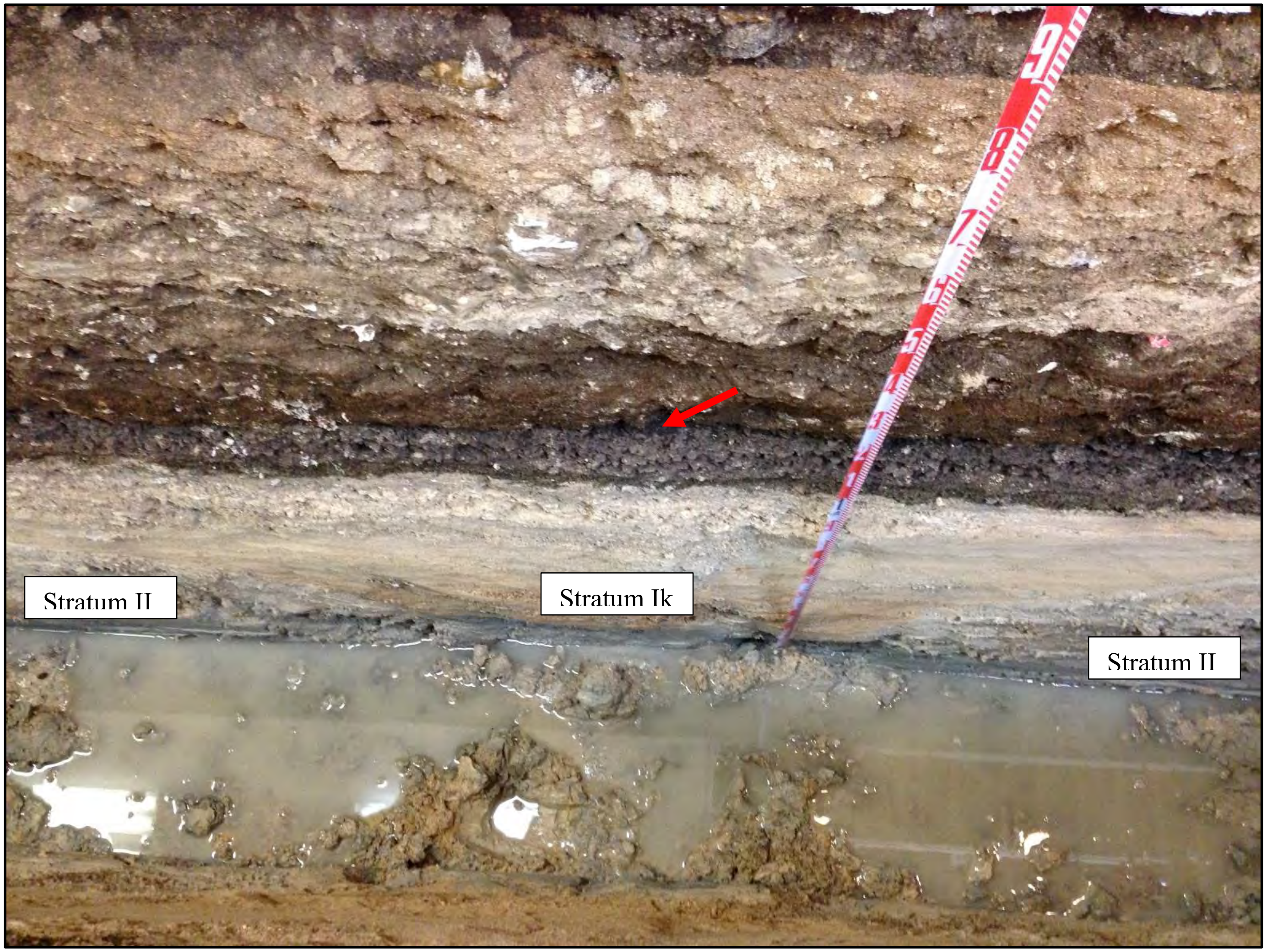

Figure 146. Photograph of the TE 28 northwest sidewall, showing steel slope of the two man-made berm features (SIHP # -7655) (Stratum II), transitioning to the wetland sediments, view to northwest; also note location of the buried historic surface (SIHP # -7658) consisting of a thin layer of compacted cinder (red arrow)

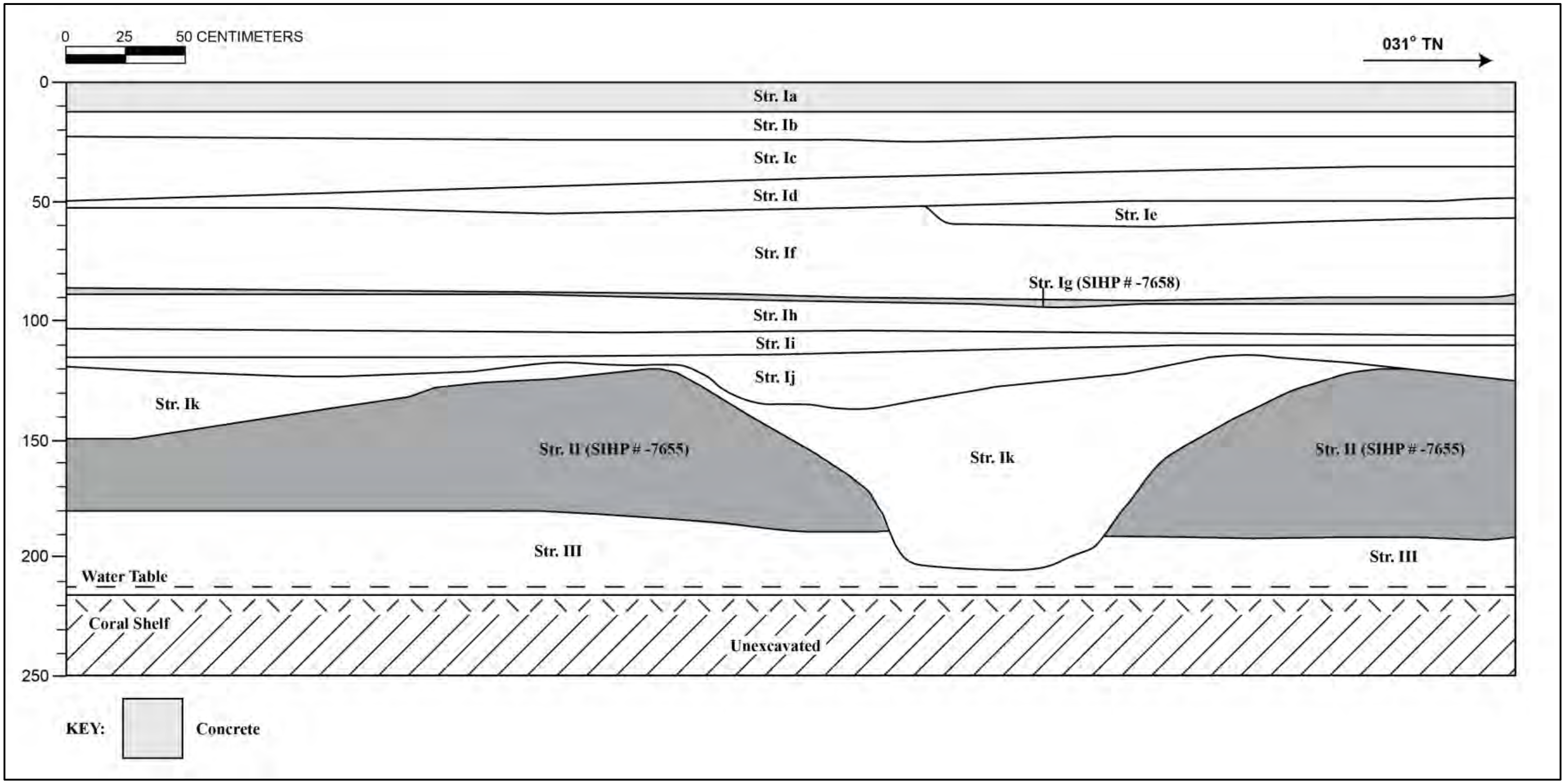

Figure 147. Profile of TE 28, northwest sidewall

Table 30. Strata Observed within Test Excavation 28

Stratum	Depth (cmbs)	Description
Ia	0–12	Concrete surface
Ib	12–25	Fill; 10YR 2/1, black; medium sand; structureless (single-grain); dry, loose consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; imported cinder associated with concrete surface
Ic	23–50	Fill; 10YR 4/3, brown; gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; imported crushed coral fill
Id	35–54	Fill; 10YR 2/2, very dark brown; very gravelly loamy sand; weak, fine, crumb structure; moist, friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; imported fill
Ie	49–60	Fill; 10YR 6/1, light brownish gray; clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; clear, broken/discontinuous lower boundary; imported clay fill
If	54–86	Fill; 10YR 2/2, very dark brown; gravelly sandy loam; weak, medium, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; imported fill
Ig	86–92	SIHP # -7658; 10YR 2/1, black; coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; highly compacted cinder; former surface
Ih	89–105	Fill; 10YR 2/2, very dark brown; extremely gravelly coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; imported basalt gravel, base course associated with former land surface
Ii	104–115	Fill; 10YR 3/1, very dark gray; very gravelly coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; imported gravel fill associated with former land surface
Ij	110–136	Fill; 10YR 7/3, very pale brown; extremely gravelly coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, wavy lower boundary; crushed coral fill associated with land reclamation events
Ik	113–191	Fill; 10YR 6/2, light brownish gray; sandy loam; weak, fine, crumb structure; moist, friable consistency; non-plastic; marine origin; clear, wavy lower boundary; hydraulic (dredge) fill associated with land reclamation events

Stratum	Depth (cmbs)	Description
II	120–191	SIHP # -7655; 10YR 6/1, gray; sandy clay; moderate, fine, blocky structure; moist, firm consistency; slightly plastic; mixed origin; clear, broken/discontinuous lower boundary; contains naturally deposited *Nerita* sp. shells; berm associated with the salt pan remnants
III	180–215 (BOE)	Natural; 10GY 5/1, greenish gray; silty clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, broken/discontinuous lower boundary; wetland sediments

4.2.30 Test Excavation 29 (TE 29)

Test Excavation 29 (TE 29), an exterior excavation located along the southeastern edge of the project area, was oriented in a northwest-southeast direction and measured 6.06 m long by 0.61 m wide. The base of excavation was determined by the presence of the hard coral shelf at 2.14 mbs. The stratigraphy of TE 29 consisted of the concrete surface (Stratum Ia), associated cinder fill (Stratum Ib), and various fill layers consisting of gravelly sandy loam (Stratum Ic) and hydraulic fill (Stratum Id) overlying laminated organic material (SIHP # -7655) (Stratum II) and sandy clay wetland sediments (Stratum III) (Figure 148 through Figure 151, and Table 31). A concrete footing associated with the existing structure was encountered within imported cinder fill in the center of the northwest sidewall.

TE 29 documented the presence of historic salt pan remnants, SIHP # -7655, consisting of a thin layer of laminated organic material (Stratum II) (see Figure 150). No evidence of the man-made berms associated with the salt pan remnants was encountered. The natural wetland sediments and laminated organic materials were present at only 10–15 cm above the coral shelf.

Figure 148. Photograph of northwest end of TE 29 southwest sidewall, concrete footing visible to the left, view to south

Figure 149. Photograph of southeast end of TE 29 southwest sidewall, view to south

Figure 150. Close-up of thin layer of laminated organic material (SIHP # -7655) (Stratum II)

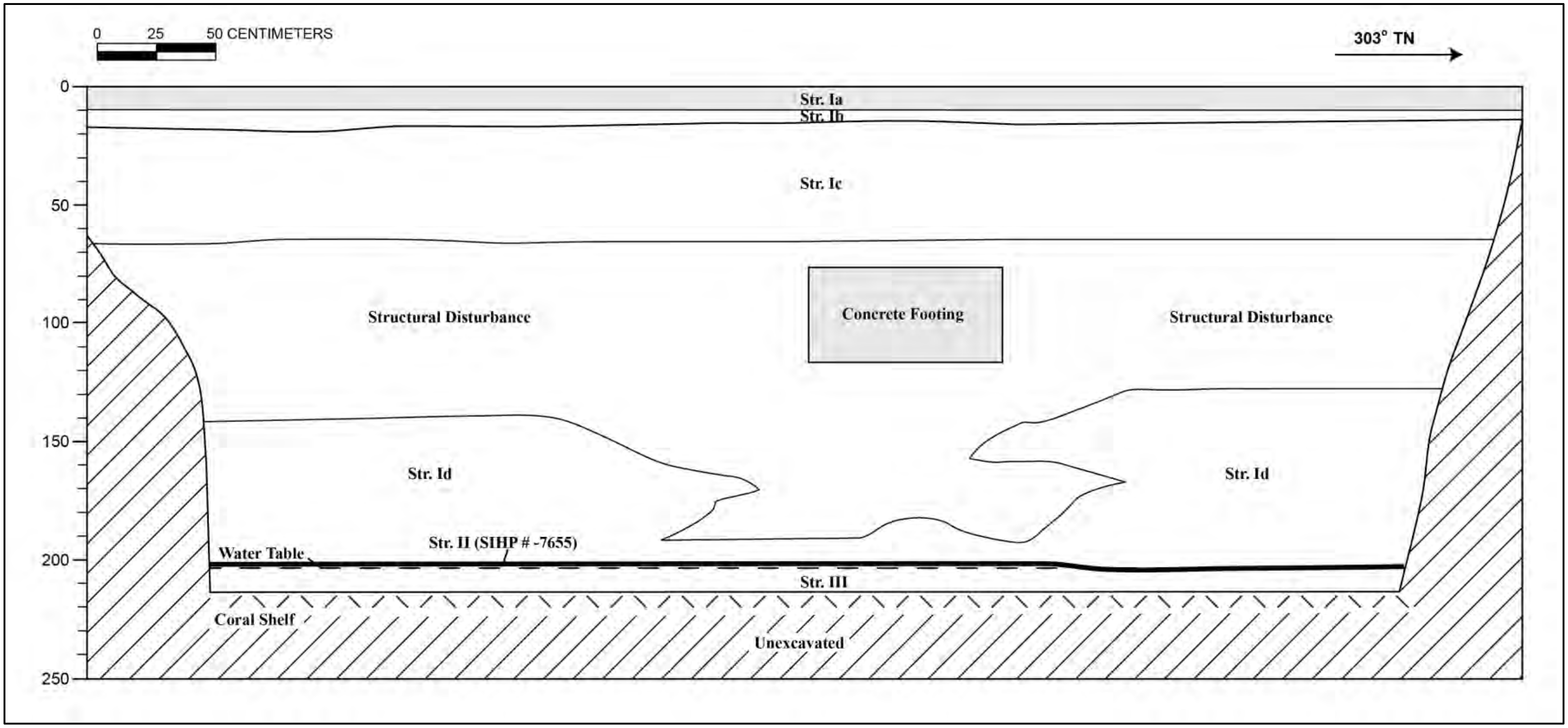

Figure 151. Profile of TE 29, southwest sidewall

Table 31. Strata Observed within Test Excavation 29

Stratum	Depth (cmbs)	Description
Ia	0–10	Concrete surface
Ib	10–17	Fill; 10YR 2/1, black; medium sand; structureless (single-grain); dry, loose consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; imported cinder associated with concrete surface
Ic	14–60	Fill; 10YR 4/2, dark grayish brown; gravelly sandy loam; weak, fine crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; imported crushed coral fill
Id	126–191	Fill; 10YR 8/3, very pale brown grading to 10BG 6/1, greenish gray; very fine sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; hydraulic (dredge) fill associated with land reclamation events, grading from fine sand to clay
Structural disturbance	65–193	Fill; 10YR 3/2, very dark grayish brown; structureless (single-grain); moist, loose consistency; non-plastic; mixed origin; clear, irregular lower boundary; imported cinder fill mixed with coral gravel, associated with a footing for existing building foundation
II	201–206	SIHP # -7655; organic laminations associated with salt pan remnants
III	205–214	Natural; 5Y 5/1, gray; sandy clay; structureless (massive); wet, sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; wetland sediments

4.2.31 Test Excavation 30 (TE 30)

Test Excavation 30 (TE 30), an exterior excavation located along the *makai* edge of the project area, was oriented in an east-west direction and measured 6.1 m long by 0.6 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.37 mbs. The stratigraphy of TE 30 consisted of the current grassy land surface and associated landscaping fill (Stratum Ia), crushed coral fill (Stratum Ib), and a tar-based buried land surface (SIHP # -7658) (Stratum Ic) overlying disturbed and reworked sand (Stratum II) and natural marine sandy clay (Stratum III) (Figure 152 through Figure 155, and Table 32). An irrigation line associated with the landscaping was observed within the center of the test excavation.

A coral and tar pavement (Stratum Ic) was determined to a component of SIHP # -7658. The pavement is continuous throughout the length of TE 30 at a depth of 27 to 43 cmbs. This former land surface overlies a reworked sand layer, possibly associated with the former shoreline and sand dunes in the area. The coral and tar pavement was only observed along the southwest boundary of Block B East suggesting it may be associated with the old beach road; however, due to disturbance to the underlying sand, which was thought to be a result of land restructuring associated with land reclamation and the surrounding urban development, it may be associated with various roadways and parking areas following the 1919–1926 land reclamation.

The natural marine clay observed overlying the coral shelf (Stratum III) appears to represent an in situ remnant of the sandy clay from which the man-made berms associated with SIHP # -7655were constructed. The marine clay was consistent with the berm sediments, but does not show evidence of anthropogenic altering by salt pan activities.

Figure 152. Photograph of the TE 30 north sidewall, view to northeast

Figure 153. Photograph of trash observed within TE 30

Figure 154. Photograph of trash observed within TE 30

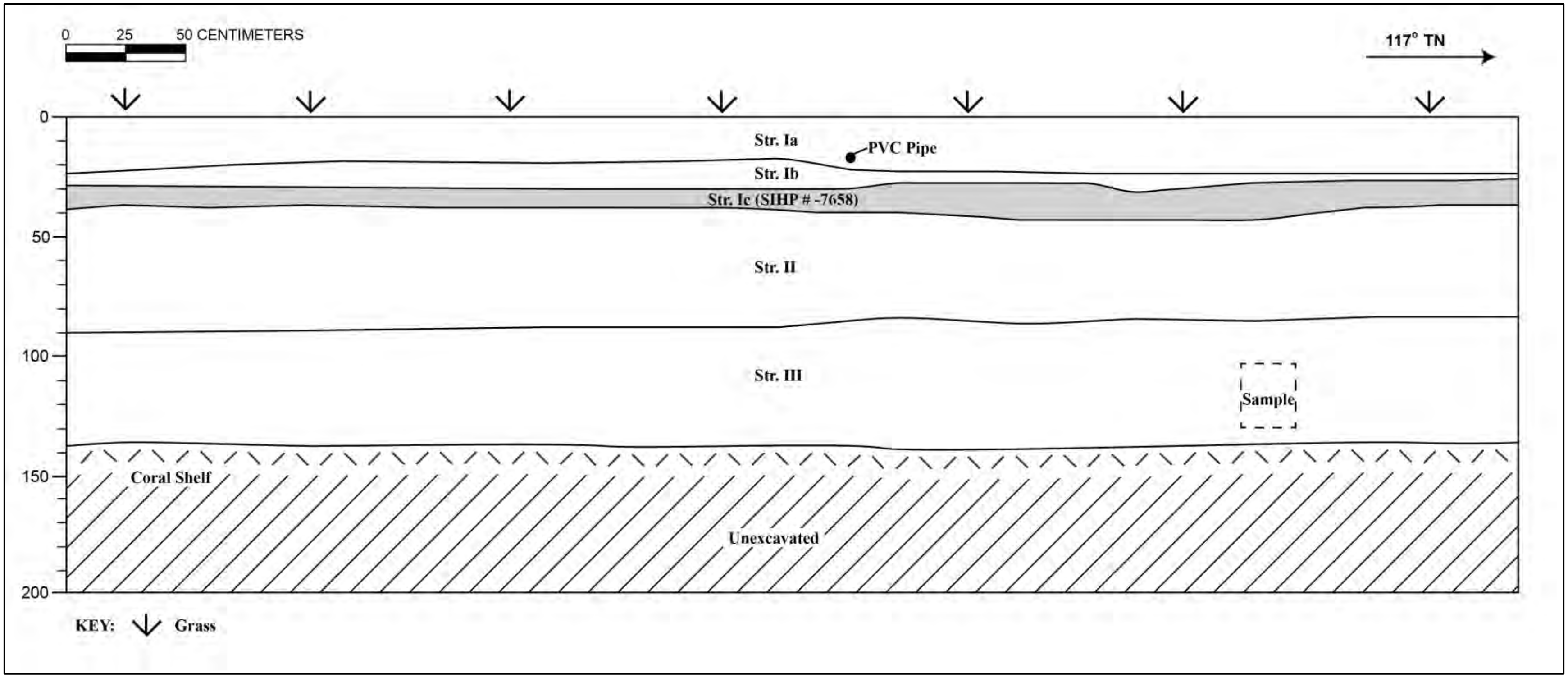

Figure 155. Profile of TE 30, north sidewall

Table 32. Strata Observed within Test Excavation 30

Stratum	Depth (cmbs)	Description
Ia	0–25	Fill; 10YR 3/3, dark brown; sandy clay loam; moderate, medium, crumb structure; moist, friable consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; many medium to coarse roots; contained irrigation line; landscape fill with grassy surface
Ib	17–31	Fill; 2.5YR 8/1, white; gravelly sandy loam; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; abrupt, smooth lower boundary; no roots observed; crushed coral fill
Ic	27–43	SIHP # -7658; 10YR 2/1, black with mottling of 10YR 3/3, dark brown; gravelly, sandy loam containing cemented tar; structureless (massive); moist, firm consistency; non-plastic; mixed origin; abrupt, smooth lower boundary; common, medium roots; contained a mix of tar, oil, and coral, creating an asphalt-like buried roadway
II	46–90	Disturbed natural; 2.5YR 6/3, light, yellowish brown; medium to coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; few, coarse roots; contained trash (i.e., glass, porcelain, and metal fragments); disturbed and reworked natural sand layer
III	83–137 (BOE)	Natural; 5Y 7/2, light gray; medium to coarse sandy clay; moderate, medium, blocky structure; wet, sticky consistency; slightly plastic; marine origin; abrupt, smooth lower boundary; common, fine roots; natural marine clay containing rootlets and shells

4.2.32 Test Excavation 31 (TE 31)

Test Excavation 31 (TE 31), an exterior excavation located along the *makai* edge of the project area, was oriented in an east-west direction, and measured 6.1 m long by 0.6 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.37 mbs. The stratigraphy of TE 31 consisted of the current grassy land surface and associated landscaping fill (Stratum Ia) and gravelly sandy loam (Stratum Ib) overlying a buried land surface, likely associated with the old coastal road (SIHP # -7658) (Stratum Ic), overlying disturbed and reworked sand (Stratum II), natural marine coarse sandy clay (Stratum III), and fine sandy clay wetland sediment (Stratum IV) (Figure 156, Figure 160, and Table 33). An existing utility was observed in the eastern end of the test excavation.

A coral and tar pavement (SIHP # -7658) (Stratum Ic) was observed in the central portion of TE 31. The pavement is discontinuous most likely due to utility installation. This former land surface was observed at a depth of 35 to 40 cmbs with an average thickness of 5 cm and overlies a reworked sand layer, possibly associated with the former shoreline and sand dunes in the area. The coral and tar pavement was only observed along the southwest boundary of Block B East suggesting it may be associated with the old beach road; however, due to disturbance to the underlying sand, which was thought to be a result of land restructuring associated with land reclamation and the surrounding urban development, it may be associated with various roadways and parking areas following the 1919–1926 land reclamation.

Two layers of undisturbed natural sediments were observed underlying the disturbed sand (Strata III and IV). Stratum III appears to represent an in situ remnant of the sandy clay utilized to construct the man-made berms associated with SIHP # -7655. These sediments were consistent with the berm sediments, but do not show evidence of anthropogenic altering by salt pan activities. Stratum IV, observed directly overlying the coral shelf, was consistent with the wetland sediments observed throughout the project area.

An isolated human cranial fragment, SIHP # -7656, was encountered within the reworked sand layer (Stratum II) near the western end of the test excavation at 0.72 mbs. No associated pit feature was observed; however, the sand was carefully inspected and hand troweled. Following the complete excavation of TE 31, a clean sand pedestal was constructed at 0.8 mbs and lined with tī leaves. The fragment was wrapped in muslin, secured in a *lauhala* basket, and placed on the pedestal by the on-site cultural monitor. Clean sand was then deposited over the basket, followed by a wooden board, and covered again with clean sand. The remaining portions of TE 31 were backfilled to the current ground surface level.

Figure 156. Photograph of the TE 31 north sidewall, view to east

Figure 157. Photograph of west end of TE 31, showing interim protection location of the SIHP # -7656 isolated skeletal fragment, view to south

Figure 158. Photograph of trash observed within TE 31, Strata Ic and II

Figure 159. Photograph of trash observed within TE 31, Strata Ic and II

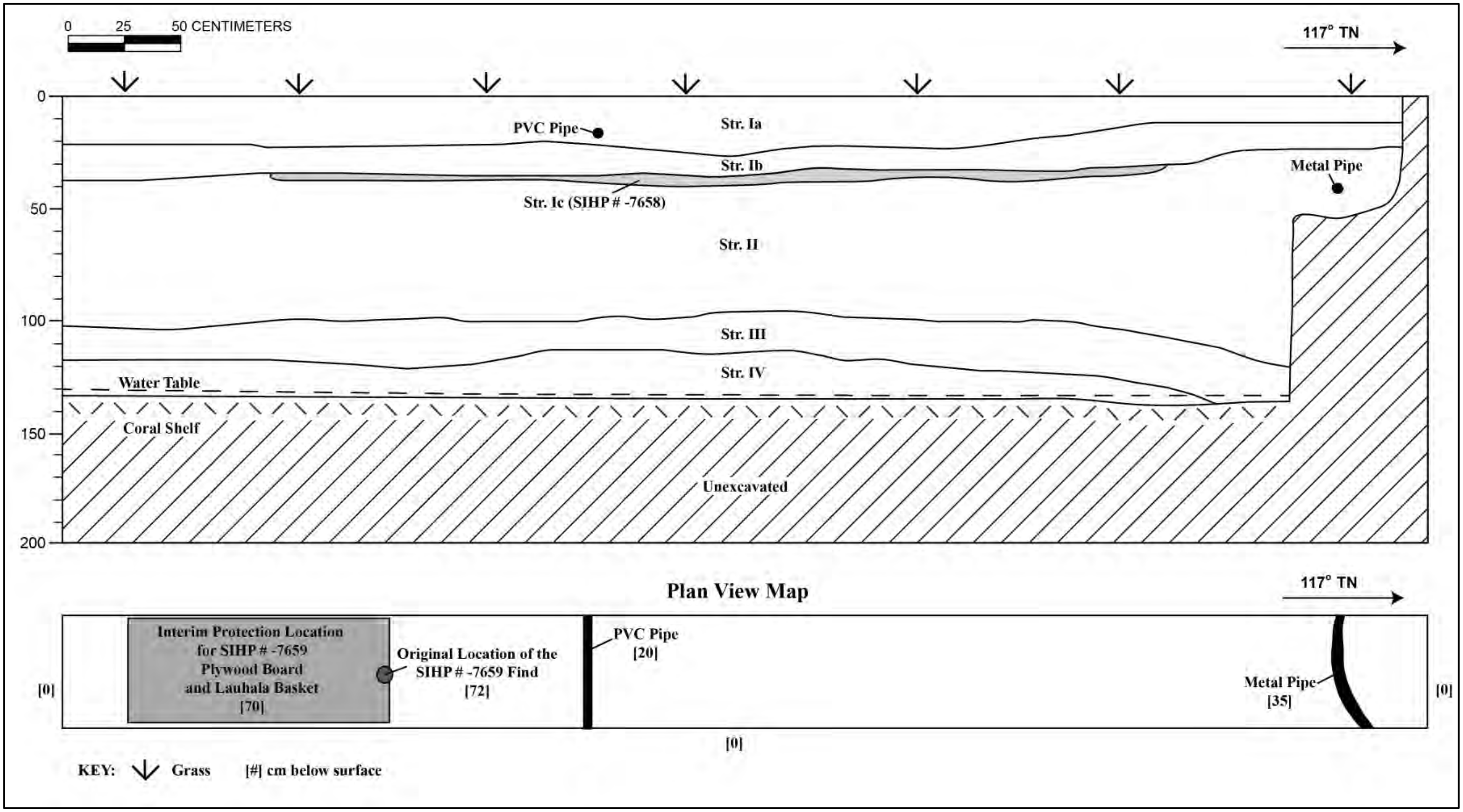

Figure 160. Profile of TE 31, north sidewall

Table 33. Strata Observed within Test Excavation 31

Stratum	Depth (cmbs)	Description
Ia	0–28	Fill; 10YR 3/3, dark brown; sandy clay loam; moderate, medium, crumb structure; moist, friable consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; many medium to coarse roots; contained irrigation line; landscape fill with grassy surface
Ib	12–40	Fill; 2.5YR 6/1, gray; gravelly sandy loam; structureless (single-grain); moist, loose consistency; non-plastic; mixed origin; abrupt, smooth lower boundary; common, fine to medium roots; imported fill
Ic	35–40	SIHP # -7658; 10YR 2/2, very dark brown; gravelly sand; structureless (massive); moist, firm consistency; non-plastic; mixed origin; abrupt, wavy lower boundary; darkened and slightly compacted buried roadway containing historic trash
II	23–120	Disturbed natural; 2.5YR 6/3, light yellowish brown; moist, very gravelly medium to coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; few, medium roots; contained trash including porcelain, glass, and metal fragments; a disturbed and reworked natural sand layer containing hydraulic (dredge) inclusions; human cranium fragment observed (SIHP # -7656) near the east end of test excavation
III	95–135	Natural; 5Y 7/2, light gray; wet, medium to coarse sandy clay; moderate, medium, blocky structure; wet, sticky consistency; slightly plastic; marine origin; clear, smooth lower boundary; common, fine roots; natural marine clay containing rootlets and naturally occurring marine shell
IV	112–137 (BOE)	Natural; 10Y 7/1, light greenish gray; fine sandy clay; structureless (massive); wet, slightly-sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; common, fine to medium roots; wetland sediment containing roots and shell

4.2.33 Test Excavation 32 (TE 32)

Test Excavation 32 (TE 32), an exterior excavation located along the southern boundary of the project area, was oriented in an east-west direction, and measured 6.1 m long by 0.5 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.45 mbs. The stratigraphy of TE 32 consisted of the current grassy land surface and associated landscaping fill (Stratum Ia) and various fill layers consisting of a historic trash fill layer (SIHP # -7660) (Stratum Ib), very gravelly sandy loam (Stratum Ic), and gravelly sandy loam (Stratum Id) overlying a buried land surface, likely associated with the old coastal road (SIHP # -7658) (Stratum Ie), and two layers of disturbed and reworked sand (Strata IIa and IIb), natural marine coarse sandy clay (Stratum III), and fine sandy clay wetland sediment (Stratum IV) (Figure 161 through Figure 167, and Table 34).

A concrete structural feature, possibly consisting of an abandoned storm drain box, was encountered in the eastern half of TE 32 (see Figure 162). The box was filled with extremely gravelly silty loam fill (Stratum Ib) containing a large quantity of historic trash, designated SIHP # -7660 (see Figure 163). The trash primarily consisted of materials related to the boat harbor including a boat cleat and engine parts, as well as bottle, ceramic, and metal fragments (Acc. #s 10–24) (see Figure 164 and Figure 165). The full artifact analysis can be found in the Laboratory Analysis section (Section 5). The water table was very high within the concrete structure, likely due to water trapped in the box when it was sealed off and filled in. The water table was not observed within the remainder of the trench.

A coral and tar pavement (Stratum IIc), determined to a component of SIHP # -7658, was observed in the northwest end of the test excavation. This historic former land surface (SIHP # -7658) is relatively flat in the west portion of the test excavation and was possibly removed in the central portion for installation of the possible storm drain box associated with SIHP # -7660. The pavement was observed at a depth of 35 to 40 cmbs and overlies a reworked sand layer, possibly associated with the former shoreline and sand dunes in the area. The coral and tar pavement was only observed along the southwest boundary of Block B East suggesting it may be associated with the old beach road; however, due to disturbance to the underlying sand, which was thought to be a result of land restructuring associated with land reclamation and the surrounding urban development, it may be associated with various roadways and parking areas following the 1919–1926 land reclamation.

TE 32 documented the presence of two reworked sand layers (Strata IIa and IIb). These layers of reworked sediment likely represent local materials, disturbed and leveled due to the surrounding urban development. A darkened and slightly compacted lens containing historic trash (Acc. # 9) (see Figure 166) was observed on the upper boundary of Stratum IIa, suggesting a former living surface likely related to the old coastal road (SIHP # -7658) (Stratum Ie). Two layers of undisturbed natural sediments were observed underlying the disturbed sand (Strata III and IV). Stratum III appears to represent an in situ remnant of the sandy clay utilized to construct the man-made berms associated with SIHP # -7655. These sediments were consistent with the berm sediments, but do not show evidence of anthropogenic altering by salt pan activities. Stratum IV, observed directly overlying the coral shelf, was consistent with the wetland sediments observed throughout the project area.

Figure 161. Photograph of the west end of the TE 32 north sidewall, view to east

Figure 162. Photograph of the east end of the TE 32 north sidewall, view to east

Figure 163. Close-up of historic trash fill (SIHP # -7660) (Stratum Ib) within concrete drain box

Figure 164. Photograph of trash observed within TE 32, Stratum Ib

Figure 165. Photograph of trash observed within TE 32, Stratum Ib

Figure 166. Photograph of trash observed within TE 32, Stratum Id

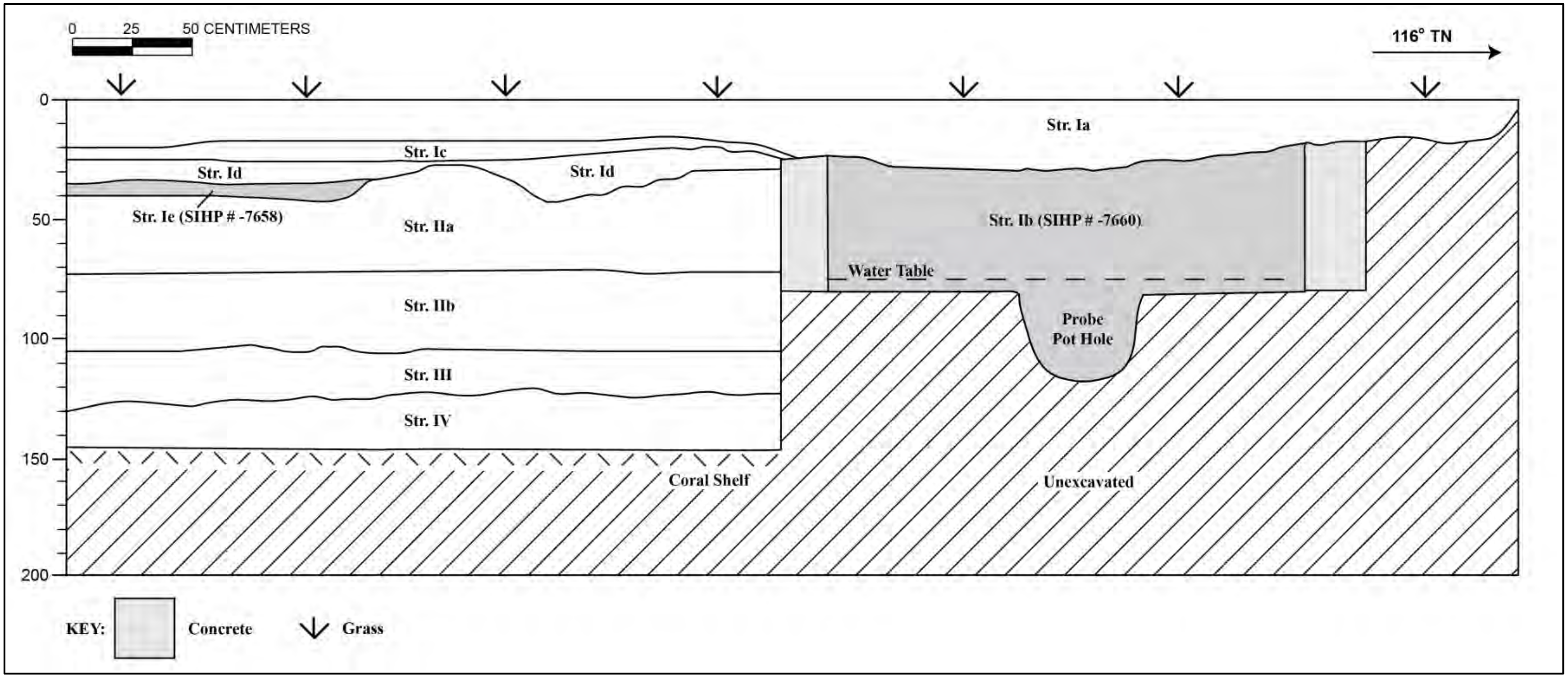

Figure 167. Profile of TE 32, north sidewall

Table 34. Strata Observed within Test Excavation 32

Stratum	Depth (cmbs)	Description
Ia	0–30	Fill; 10YR 3/3, dark brown; sandy clay loam; moderate, medium, crumb structure; moist, friable consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; many medium to coarse roots; landscape fill with grassy surface
Ib	18–115	SIHP # -7660; 10YR 2/1, black; extremely gravelly silty loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, irregular lower boundary; no roots observed; contained modern and historic trash (i.e., oxidized metal, glass, porcelain, ceramic, wood, boat tie, rebar, wire); imported fill sediment utilized to fill in former drain box
Ic	15–25	Fill; 5YR 2.5/2, dark reddish brown; very gravelly sandy loam; weak, medium, crumb structure; moist, friable consistency; slightly plastic; terrigenous origin; clear, broken/discontinuous lower boundary; common, fine to medium roots; imported fill containing modern trash
Id	20–43	Fill; 7.5YR 3/2, dark brown; gravelly sandy loam; weak, fine, crumb structure; moist, friable consistency; slightly plastic; mixed origin; clear, broken/discontinuous lower boundary; common, fine to medium roots; imported fill containing historic trash and oxidized metal
Ie	35-40	SIHP # -7658; 10YR 4/3, brown; gravelly sand; structureless (massive); moist, firm consistency; non-plastic; mixed origin; abrupt, wavy lower boundary; darkened and slightly compacted buried roadway containing historic trash
IIa	27–72	Disturbed natural; 10YR 4/4, dark yellowish brown; loamy sand; weak, fine, granular structure; moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; common, fine to medium roots; disturbed and reworked natural sand layer
IIb	72–105	Disturbed natural; 2.5Y 6/2, light brownish gray; loamy sand; structureless (single-grain); moist, loose consistency; non-plastic; mixed origin; abrupt, smooth lower boundary; common, fine to medium roots; disturbed and reworked natural sand layer
III	105–130	Natural; 5Y 7/2, light gray; medium to coarse sandy clay; moderate, medium, blocky structure; wet, sticky consistency; slightly plastic; marine origin; clear, smooth lower boundary; few, fine roots; natural marine clay
IV	122–145 (BOE)	Natural; 10Y 7/1, light greenish gray; fine sandy clay; structureless (massive); wet, slightly sticky consistency; plastic; abrupt, smooth lower boundary; no roots observed; wetland sediment

4.2.34 Test Excavation 33 (TE 33)

Test Excavation 33 (TE 33), an exterior excavation located along the southern boundary of the project area, was oriented in a northwest-southeast direction, and measured 6.1 m long by 0.5 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.35 mbs. The stratigraphy of TE 32 consisted of the current grassy land surface and associated landscaping fill (Stratum Ia) and loamy sand (Stratum Ib) overlying natural marine sandy clay (Stratum II), and sandy clay wetland sediment (Stratum III) (Figure 168, Figure 169, and Table 35). A concrete utility jacket was observed near the southeastern end of the test excavation.

TE 33 documented two layers of undisturbed natural sediments (Strata II and III). Stratum II appeared to represent an in situ remnant of the sandy clay utilized to construct the man-made berms associated with SIHP # -7655. These sediments were consistent with the berm sediments, but do not show evidence of anthropogenic altering by salt pan activities. Stratum III, observed directly overlying the coral shelf, was consistent with the wetland sediments observed throughout the project area.

Figure 168. Photograph of the TE 33 north sidewall, view to west

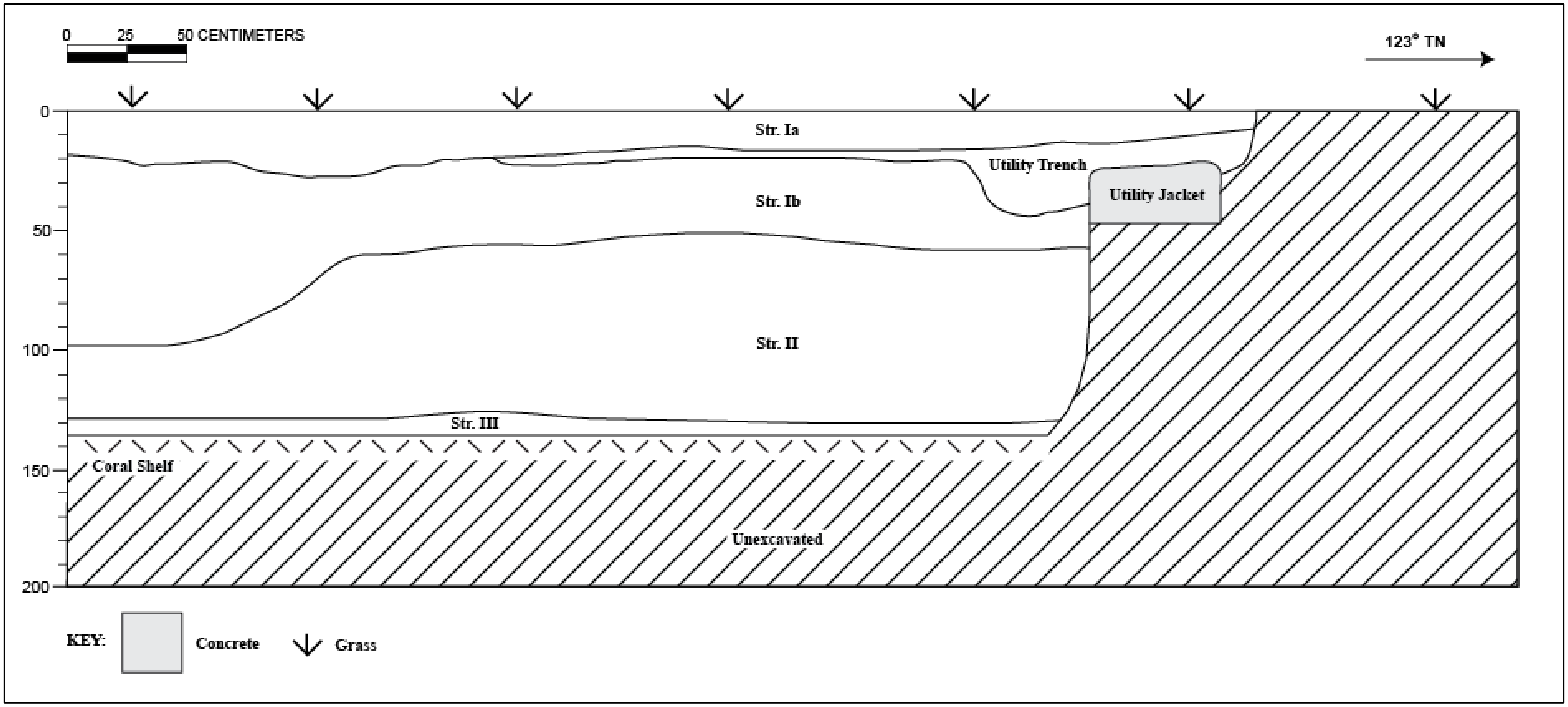

Figure 169. Profile of TE 33, north sidewall

Table 35. Strata Observed within Test Excavation 33

Stratum	Depth (cmbs)	Description
Ia	0–28	Fill; 10YR 3/3, dark brown; sandy clay loam; moderate, medium, crumb structure; moist, friable consistency; non-plastic; terrigenous origin; abrupt, smooth lower boundary; many medium to coarse roots; landscape fill with grassy surface
Ib	13–100	Fill; 2.5YR 5/3, light olive brown; loamy sand; weak, medium, crumb structure; moist, loose consistency; non-plastic; mixed origin; clear, wavy lower boundary; few, fine roots; contained modern debris including cane slag, metal, and glass fragments; disturbed crushed coral fill associated with land reclamation events
Utility Trench	12–45	Fill; 7.5YR 4/1, dark gray; extremely gravelly sandy loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; abrupt, broken/discontinuous lower boundary; common, no roots observed; crushed coral fill associated with utility jacket
II	49–130	Natural; 5Y 7/2, light gray; fine to medium sandy clay; structureless (massive); moist, firm consistency; plastic; marine origin; clear, smooth lower boundary; common, fine roots; modern trash observed in disturbed upper boundary (porcelain, glass, metal, abandoned utility pipe); previously disturbed natural marine clay
III	112–137 (BOE)	Natural; 10Y 7/1, light greenish gray; fine sandy clay; structureless (massive); wet, slightly-sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; common, fine to medium roots; wetland sediments containing rootlets

4.2.35 Test Excavation 34 (TE 34)

Test Excavation 34 (TE 34), an interior excavation located within the western corner of the project area, was oriented in a northwest-southeast direction, and measured 6.04 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 2.23 mbs. The stratigraphy of TE 34 consisted of the concrete surface (Stratum Ia), associated gravel fill (Stratum Ib), and various fill layers consisting of crushed coral fill (Stratum Ic), sandy clay (Stratum Id), and loamy sand (Stratum Ie) overlying disturbed and reworked sand (Stratum II), a sandy clay man-made berm (SIHP # -7655) (Stratum III), and sandy clay wetland sediments (Stratum IV) (Figure 170 through Figure 173, and Table 36). Excavations were limited within TE 34 due to a sewer clean-out in the center of the test excavation and a second sewer clean-out associated with an existing utility in the northwest end (see Figure 172).

TE 34 documented the presence of a reworked sand layer (Stratum II) and salt pan remnants (SIHP # -7655), consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum III). The berm is observed sloping down towards the southeast end of the test excavation. The reworked sand (Stratum II) likely represents local materials, disturbed and leveled due to the surrounding urban development following abandonment of the salt pans. Although the man-made berm is located beneath the reworked sand, the material was consistent with the anthropogenic altered marine clay from which the man-made berms were constructed.

Figure 170. Photograph of the TE 34 northeast sidewall, view to northeast

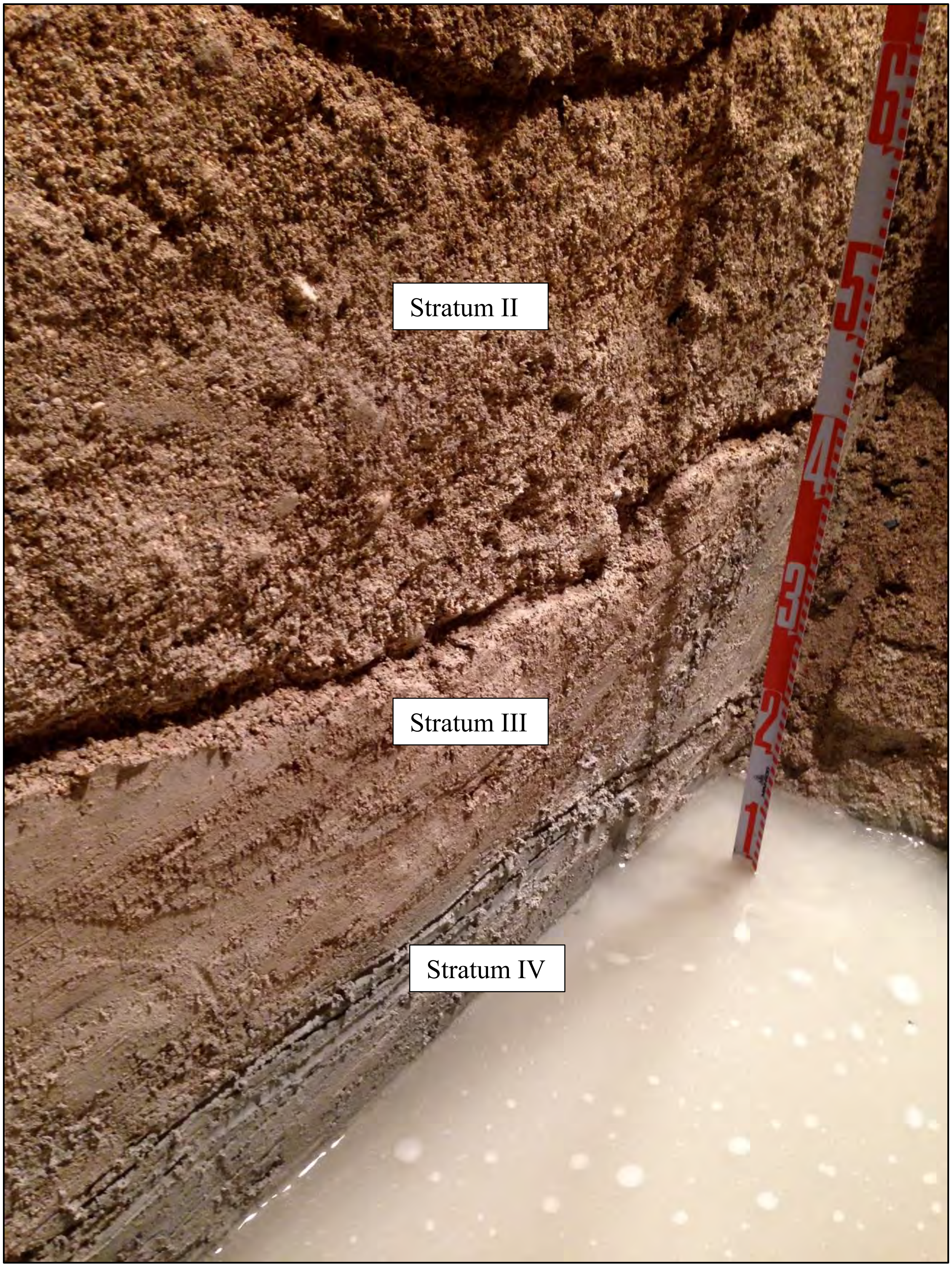

Figure 171. Close-up of reworked sand (Stratum II), man-made berm (SIHP # -7655) (Stratum III), and wetland sediments (Stratum IV) within the northeast sidewall, view to northeast

Figure 172. Overview of TE 34, showing location of the sewer clean-out and the sewer pipe, outlined in orange paint, view to south

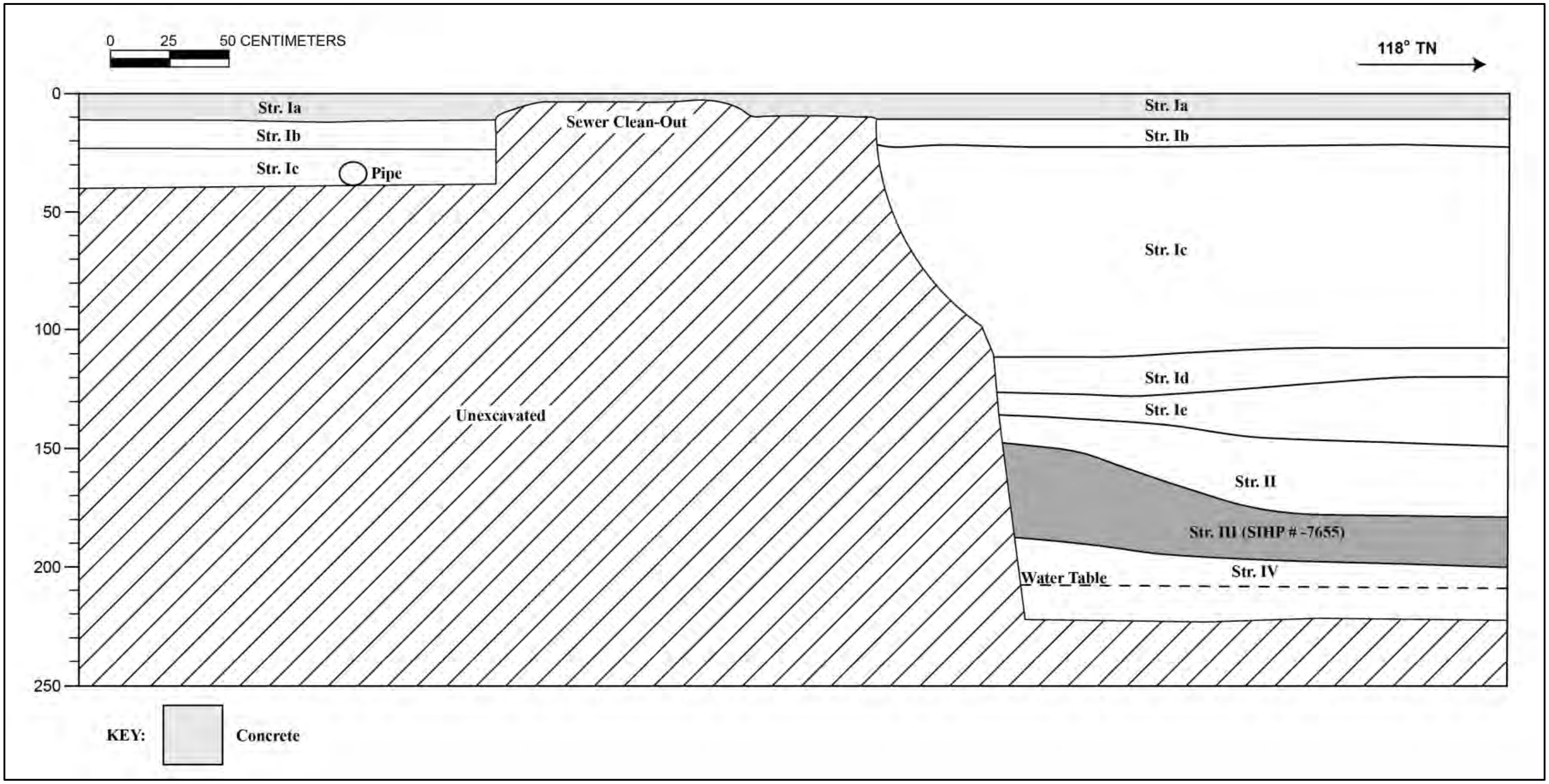

Figure 173. Profile of TE 34, northeast sidewall

Table 36. Strata Observed within Test Excavation 34

Stratum	Depth (cmbs)	Description
Ia	0–11	Concrete surface
Ib	11–23	Fill; 10YR 2/2, very dark brown; extremely gravelly loamy sand; weak, medium, crumb structure; moist, very friable consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; basalt gravel associated with concrete surface
Ic	23–111	Fill; 10YR 5/2, greyish brown; gravelly sandy loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; imported crushed coral fill
Id	107–127	Fill; 10YR 5/2; grayish brown; sandy clay; moderate, fine, blocky structure; moist, friable consistency; slightly plastic; mixed origin; clear, smooth lower boundary; imported fill
Ie	120–149	Fill; 10YR 4/2, dark grayish brown; medium loamy sand; structureless (single-grain); moist, loose consistency; non-plastic; mixed origin; clear, smooth lower boundary; imported fill
II	136–179	Disturbed natural; 10YR 7/2, light gray; medium sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, smooth lower boundary; disturbed and reworked natural sand layer
III	148–200	SIHP # -7655; 10YR 7/1, light gray; sandy clay; moderate, fine, blocky structure; wet, non-sticky consistency; slightly plastic; clear, smooth lower boundary; berm associated with salt pan remnants
IV	188–223 (BOE)	Natural; 5Y 6/1, sandy clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; wetland sediments

4.2.36 Test Excavation 35 (TE 35)

Test Excavation 35 (TE 35), an exterior excavation located along the northwestern edge of the project area, was oriented in a northwest-southeast direction, and measured 6.05 m long by 0.72 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.8 mbs. The stratigraphy of TE 35 consisted of the asphalt parking lot surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of gravelly sandy loam (Stratum Ic), crushed coral fill mixed with hydraulic fill (Stratum Id), hydraulic fill (Stratum Ie), and crushed coral fill (Stratum If) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II) (Figure 174, Figure 175, Figure 176, and Table 37). Three utilities were observed within TE 35, two abandoned utilities in the southeast end within disturbed fill (Stratum Id), and a third utility in the northwest end.

TE 35 documented the presence of salt pan remnants, designated SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum II). The full extent of the man-made berm was unable to be determined due to a previous disturbance in the northwestern half of TE 35. The wetland sediments (Stratum III) were not present beneath the man-made berm, likely removed during construction of the berm.

Figure 174. Photograph of the TE 35 southwest sidewall, view to southeast

Figure 175. Close-up of the man-made berm (SIHP # -7655) (Stratum II) within the TE 35 southwest sidewall, view to southwest

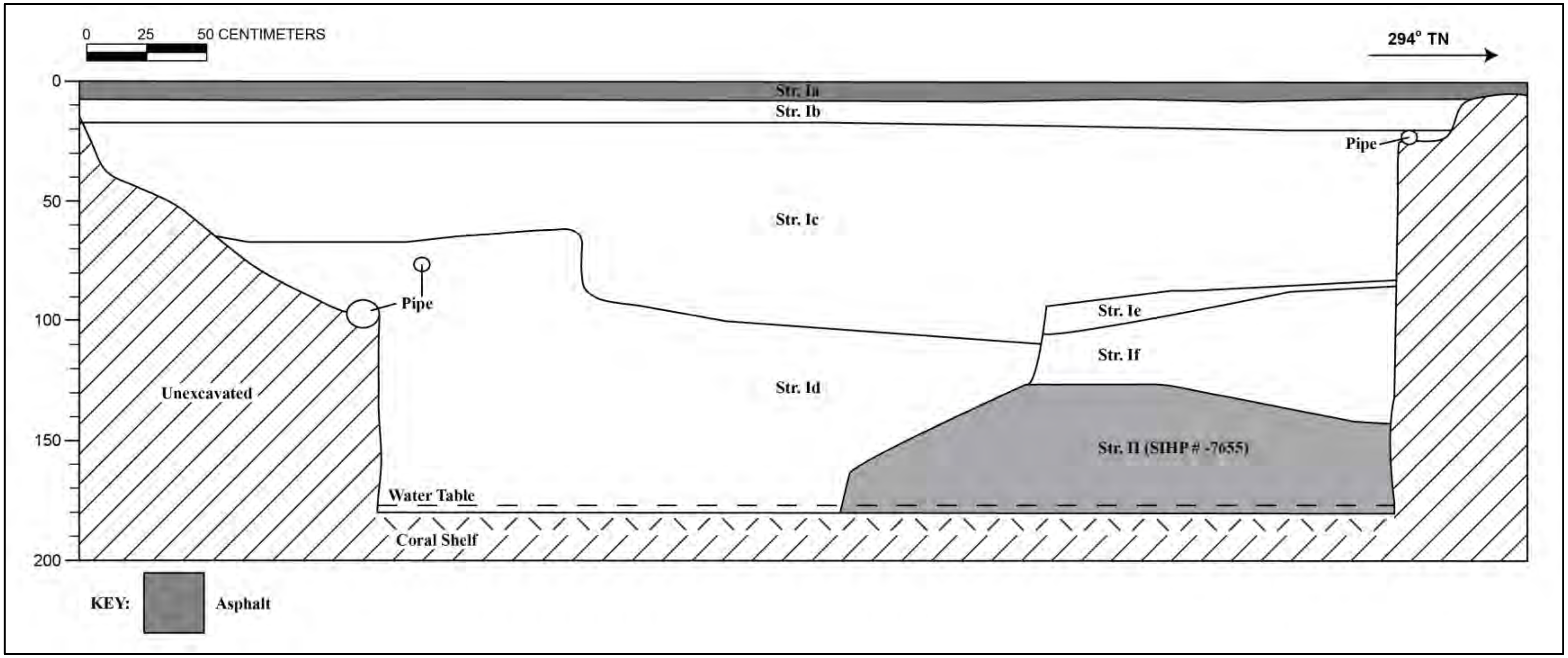

Figure 176. Profile of TE 35, southwest sidewall

Table 37. Strata Observed within Test Excavation 35

Stratum	Depth (cmbs)	Description
Ia	0–7	Asphalt surface
Ib	7–20	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	16–110	Fill; 10YR 4/3, brown; gravelly sandy loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, wavy lower boundary; imported fill
Id	61–180 (BOE)	Fill; 10YR 7/2, light gray; extremely gravelly sandy loam; weak, medium, blocky structure; moist, friable consistency; non-plastic; marine origin; clear, wavy lower boundary; disturbed crushed coral fill
Ie	82–104	Fill; 10YR 6/2, light brownish gray; silty clay; structureless (massive); wet, slightly-sticky consistency; plastic; marine origin; clear, broken/discontinuous lower boundary; hydraulic (dredge) fill associated with land reclamation events
If	85–142	Fill; 10YR 8/2, very pale brown; gravelly medium sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, broken/discontinuous lower boundary; crushed coral fill associated with land reclamation events
II	126–180 (BOE)	SIHP # -7655; 10YR 6/2, light brownish gray; sandy clay; structureless (massive); wet, sticky consistency; plastic; abrupt, smooth lower boundary; berm associated with salt pan remnants

4.2.37 Test Excavation 36 (TE 36)

Test Excavation 36 (TE 36), an exterior excavation located along the northwestern edge of the project area, was oriented in an east-west direction and measured 6.1 m long by 0.65 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.80 mbs 2.04 mbs. The stratigraphy of TE 36 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various layers of fill consisting of gravelly sandy loam (Stratum Ic), crushed coral fill (Stratum Id), and hydraulic fill (Stratum Ie) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum IIa), laminated organic material (SIHP # -7655) (Stratum IIb), and sandy clay wetland sediments (Stratum III) (Figure 177, Figure 178, Figure 179, and Table 38).

TE 36 documented the presence of the salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum IIa) and a thin layer of laminated organic material (Stratum IIb). The berm sediment was observed primarily in the eastern half of the trench, sloping steeply towards the western end and transitioning into the laminated organic material (see Figure 178). The wetland sediments (Stratum III) were not present beneath the man-made berm, likely removed during berm construction.

Figure 177. Photograph of the TE 36 northeast sidewall, view to northeast

Figure 178. Close-up of transition from the man-made berm (SIHP # -7655) (Stratum IIa) to the laminated organic material (SIHP # -7655) (Stratum IIb)

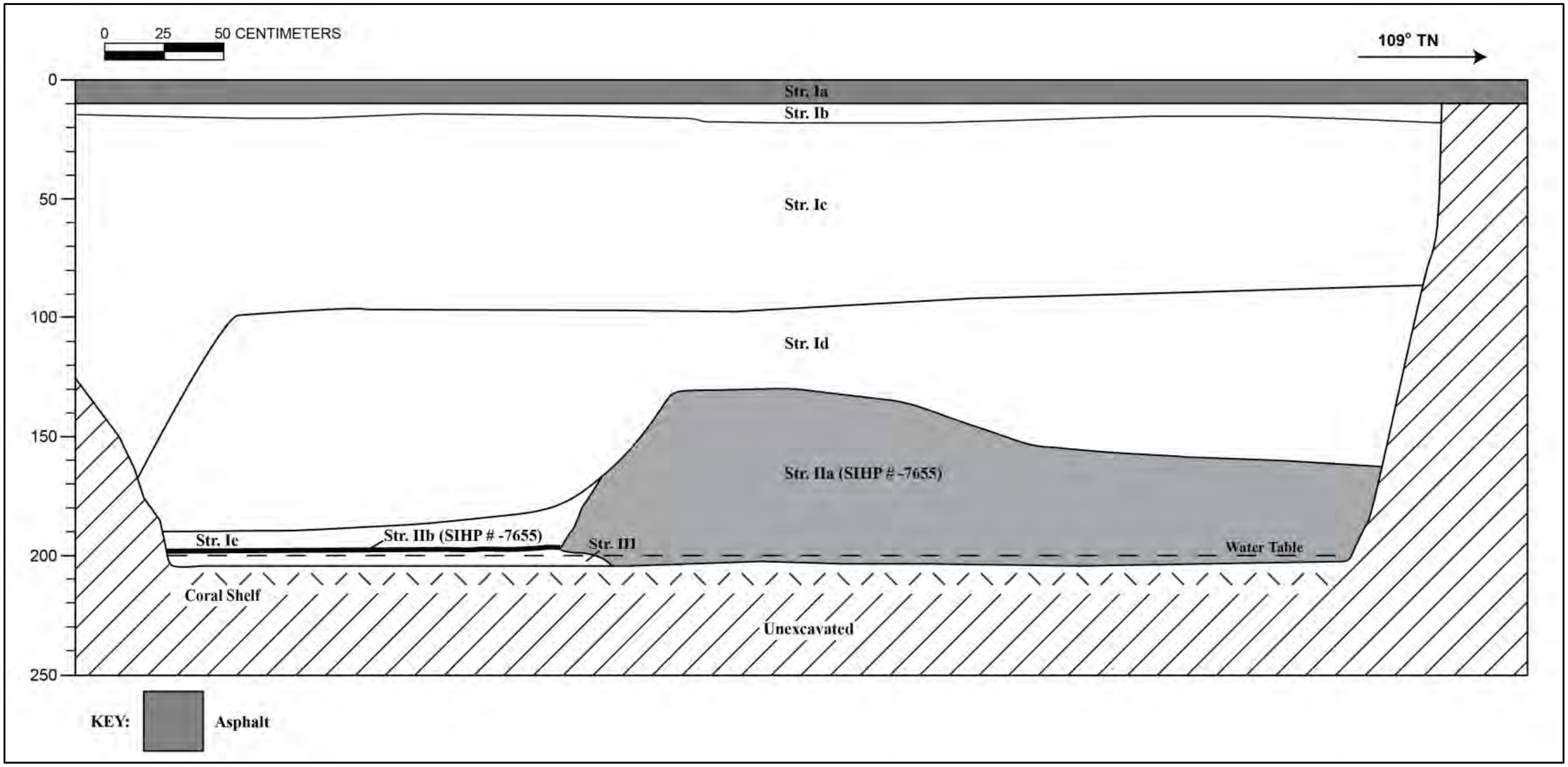

Figure 179. Profile of the TE 36, northeast sidewall

Table 38. Strata Observed within Test Excavation 36

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt surface
Ib	10–18	Fill; 10YR 3/1, very dark gray; extremely gravelly loam; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; no roots observed; imported base course fill associated with asphalt surface
Ic	14–107	Fill; 10YR 4/2, dark grayish brown; gravelly sandy loam; weak, fine, crumb structure; moist, very friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; imported fill
Id	87–190	Fill; 10YR 8/3, very pale brown; very gravelly coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; abrupt, smooth lower boundary; crushed coral fill associated with land reclamation events
Ie	167–198	Fill; 5B 7/1, light bluish gray; clay; structureless (massive); moist, firm consistency; plastic; marine origin; abrupt, smooth lower boundary; hydraulic (dredge) fill
IIa	130–204	SIHP # -7655; 2.5Y 6/3, light yellowish brown; structureless (massive); moist, firm consistency; plastic; mixed origin; clear, wavy lower boundary; berm associated with salt pan remnants
IIb	197–199	SIHP # -7655; organic laminations associated with salt pan remnants
III	198–204	Natural; 5Y 5/1, gray; sandy clay; structureless (massive); moist, firm consistency; plastic; marine origin; abrupt, smooth lower boundary; wetland sediments

4.2.38 Test Excavation 37 (TE 37)

Test Excavation 37 (TE 37), an exterior excavation located in the northern portion of the project area, was oriented in a northwest-southeast direction, and measured 8.0 m long by 0.80 m wide. The base of excavation was determined by the presence of the hard coral shelf at 178 cmbs. The stratigraphy of TE 37 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various layers of fill consisting of gravelly sandy loam (Stratum Ic), buried concrete surface (SIHP # -7658) (Stratum Id), crushed coral fill (Stratum Ie), and hydraulic fill (Stratum If) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum II), and clay wetland sediment (Stratum III) (Figure 180 through Figure 183, and Table 39).

A buried concrete surface (Stratum Id) was determined to a component of SIHP # -7658. The concrete slab observed in TE 37 is disturbed in the southeast portion of the test excavation and is continuous into TE 7, which intersects TE 37. The former land surface was observed between 47 and 62 cmbs and overlies a crushed coral fill and hydraulic dredge fill associated with 1919-1926 land reclamation. Based on historic maps and aerial photos, the buried concrete surface likely dates from 1939 and 1976.

TE 37 was positioned perpendicular to and intersecting Test Excavation 7. The purpose of the excavation was to target the man-made berm observed across the length of TE 7 in an effort to determine its size and association with organic laminations associated with the salt pan remnants (SIHP # -7655). The targeted man-made berm, consisting of locally procured natural sediment modified into a structural feature (SIHP # -7655) (Stratum II), was observed across a majority of TE 37, sloping steeply in the western end; however, the full extent of the berm and its transition to the laminated organic material was unable to be determined due to a hard concrete building foundation (SIHP # -7655). The findings from TE 37 indicate berm features within this portion of the project area were lower and wider than previously thought. A disturbance was observed along the western side of the man-made berm feature resulting in a mix of the berm sediment and the overlying hydraulic fill (Stratum If). Although its cause is unknown, the disturbance appears to be related to the land reclamation events.

Several fragments of metal were observed within the upper boundary of the man-made berm (Stratum II), in addition to two large isolated charcoal pieces (Acc. # 28) encountered near the western end of the man-made berm near its transition to the wetland sediments. The charcoal pieces were determined to be from a low oxygen environment (i.e., underground oven or a kiln), and are the size and shape of a small branch (see Section 5). Due to their context within the test excavation, the charcoal was likely transported to this location for an unknown purpose. Based on the presence of charcoal and metal fragments, Stratum II served as a stable ground surface for a period of time.

Figure 180. Photograph of the TE 37 southwest sidewall, view to west

Figure 181. Photograph of the northwest end of TE 37, showing slope of the man-made berm (SIHP # -7655) (Stratum II), beginning to transition to a salt pan bed, view to northwest

Figure 182. Close-up of northwest end of TE 37, showing the beginning of a transition from the man-made berm to a salt pan bed

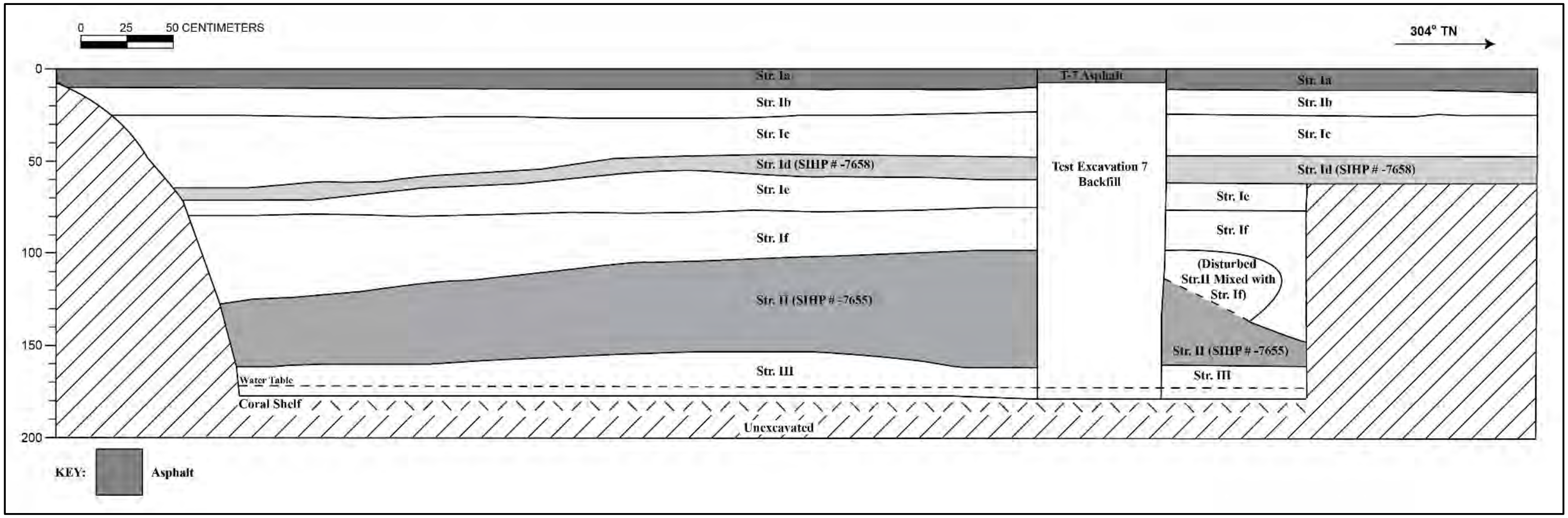

Figure 183. Profile of TE 37, southwest sidewall

Table 39. Strata Observed within Test Excavation 37

Stratum	Depth (cmbs)	Description
Ia	0–11	Asphalt surface
Ib	10–27	Fill; 10YR 3/1, very dark gray; extremely gravelly sandy loam; structureless (single-grain); moist, loose consistency; non-plastic; mixed origin; clear, smooth lower boundary; imported base course fill associated with asphalt surface
Ic	24–65	Fill; 10YR 5/3, brown; gravelly sandy loam; weak, fine, crumb structure; moist, friable consistency; non-plastic; mixed origin; clear, smooth lower boundary; no roots observed; imported fill
Id	47–72	SIHP # -7658; buried concrete surface
Ie	56–80	Fill; 10YR 6/2, light gray brown; very gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; abrupt, smooth lower boundary; no roots observed; crushed coral fill associated with land reclamation fill
If	75–148	Fill; 10YR 6/2, light brownish gray; silty clay; structureless (massive); wet, slightly sticky to sticky consistency; plastic; marine origin; clear, wavy lower boundary; hydraulic (dredge) fill associated with land reclamation events
II	99–172	SIHP # -7655; 10YR 6/3, pale brown; gravelly sandy clay loam; moderate, very fine to fine, crumb structure; moist, friable consistency; plastic; marine origin; clear, smooth lower boundary; berm associated with salt pan remnants
III	153–178 BOE	Natural; 5PB 7/1, light blue gray; clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, smooth lower boundary; wetland sediments containing freshwater snails

4.2.39 Test Excavation 38 (TE 38)

Test Excavation 38 (TE 38), located at the basement entrance to the Ward Warehouse parking structure in the northwestern corner of the project area, was oriented in a north-south direction, and measured 6.0 m long by 0.70 m wide. The base of excavation was determined by the presence of the hard coral shelf at 1.27 mbs. The stratigraphy of T-38 consisted of the asphalt surface (Stratum Ia), associated base course (Stratum Ib), and various fill layers consisting of crushed coral fill (Stratum Ic) and hydraulic fill (Stratum Id) overlying a sandy clay man-made berm (SIHP # -7655) (Stratum IIa), modified sandy clay wetland sediments associated with the man-made berm (SIHP # -7655) (Stratum IIb), peaty pond sediments (Stratum IIc), and clay wetland sediments (Stratum III) (Figure 184 through Figure 191, and Table 40). A structural disturbance was encountered near the south end of TE 38, likely associated with the existing structure.

TE 38 documented the presence of the salt pan remnants, SIHP # -7655, consisting of locally procured natural sediment modified into a structural feature (man-made berm) (Stratum IIa) overlying modified wetland sediments (Stratum IIb) (see Figure 185). Stratum IIa consisted of a thin layer of standard man-made berm sediments located within the northern half of TE 38, overlying disturbed wetland sediments and tabular limestone boulders. Stratum IIa remained level across the excavation length, transitioning to peaty pond sediments in the southern end of the test excavation. The transition between the berm material and the pond was not observed due to a previous disturbance at the transition that extended to the coral shelf. Stratum IIb was observed underlying Stratum IIa and contained mixing of sandy clay wetland sediments and the Stratum III clay, likely disturbed during construction of the surrounding berms.

The tabular limestone boulders, present only in the center of TE 38, appear to be contiguous with Stratum IIb, purposefully placed to create a level surface (see Figure 187 and Figure 188). Limestone cobble and gravel fill was placed beneath the boulders to raise the level of the naturally tabular boulders. As the limestone boulders appear to be integrated into the man-made berms, they were determined to be a feature of the salt pan remnants (SIHP # -7655, Feature 2).

Peaty pond sediments were observed within the far southern edge of the test excavation (Stratum IIc) (see Figure 189). The peat material appeared to be naturally occurring pond sediments consisting of marine clays and a large abundance of rootlets (see Figure 190). The transition from Stratum IIa to the pond had been removed by a previous disturbance. 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 had been removed by the previous disturbance. As TE 38 is located on the project area boundary, further exploration of this transitional zone, including the limestone boulders and the possible pond will be undertaken during subsequent testing within the adjacent project area (Block B West).

Figure 184. Photograph of the TE 38 east sidewall, view to southwest

Figure 185. Close-up of the berm sediments within the north end of TE 38, view to east

Figure 186. Photograph of south end of the TE 38 east sidewall, showing the small section of pond material (Stratum IIc), view to south

Figure 187. Photo of the tabular limestone boulders within TE 38 (SIHP # -7655, Feature 2)(boundaries shown by red arrows) prior to their removal from the test excavation, view to south

Figure 188. Close-up of limestone boulders within the TE 38 east sidewall (SIHP # -7655, Feature 2), view to southeast

Figure 189. Close-up of peaty pond sediments (Stratum IIc) within the south end of TE 38, view to south

Figure 190. Close-up of peat within the Stratum IIc pond sediment

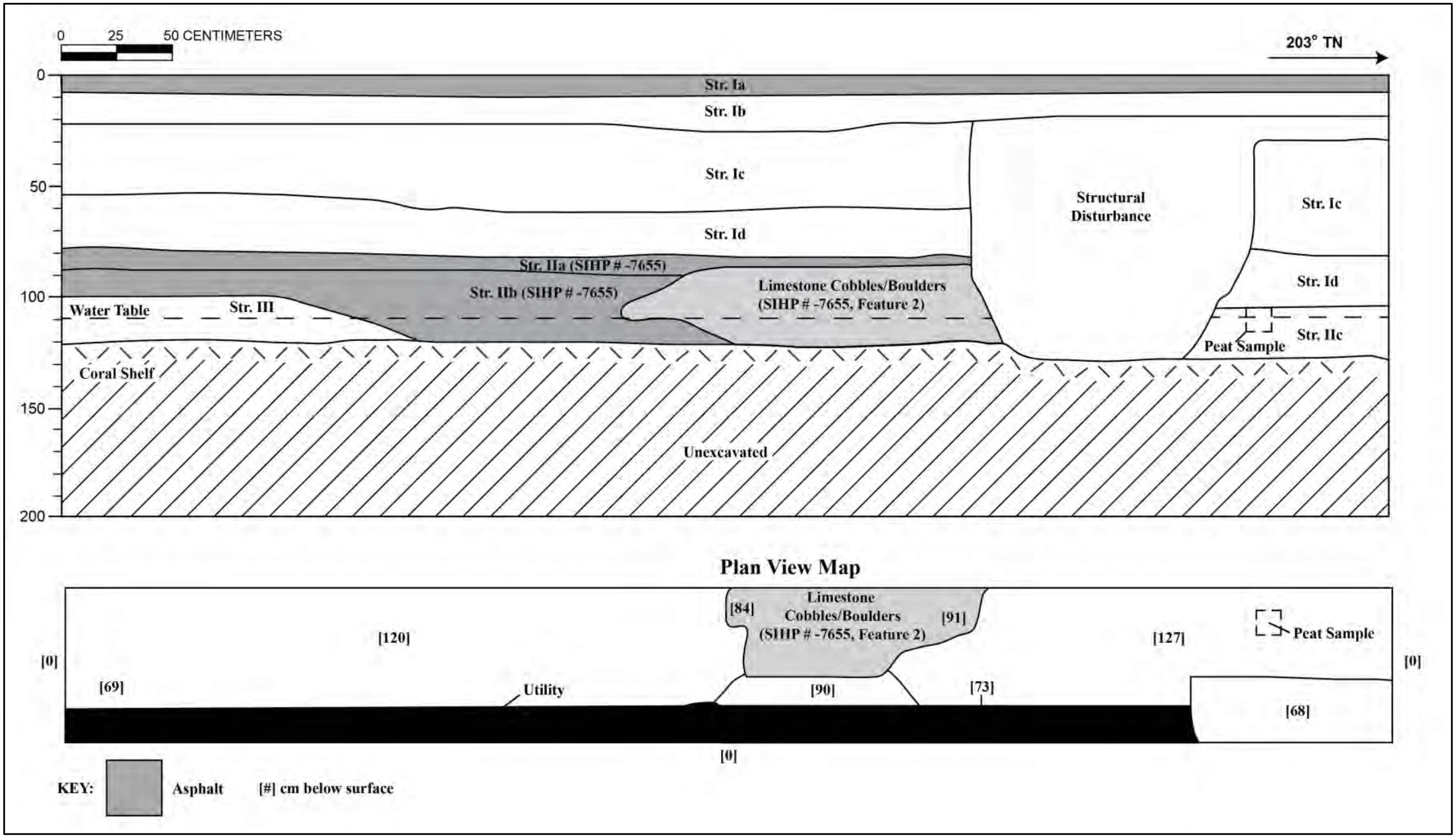

Figure 191. Profile and plan of TE 38, east sidewall

Table 40. Strata Observed within Test Excavation 38

Stratum	Depth (cmbs)	Description
Ia	0–10	Asphalt; current road surface
Ib	9–25	Fill; 10YR 3/1, very dark gray; gravelly, coarse sand; structureless (single-grain); moist, loose consistency; non-plastic; terrigenous origin; clear, smooth lower boundary; imported base course fill associated with asphalt surface
Ic	23–81	Fill; 10YR 8/2, very pale brown; gravelly sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, broken/discontinuous lower boundary; crushed coral fill associated with land reclamation fill
Id	54–99	Fill; 10YR 7/3, very pale brown; silty clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; clear, broken/discontinuous lower boundary; hydraulic (dredge) fill associated with land reclamation fill
Structural Disturbance	17–127 BOE	Fill; 10YR 3/2, very dark grayish brown; gravelly loamy sand; weak, medium to coarse, crumb structure; moist, very friable consistency; slightly plastic; mixed origin; abrupt, smooth lower boundary; few, medium roots; disturbance associated with building foundation
IIa	76–90	SIHP # -7655; 5Y 5/2, olive gray; fine sand; structureless (single-grain); moist, loose consistency; non-plastic; marine origin; clear, broken/discontinuous lower boundary; berm associated with salt pan remnants
IIb	87–120 BOE	SIHP # -7655; 10GY 6/1, greenish gray; sandy clay; structureless (massive); wet, sticky consistency; plastic; marine origin; clear, broken/discontinuous lower boundary; berm associated with salt pan remnants consisting of mottled wetland sediment
IIc	109–127 BOE	Natural; 10GY 6/1, greenish gray mottled with 10YR 4/3, brown; loamy clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, broken/discontinuous lower boundary; pond sediments with abundance of naturally occurring peat
III	99–120 BOE	Natural; 10GY 6/1, greenish gray; clay; structureless (massive); wet, slightly sticky consistency; plastic; marine origin; abrupt, broken/discontinuous lower boundary; wetland sediments

Section 5 Results of Laboratory Analysis

5.1 Artifact Analysis

No traditional Hawaiian artifacts were encountered during AIS excavations. However, two charcoal fragments (Acc. #28) were encountered within Test Excavation 37, at the edge of a man-made berm (SIHP # -7655) near the transition to the underlying wetland sediments. The two pieces of charcoal are manuport items because of their provenience and absence of an associated feature. Characteristics of the charcoal pieces are consistent with that of a low temperature burn associated with underground fire pits such as an *imu*. Due to their association with the historic salt pans, they are likely related to post-Contact activity.

Representative historic artifacts were collected for further laboratory analysis, focusing primarily on attributes to provide a general time frame for the associated stratigraphy. 28 historic artifacts were collected from the Block B East excavations, consisting of: four complete glass bottles (Acc. #s 5, 7, 9, and 25); various glass bottle and jar fragments (Acc. #s 6, 10/12, 11, 13, 21, 22, 23, 26, and 27); one graphite pencil (Acc. # 1); one piece of rubber electrical insulation (Acc. # 18); three porcelain fragments (Acc. #s 15, 16, and 17); various earthenware portions (Acc. #s 3 and 14); 4 metal rods (Acc. # 19); a metal boat cleat (Acc. # 20); a portion of a wooden post (Acc. # 8); one glass insulator fragment (Acc. # 24); and a single glass marble (Acc. # 4), and a small, saw cut faunal bone fragment (Acc. # 2), for a total of 28 accessions (including the charcoal fragments). These are summarized in Table 41 and can be seen in Figure 192 through Figure 206.

15 of the observed artifacts were collected from within a single excavation (TE 32), 10 of which originated within a historic trash fill layer (SIHP # -7660) (Acc. #s 10–20).

5.1.1 Bottle Glass Analysis

The Bureau of Land Management and the Society for Historic Archaeology maintain and continually update an electronic resource called “Historic Glass Bottle Identification & Information Website.” All descriptive terms for glass bottles and all date ranges for manufacturing techniques were taken from this source, unless otherwise noted (referenced as BLM/SHA 2014).

There are three major technological divisions in the manufacture of glass bottles. From antiquity, bottles have been free-blown (mouth-blown using a blowpipe and no formal mold). In the United States and Canada, free-blown utilitarian bottles generally pre-date 1860. From ca. 1800, bottles were mouth-blown into some type of mold and the mouth of the bottle was finished by hand. Around 1903, Michael Owens invented a fully-automatic bottle machine (ABM) to blow bottles from the base to the lip. By 1920, in North America, use of the fully automatic machines had completely supplanted the older methods of manufacture. Thus the mold-blown era for American bottles extends from ca. 1800 to 1920, which overlaps with the fully automatic machine-made bottle era from ca. 1903 to the present (BLM/SHA 2013_Glassmaking).

There are 12 bottles in the Block B West collection; 11 are machine blown, and the manufacturing process of one body fragment cannot be determined. There are no definite free-blown or mold blown bottles in the collection; all are machine blown and thus post-date 1903. In the Block B East collection, three complete bottles were manufactured automatically (ABM), and

Table 41. Summary of Artifacts Collected within the Block B East Project Area

Acc. #.	Provenience	H/L (cm)	Di. (cm)	Material	Type	Age	Description/Identification
1	T-4, Str. 8b, 0-45 cmbs, Ewa half of trench	6.2	1.0	Graphite	Pencil	--	Gray graphite pencil fragment
2	T-4, spoil pile	--	--	Bone	--	--	Very small frag of sawn/cut bone
4	T-10, Str. Ic-Ie, 0-100 cmbs	--	1.6	Glass	Marble	--	Playing marble, clear to opaque, visible air bubbles
3	T-10, Str. Ic-Ie, 0-100 cmbs, spoil pile	--	--	Ceramic	Hollowware	--	Low-fired terra cotta, bluish-green glaze
5	T-11, Str. Ic	31.0	5.1	Glass	Bottle	1937	Colorless glass soda bottle, complete, round base, machine-made two piece cup mold, crown finish; Embossing: 4 Maltese Crosses & TRADEMARK" around shoulder, "PROPERTY OF HONOLULU SODA WATER CO. LTD."/NET CONTENTS 6 1/2 FLUID OUNCES on heel. Maltese cross in center on base. 1197G/ 21/ O in Diamond Emblem/7 on base. manufactured by Owens Illinois Glass Co. (BLM/SHA 2014_Glass Marks)
6	T-13, Str. Id, spoils pile	--	6.5	Glass	Bottle	Post-1903	Aqua blue glass bottle, base to body fragment, round base, two piece cup mold, machine-made, valve mark on base
7	T-14, Str. IIb	20.0	6.0	Glass	Bottle	1935-1980	Colorless glass beer bottle, complete, round base, two-piece cup mold, machine-made, crown finish; Paper label on body for "MILLER HIGH LIFE"; Embossing: "B" with two serifs inside a circle, and "16 73 18" on base; Brockway Glass Co . (BLM/SHA 2014_Glass Marks)
8	T-14	49.0	15.0 x 13.0	Wood	Post	--	Water saturated wooden milled post fragment
9	T-32, Str. Ie, 34-54 cmbs, Ewa 1/2	22.0	5.0	Glass	Bottle	1946	Colorless glass soda bottle, complete, round base, two-piece cup mold, machine-made, crown finish; crown style finish; Embossing: "PACIFIC" horizontally on opposite sides of shoulder; "6.5 FLUID OUNCES" and "NET CONTENTS" on heel; "20 [0-I] 46" on heel; "/ P SW" on base; Pacific Soda Works, Honolulu, made by Owens-Illinois Glass Co. (Lockhart 2004:25)

Acc. #.	Provenience	H/L (cm)	Di. (cm)	Material	Type	Age	Description/Identification
10/ 12	T-32, Str. Ib, 115 cmbs	10.2	6.5	Glass	Jar	1923-ca. 1964	Colorless glass jar, base to lip fragments (3), round dodecagon shape, two-piece cup mold, machine-made, wide-mouth, continuous external thread finish; Embossing: "1" underlying a "H" with a "A" and "DESIGNED PATENED" (also written backwards) on base; scalloped design around heel (Acc. #12 is part of the same bottle); made by Hazel-Atlas Glass Co. (BLM/SHA 2014_Glass Marks; Whitten 2014)
11	T-32, Str. Ib, 115 cmbs	--	--	Glass	Bottle	post 1908	Olive green beverage bottle, neck to lip fragment, body fragment, two-piece mold, machine-made; crown top
13	T-32, Str. Ib, 115 cmbs	--	--	Glass	Bottle	--	Aqua glass bottle, body fragment; possible embossed Kanji characters on body
14	T-32, Str. Ib, 115 cmbs	--	~35.0; ~19.5 (lid);	Ceramic	Hollowware	--	Refined earthenware (whiteware) hollowware and lid (7 fragments), blue banded slip glaze, possible wash basin
15	T-32, Str. Ib, 115 cmbs	--	--	Ceramic	Hollowware	--	Porcelain body fragment, Asian hand-painted over glaze floral design in dark blue
16	T-32, Str. Ib, 115 cmbs	--	--	Ceramic	Tableware	--	Porcelain body fragment, Asian hand-painted floral design in light blue
17	T-32, Str. Ib, 115 cmbs	--	~6.5	Ceramic	Hollowware	--	Porcelain rim to body fragment, white
18	T-32, Str. Ib, 115 cmbs	--	--	Rubber	Insulator	--	Electric insulator (in 2 fragments), black
19	T-32, Str. Ib, 115 cmbs	31.0, 16.0; 11.5; 10.0	--	Metal	Rods	--	Rusted metal, spikes/rods (4 fragments)
20	T-32, Str. Ib, 115 cmbs	15.0	--	Metal	Cleat	--	Metal cleat likely used as a boat tie given its physical appearance and was also found close to the shoreline
21	T-32, spoils pile	--	--	Glass	Bottle	1940-1946	Colorless glass soda bottle, body fragment, two-piece mold; Embossing: "Sparkling Pepsi Cola" in pennant diagonally on body; date based on embossing style (Lockhart 2010:276).
22	T-32, spoils pile	--	5.2	Glass	Bottle	1920-1933	Colorless glass bottle, base to body fragment, round base, two-piece cup mold; "F" on base, probably for the Fairmount Glass Works, Ind. (Whitten 2014)

Acc. #.	Provenience	H/L (cm)	Di. (cm)	Material	Type	Age	Description/Identification
23	T-32, spoils pile	--	5.5	Glass	Bottle	1925-1931	Colorless glass soda bottle, base to body fragment, round base, Owens suction scar on base, machine-made, two piece cup mold; Embossing: " P / S W" on base; "IPG" in triangle / 6" on heel; Pacific Soda Works of Honolulu, HI bottle made by the Illinois Glass Corp. (Lockhart et al. 2005:78)
24	T-32, spoils pile	--	--	Glass	Insulator	--	Aqua glass threaded- insulator fragment
26	T-2, spoils pile	--	6.0	Glass	Bottle	1938-1951	Aqua green glass soda bottle, base to neck fragment, round base, hobble-skirt bottle, machine-made, two piece cup mold, Embossing on body: "Coca-Cola/ TRADE-MARK REGISTERED/ MIN. CONTENTS 6-FL. OZS." "Coca-Cola/ TRADE-MARK REGISTERED BOTTLE PAT. D-105529"
27	T-2, spoils pile	--	--	Glass	Bottle	post-1908	Aqua green glass condiment bottle, neck to lip fragment, two piece cup mold, machine-made, club sauce finish.
25	T-36, Str. Ic, 80 cmbs	22.2	5.5	Glass	Bottle	early 1950's	Milk glass bottle, round base; Image of a ship (in gilt) on bottle as well as "AFTER/ SHAVING /LOTION/ SHIP GRAND TURK; "Old Spice" in cursive faded on body. On heel, "SHULTON/CLIFTON N.J./4.75FL .OZ; On base, "EARLY AMERICAN OLD SPICE" with a star; "SHULTON INC."; 3 (makers mark) Wheaton Glass Company with Stopper #2 (no stopper); milk-glass (oldspicecollectibles.com)
28	T-37, Str., IIa, 155 cmbs	3.5 - 4.0	1.4	Charcoal	Charcoal	--	Black charcoal, 2 fragments

Figure 192. A graphite pencil fragment (Acc. # 1) collected from within Test Excavation 4

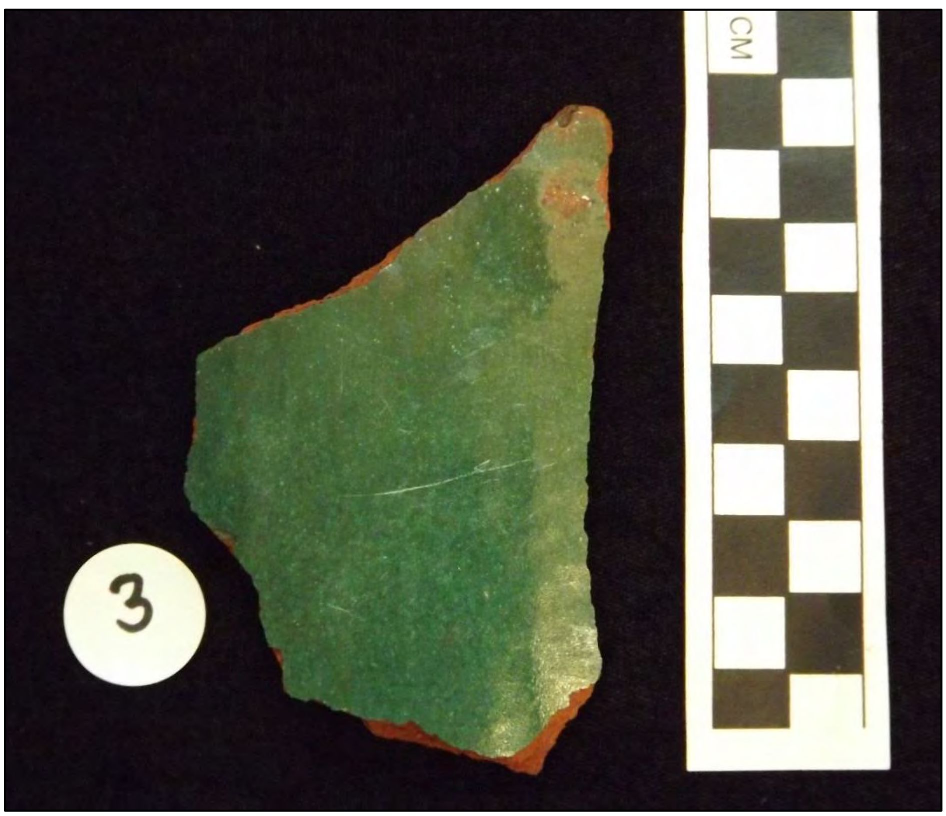

Figure 193. A ceramic hollowware fragment (Acc. # 3) collected from within Test Excavation 10

Figure 194. A glass marble (Acc. # 4) collected from within Test Excavation 10

Figure 195. A milled wood post (Acc. # 8) (SIHP # -7658) collected from within Test Excavation 14

Figure 196. A glass bottle (Acc. # 9) collected from within Test Excavation 32

Figure 197. Glass fragments (Acc. #s 10, 11, 12, and 13) collected from within the historic fill layer (SIHP # -7660) in Test Excavation 32

Figure 198. Ceramic fragments (Acc. # 14) collected from within the historic fill layer (SIHP # -7660) in Test Excavation 32

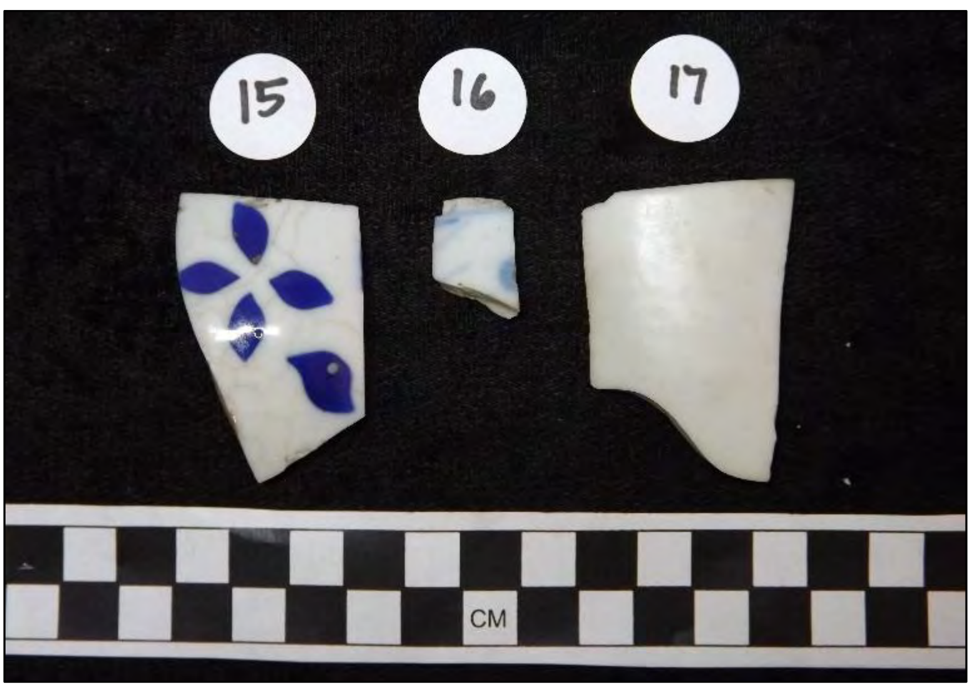

Figure 199. Ceramic fragments (Acc. #s 15, 16, and 17) collected from within the historic fill layer (SIHP # -7660) in Test Excavation 32

Figure 200. Rubber insulator (Acc. # 18) collected from within the historic fill layer (SIHP # -7660) in Test Excavation 32

Figure 201. Metal fragments, including boat trash (Acc. # 19 and 20) collected from within the historic fill layer (SIHP # -7660) in Test Excavation 32

Figure 202. Glass fragments (Acc. #s 21, 22, 23, and 24) collected from Test Excavation 32

Figure 203. Old Spice bottle (Acc. # 25) collected from Test Excavation 36

Figure 204. Coca-Cola bottle (Acc. # 26) collected from Test Excavation 2

Figure 205. Bottle fragment (Acc. # 27) collected from Test Excavation 2

Figure 206. Two charcoal pieces (Acc. # 28) collected from Test Excavation 37

thus post-dates 1903. Two of those bottles had visible two-piece cup mold seams along the body, and one was a modern 1973 beer bottle with a “Miller High Life” paper label (Acc. # 7)

Two soda bottles were manufactured by the Owens-Illinois Glass Co., one (Acc. # 5) in 1937, and one (Acc. # 9) in 1946, one beer bottle (Acc. # 7) was manufactured by the Brockway Glass Co. between 1935 and 1980, a glass jar (Acc. # 10/12–fragments from the same jar) was manufactured by the Hazel-Atlas Co. between 1923 and 1964, one bottle (Acc. # 22) was probably manufactured by the Fairmount Glass Co between 1920 and 1933, and one soda bottle (Acc. #23) was manufactured by the Illinois-Pacific Corp. in 1925–1931. Brand name information and styles were also used to date bottles. Based on embossing style, a Coca-Cola bottle fragment (Acc. # 26) can be dated between 1938 and 1951 and a Pepsi bottle fragment (Acc. # 21) can be dated to 1940–1946. Sources used for dating glass bottle manufacturing marks, other than the BLM/SHA 2014 internet site, includes Lockhart 2010, Lockhart et al. 2005,Toulouse 1971, and Whitten 2014.

The glass bottle found within Test Excavation 11 (Acc. # 5) and manufactured by Owens Illinois Glass Co., was embossed with four Maltese crosses running around the shoulder, a Maltese cross in center on the base, and a vertical line design running all around the body. "PROPERTY OF HONOLULU SODA WATER CO. LTD”/NET CONTENTS 6 ½ FLUID OUNCES” is embossed along the heel of the bottle. Above the center text on the base is an Owens-Illinois maker’s mark consisting of a superimposed diamond and “O” with an “I” in the center. The maker’s mark is preceded by a mold number “1197 G” as well as the number “21.” The glass bottle found within Test Excavation 32 (Acc. # 9) and manufactured by Pacific Soda Works on Oahu, was embossed "PACIFIC" on opposite sides of the shoulder; "6.5 FLUID OUNCES" and "NET CONTENTS" embossed on the heel; "20 0 46" embossed on the heel; and a maker's mark of "PSW" on base in a triangular formation. The “Old Spice After Shaving Lotion” bottle is a milky white glass bottle dating from the early 1950’s. The bottle has the classic ship logo between the words "OLD" and "SPICE" in faded cursive, which were in red script. Beneath the ship, the faded words "SHIP GRAND TURK" appear in a faded banner. On the back of the container, in blue, appears the contents: "SHULTON/CLIFTON N.J./4.75FL .OZ. The base of the bottle is embossed with "EARLY AMERICAN OLD SPICE" with a star symbol and "SHULTON INC." in a circular formation. The number “3” serves as makers mark and represents the Wheaton Glass Company. In the early 1940’s, Shulton enlisted the Wheaton Glass Company, in Millville, New Jersey, to develop a cream-colored glass that would look like pottery (the exact description of this bottle) (oldspicecollectibles.com).

A majority of the artifacts were collected from Test Excavation 32 (Acc. #s 9–24). Acc. #s 10–20 were collected from a historic trash fill layer (SIHP # -7660), utilized to fill an abandoned storm drain box. Of the 16 artifacts collected from TE 32, of particular interest was an aqua glass fragment inscribed with Japanese characters (Acc. # 13). This type of aqua glass with Japanese inscription is associated with many different uses, as this type of bottle shape and color are associated with soda-water, beer, liquor, sake, and medicinal drugs, all of which were both imported to and from Hawaii for the Japanese and other ethnic groups who consumed these products. The exact date of this fragment could not be determined.

5.1.2 Ceramic Analysis

Ceramics manufactured in Europe or North America (Euro-American) in the collection consist of blue and white refined earthenware (whiteware) vessel fragments with a banded/slipped pattern (possibly a wash basin) (Acc. # 14), one blue-green, low fired terra cotta fragment (Acc. # 3) and three porcelain fragments, including two fragments with a hand-painted blue floral motif (Acc. # 15 and # 16). The transfer print patterns are commonly found on nineteenths century ceramics. These ceramic artifacts cannot be dated with any precision, but the collection does not contain any of the Chinese hand-painted underglaze and overglaze ceramics (Bamboo, Double Happiness, Sweet Pea, etc.) typical in later nineteenth Overseas Asian archaeological deposits. In addition, there are none of the typical "Dashed Line" Japanese transfer print ceramics commonly found at later Overseas Asian sites. These types of ceramics, described by Lister and Lister (1989:48) are common artifacts also in Hawaiian deposits, especially in trash deposits in Kakaʻako (see Hammatt et al. 2013) dating to the late nineteenth century.

5.1.3 Other Artifacts

One fragment of graphite pencil/crayon (Acc. # 1), a small fragment of cut/sawn bone (Acc. # 2), a glass marble (Acc. # 4), a rubber insulator (Acc. # 18), a glass insulator fragment (Acc. # 24), several metal roads (Acc. # 19), and a metal cleat (Acc. # 20) were also collected. These artifacts can be generally dated only to the historic period.

A milled wood post fragment (Acc. # 8) associated with the SIHP # -7658, was collected from Test Excavation 14. The post was observed extending to or just above the coral shelf. The milled wood indicates a historic time frame. It was determined that the wooden posts may be remnants of a fence line associated with historic development of the project area (SIHP # -7658)

5.1.4 Summary

The artifacts found in the Block B East excavations are typical artifacts found during archaeological projects conducted in the Kakaʻako area, such as the recent Honolulu High-Capacity Transit Corridor Project (Hammatt 2013: Volume V: Lab Results). All of the complete bottles and large bottle fragments in the collection can be dated to the machine-made era, post 1903 (post 1908 for narrow necked bottles). Nine bottles can be dated to the post 1920's period. Two bottles with exact manufacturing codes date to 1937 (Acc. # 5) and 1946 (Acc. # 9). The Old Spice bottle dates to the 1950s (Acc. # 25). There are no definite nineteenth century ceramics in the collection, especially the Chinese hand-painted and Japanese transfer prints present found during other Kakaʻako excavations. Thus the historic artifact collection seem to represent trash deposited generally within the early to the mid-twentieth century.

A majority of the artifacts were collected from the fill materials overlying the 1919–1926 land reclamation fill and, if present, the historic land surfaces (SIHP # -7658). In the case of Test Excavation 10, the collected artifacts were observed within backfill from an existing utility, also likely related to the current Ward Warehouse structure. The majority of the historic artifacts were collected from the northeast edge and the southeast edge of the project area, deposited in either fill or disturbed/reworked natural sediments. Historic trash was found in strata below the SIHP # -7658, buried historic surfaces, but only when a major disturbance to the buried surface was observed. Due to the nature of stratigraphy, it is difficult to narrow the time of deposition for the subsurface structures using the deposition of the historic artifacts.

5.2 Pollen and Microcharcoal Analysis

Eleven samples from the Block C West and Block B East project areas 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 eleven 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 and is presented in Appendix E (Cummings and Varney 2014). Below is a summary of the results.

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). 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 were collected from the sidewall using a trowel and then carefully separated in the CSH lab to prepare them for analysis.

Pollen was removed using a chemical extraction technique and identified using light microscopy. Pollen grains that were poorly preserved or distorted beyond recognition were identified as "Indeterminate." All other pollen grains were identified to the family, genus, and species level, where possible.

5.2.1 Discussion

The pollen and microscopic charcoal analysis of the samples collected from Block B East and Block C West indicate that 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 that 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 eleven sediment samples was dominated by *kolea* (*Myrsine*) (Figure 207). *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 University of Hawaiʻi at Manoa, 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) which 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.

Figure 207. Photograph of *Kolea* (*Myrisine*) leaves which may have been used to line the salt beds (Photographers: Forest & Kim Starr)

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 (Stratum IIb and II), it is possible that 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 that these plants were not growing within the salt pan areas. Fern spores were recovered in almost all of the samples, suggesting that 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 that the sediments are most likely historic.

Identified Polynesian cultigens included coconut (*Cocos nucifera*), sugarcane (*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 that there were sugarcane 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 that 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, sugarcane, sweet potato, rice, and mango) within the Test Excavation 6 samples suggests that 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 that 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.

Section 6 Historic Property Descriptions

6.1 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 208).

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 Kakaʻako has a long history of salt production activity, spanning the pre-Contact period to the early twentieth century. Māhele land claims within the Kakaʻako coastal area document a cluster of traditional Hawaiian salt lands, including Land Commission Awards 387, 1903, 10463, and 9549 (see Figure 15). LCA 387, awarded to the American Board of Commissioners for Foreign Missions, contained "fishing grounds, coral flats & salt beds" (see Appendix B). 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 (*hoʻoliu*) 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 (see Appendix C).

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]

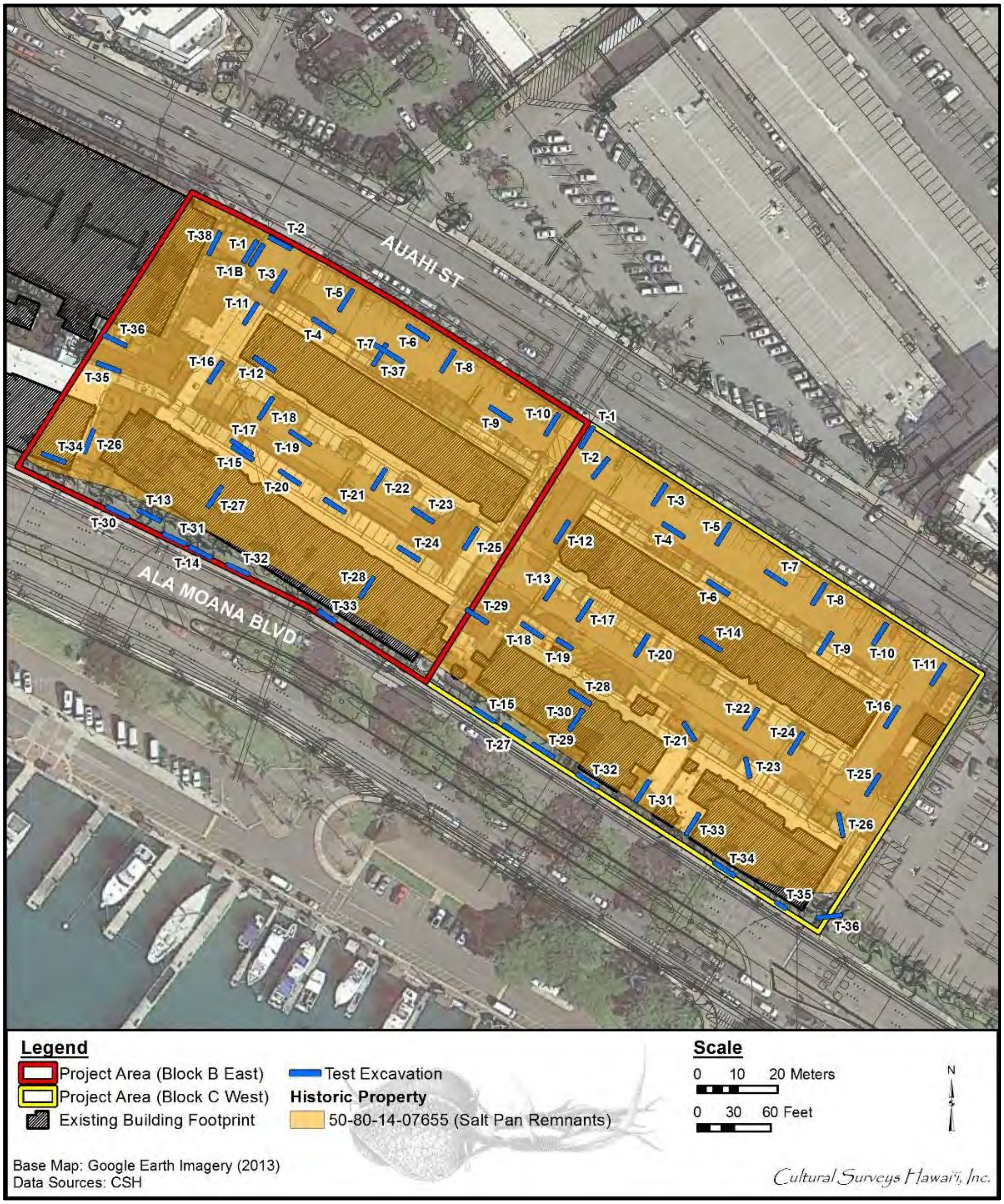

Figure 208. Aerial photograph showing the extent of historic salt pan remnants (SIHP # -7655) documented within the Block B East and Block C West project areas (source: Google Earth Imagery 2013)

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 209).

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 210). 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

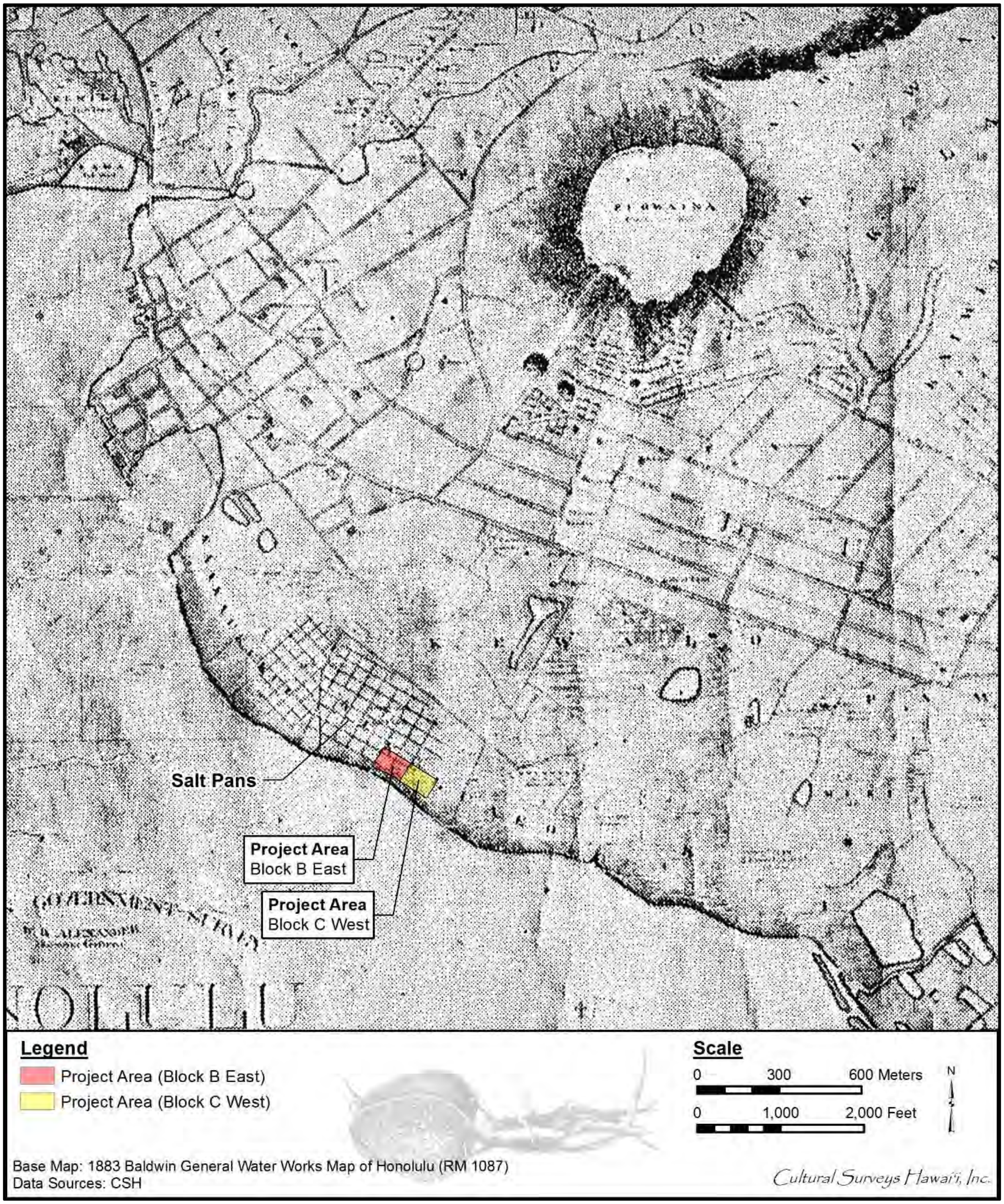

Figure 209. 1883 map of the Honolulu Water Works System by E.D. Baldwin (1883) (Hawai'i Land Survey Division, Registered Map 1087), showing a grid symbol representing salt pans. Blocks B East and C West are located at the southern fringe of this area.

Figure 210. “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.

6.1.1 Salt Pan Berms Description

6.1.1.1 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 211 through Figure 217). 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 213, Figure 215). 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 216, Figure 217). 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 218, Figure 219).

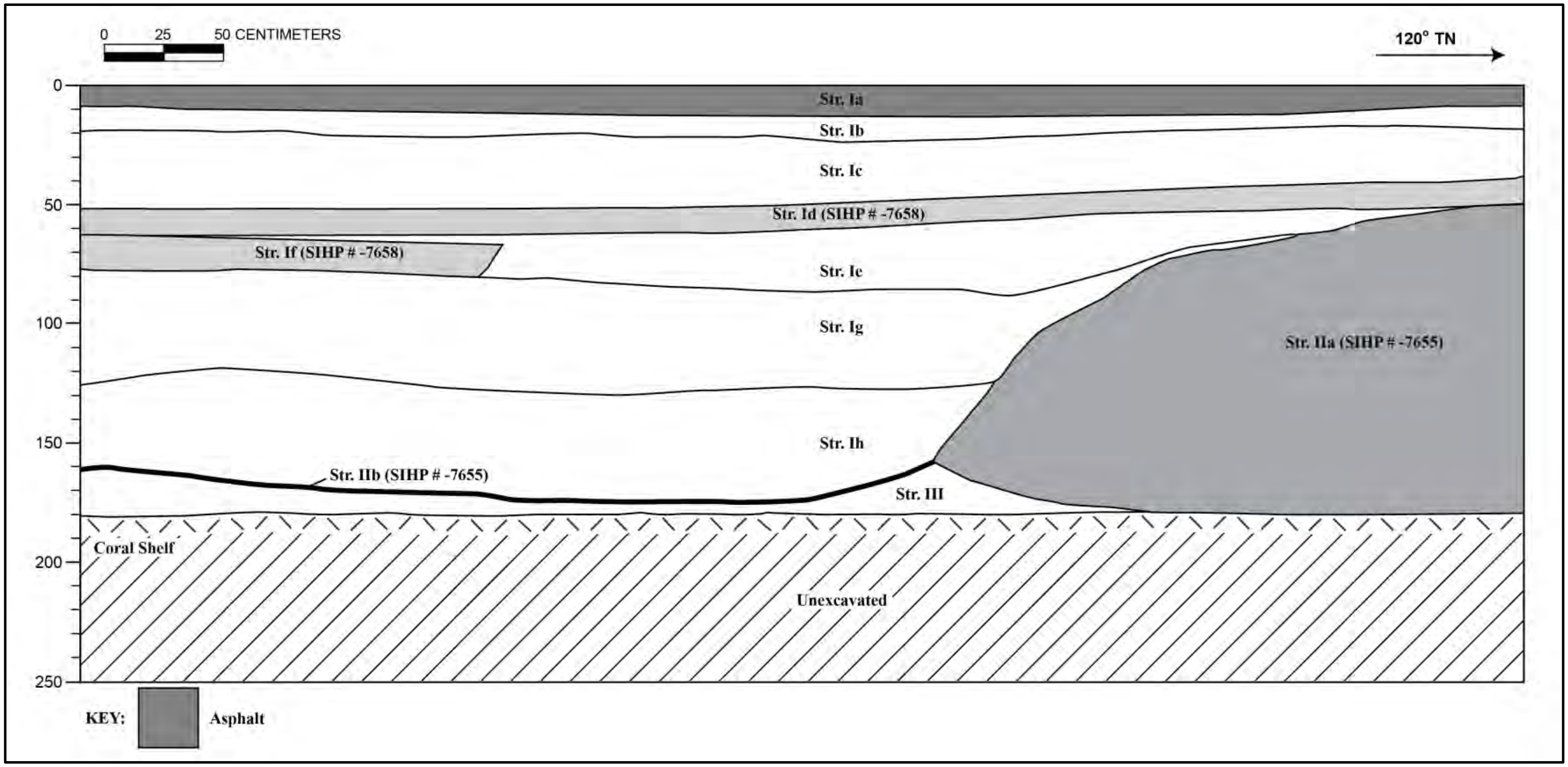

Figure 211. Profile of TE 9 (Block B East) north wall, showing a high berm structure (Stratum IIa/SIHP # -7655), measuring 130 cm above the coral shelf

Figure 212. Photograph of TE 9 north wall, showing a high berm structure sloping down to a low-lying salt pan bed, SIHP # -7655

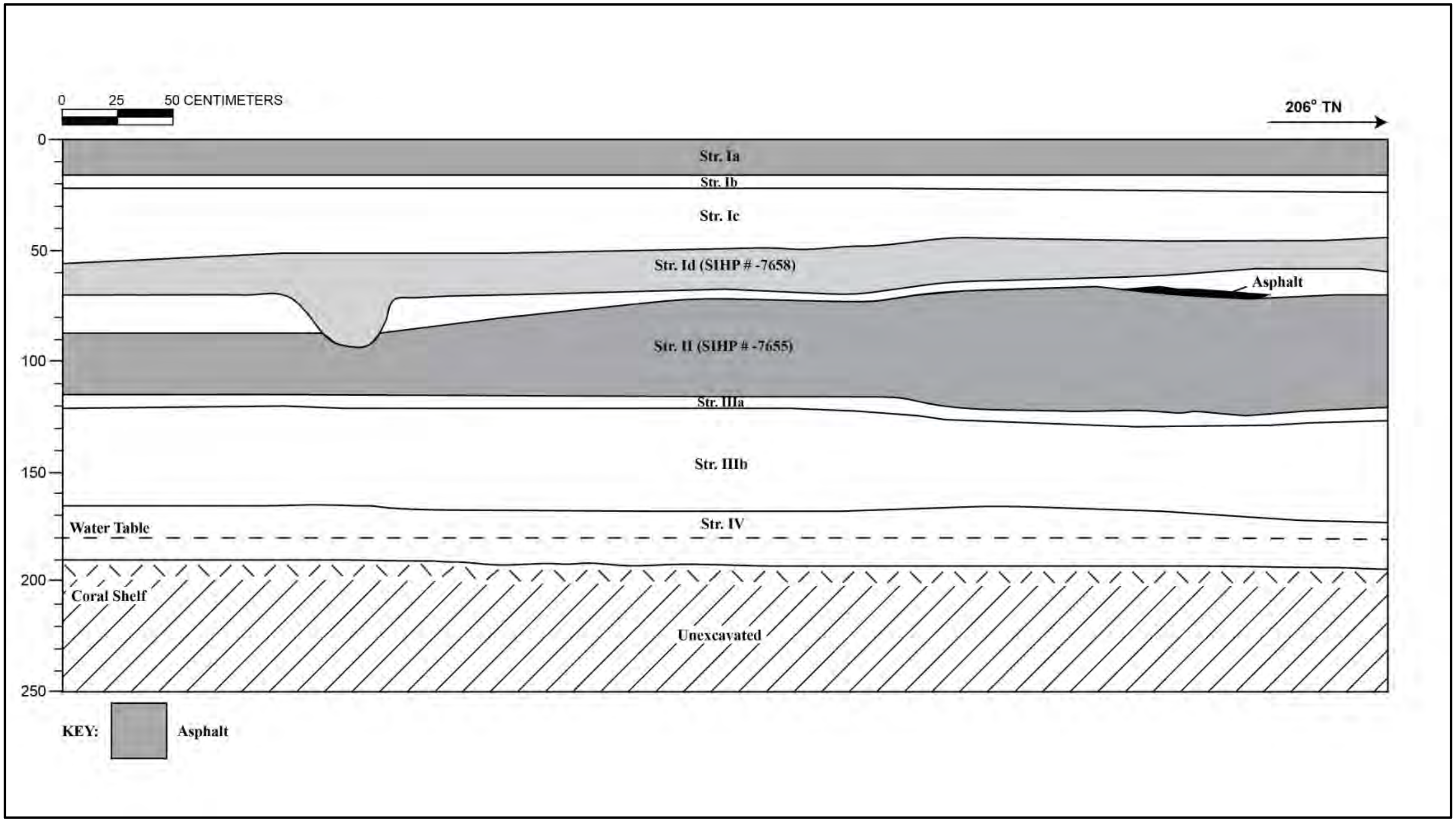

Figure 213. Profile of TE 10 (Block C West) southeast wall, showing a high berm (Stratum II/SIHP # -7655), constructed 125 cm above the coral shelf

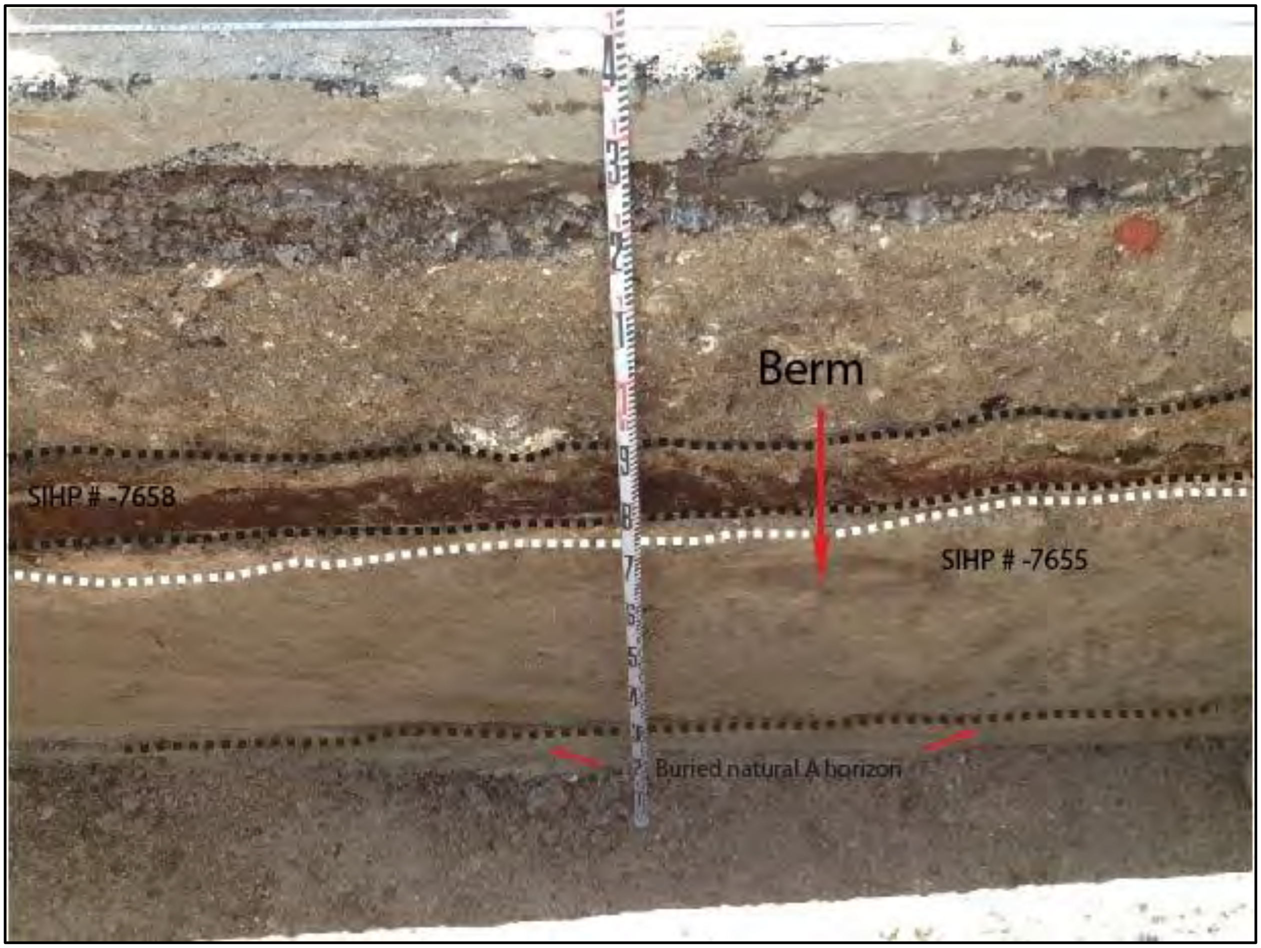

Figure 214. Photograph of TE 10 (Block C West) southeast sidewall, showing a man-made berm structure, SIHP # -7655, overlying a natural A horizon and wetland sediments

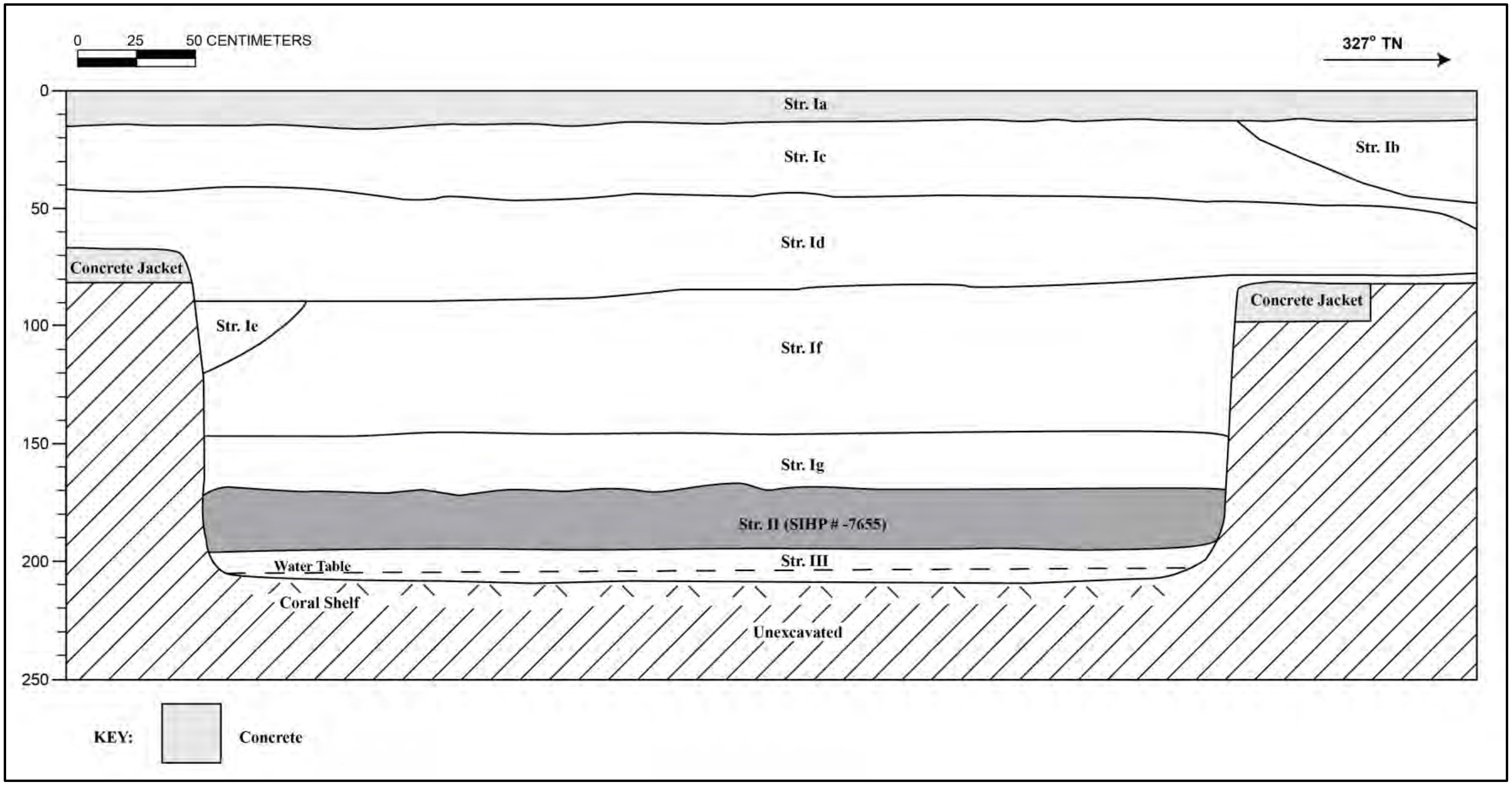

Figure 215. Profile of TE 12 (Block B East) southwest wall, showing a low berm structure (Stratum II/SIHP # -7655), measuring only 40 cm above the coral shelf

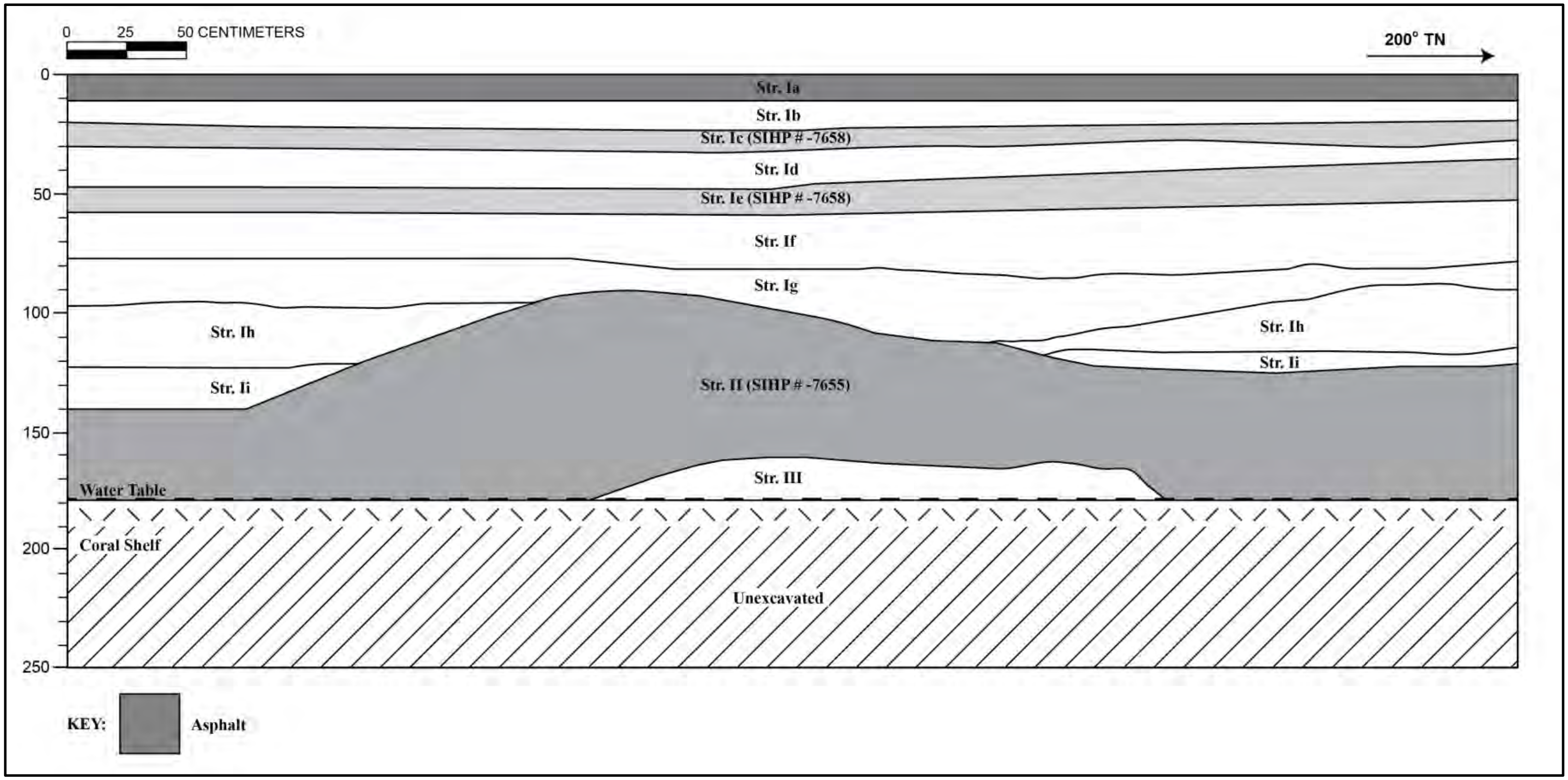

Figure 216. Profile of TE 5 (Block B East) southeast wall, showing a berm apex (Stratum II/SIHP # -7655), measuring 90 cm above the coral shelf, with the berm sloping gently down to either side and continuing into the sidewalls

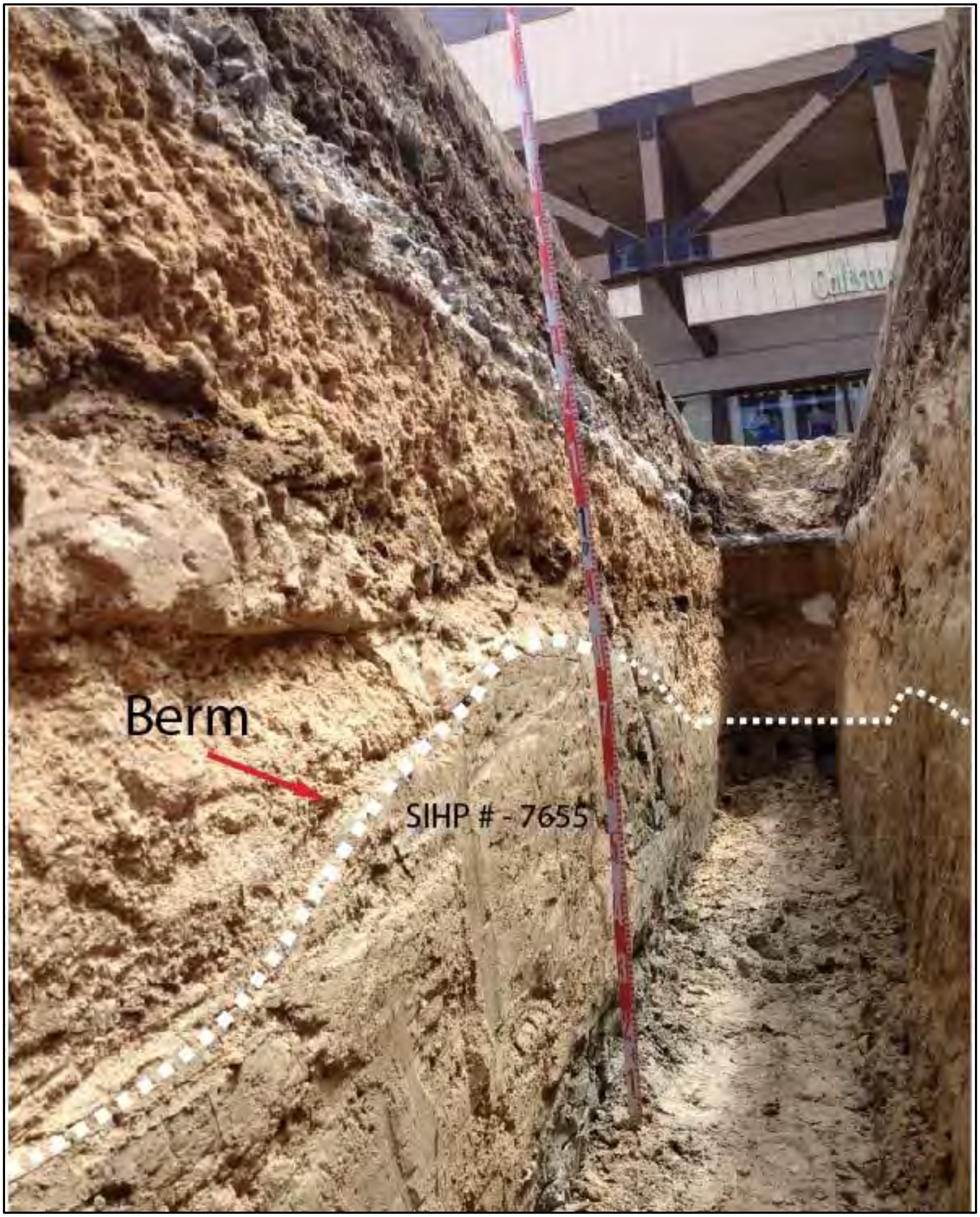

Figure 217. Photograph of the TE 5 southeast sidewall, showing a mounded berm structure, SIHP # -7655

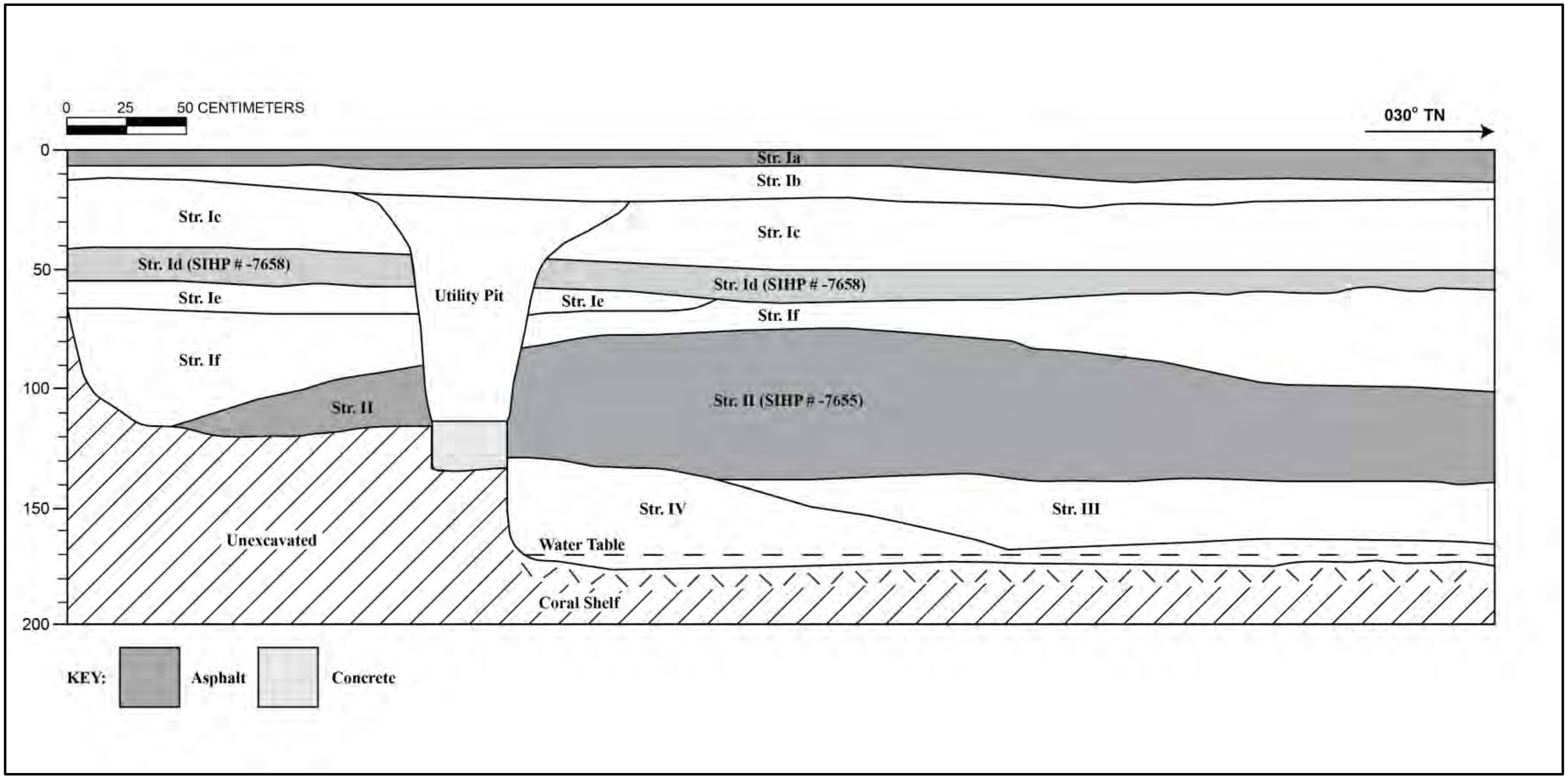

Figure 218. Profile of TE 17 (Block C West) northwest wall, showing a berm apex (Stratum II/SIHP # -7655), measuring 97 cm above the coral shelf, with the berm sloping gently down to either side and continuing into the sidewalls

Figure 219. 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 220, Figure 221). 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 210).

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 211, Figure 222).

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 223, Figure 224, and Figure 225).

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 226, Figure 227, and Figure 228). 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.

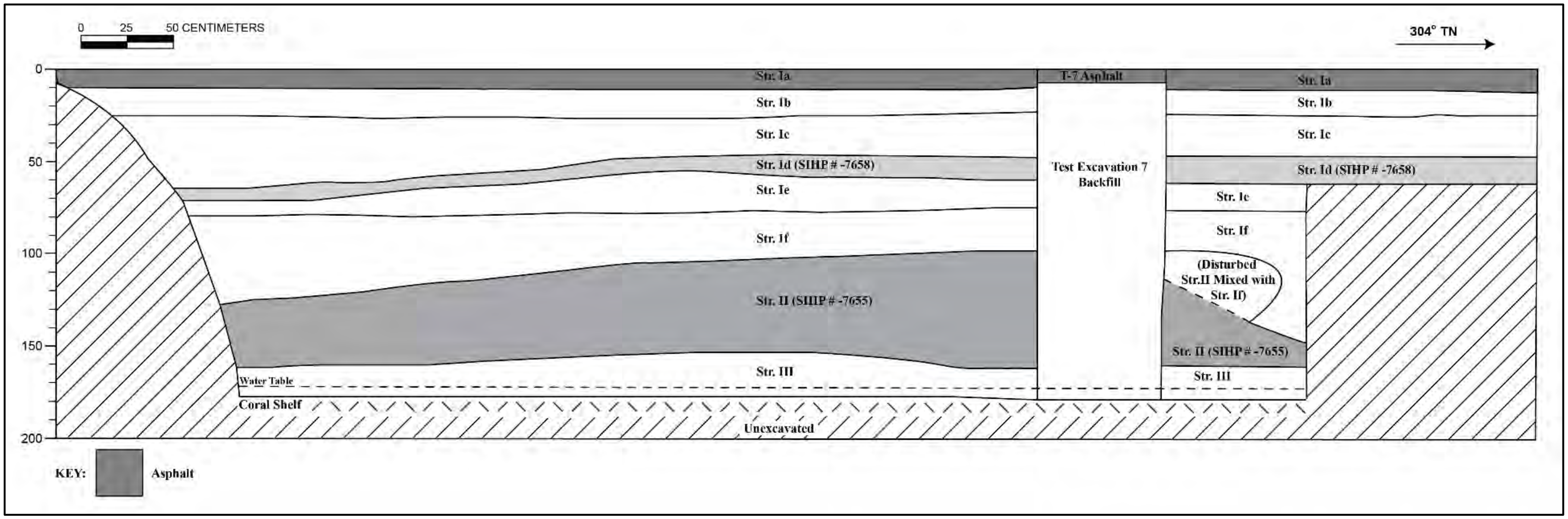

Figure 220. Profile of TE 37 (Block B East) southwest sidewall, showing the cross section of a wide berm (Stratum II/SIHP # -7655), running *mauka*-*makai* through the project area

Figure 221. 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

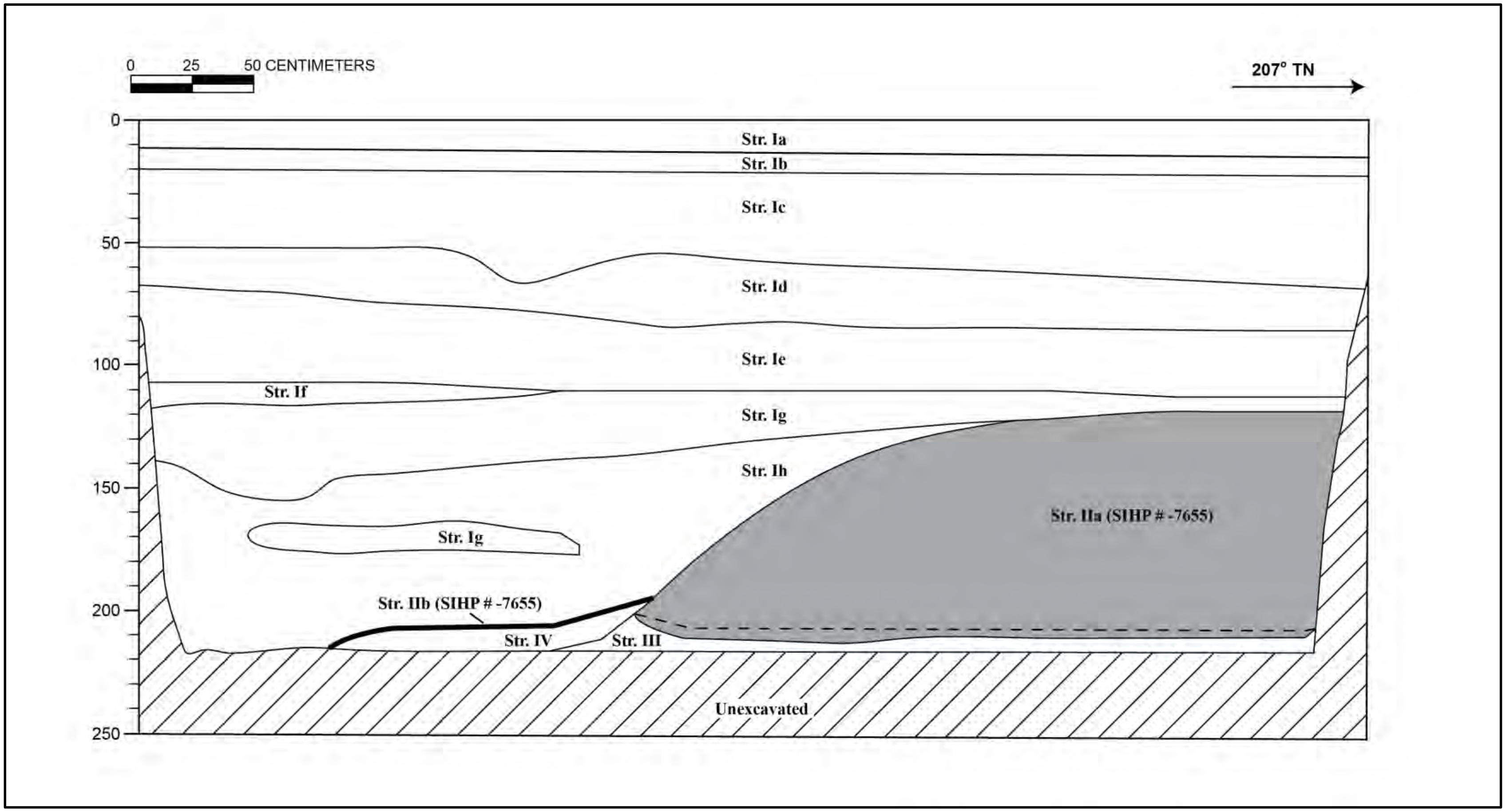

Figure 222. Profile of TE 30 southeast sidewall (Block C West), showing a steep berm (Stratum IIa/SIHP # -7655) transitioning a very low salt pan bed

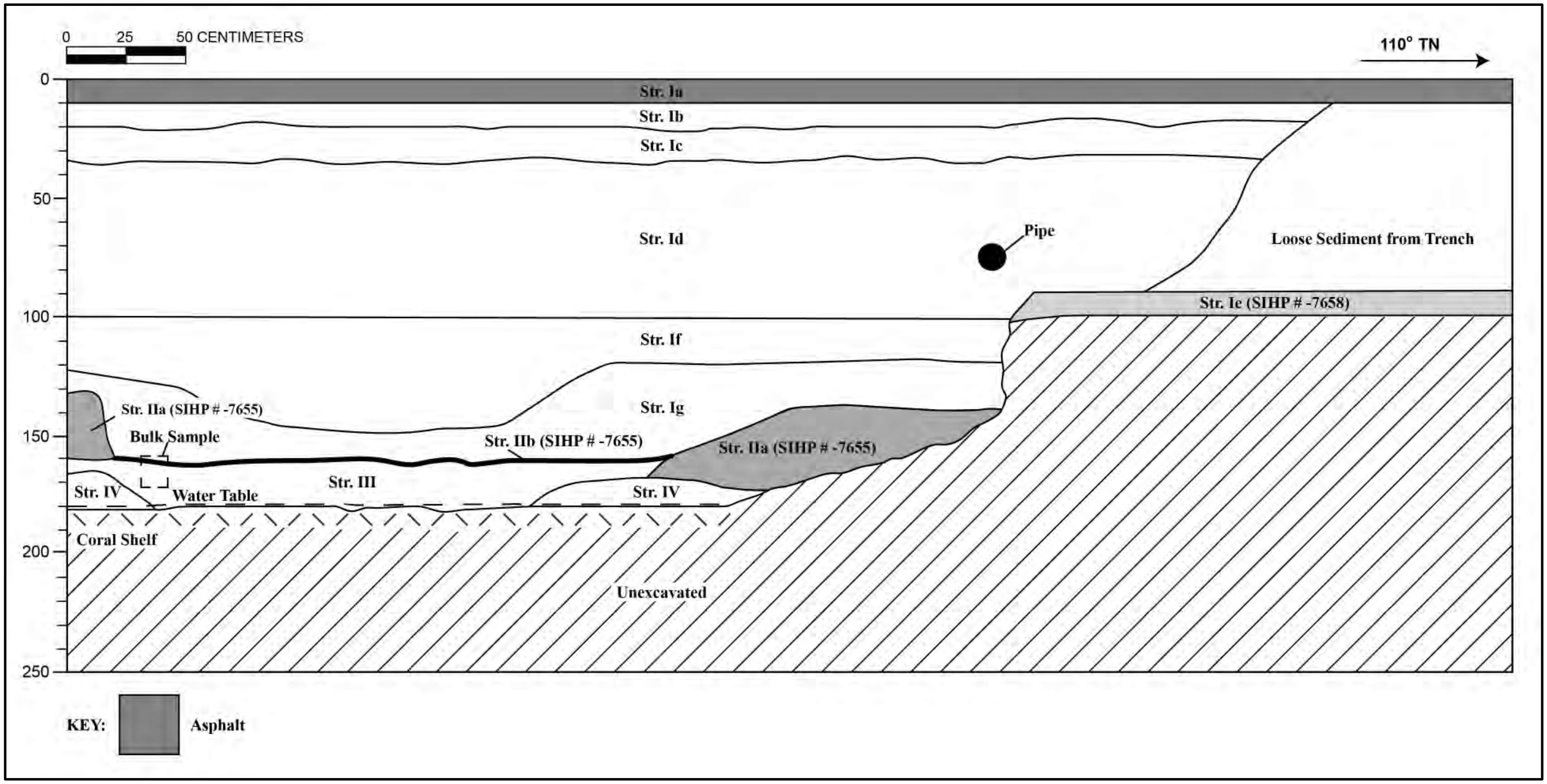

Figure 223. Profile of TE 4 (Block B East) northeast sidewall, showing two low berm structures (Stratum IIa/SIHP # -7655)

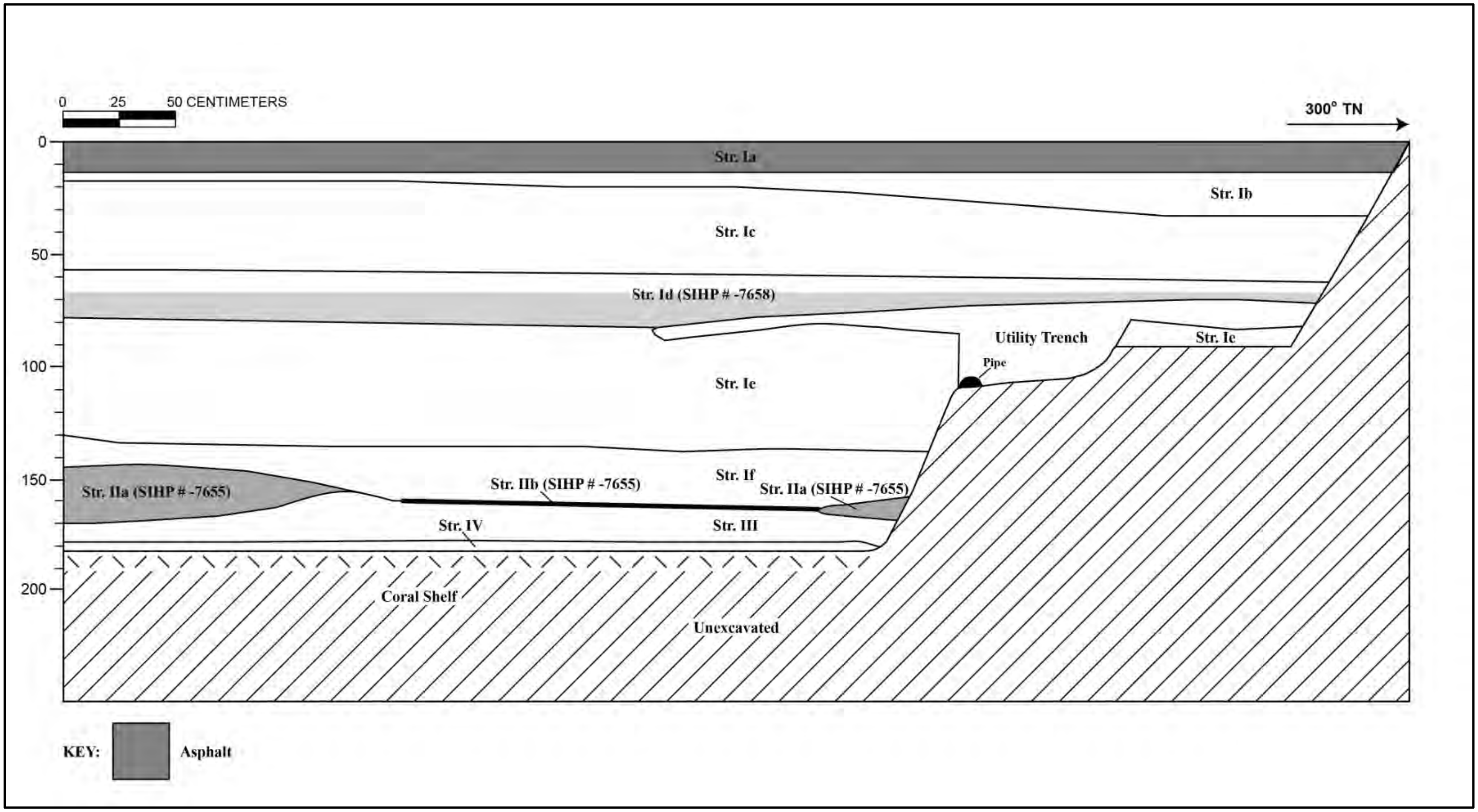

Figure 224. Profile of TE 4 (Block C West), similarly showing low berm structures (Stratum IIa/SIHP # -7655)

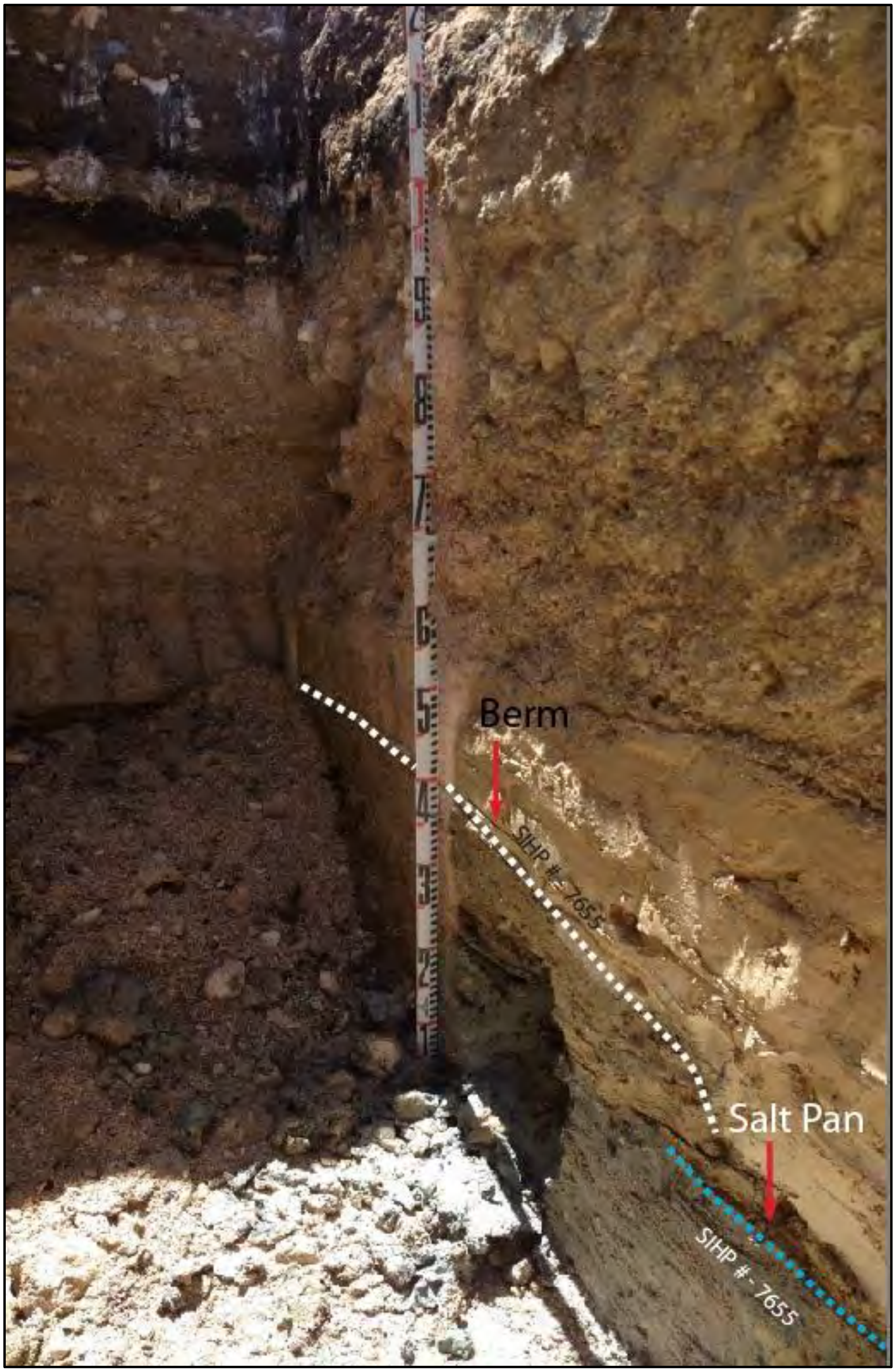

Figure 225. Close-up photo of low berm within TE 4 (Block C West), SIHP # -7655

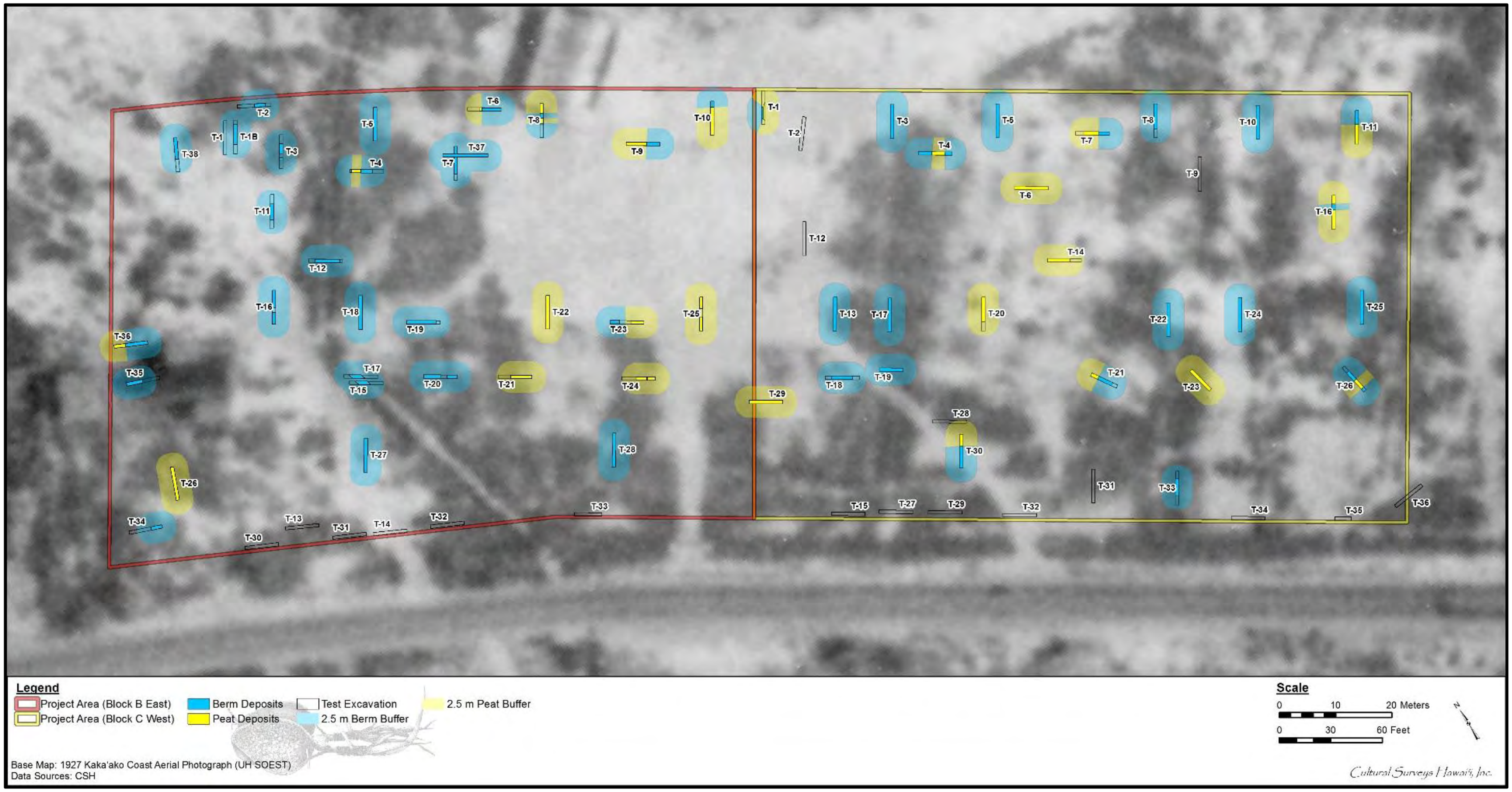

Figure 226. 1927 aerial photograph showing the location of documented salt pan berm remnants (blue) and salt pan bed deposits (yellow) within the Block B East and Block C West project areas

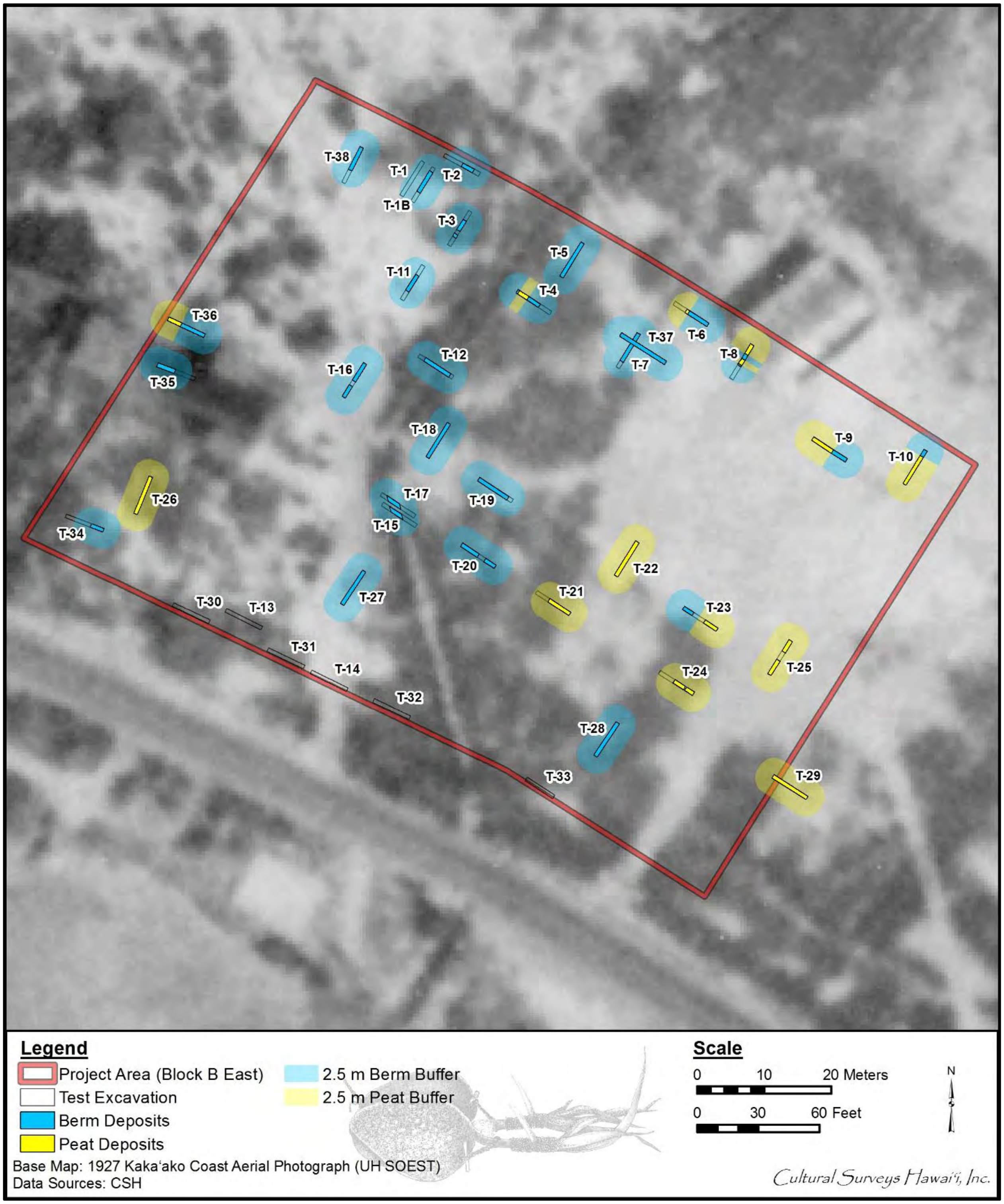

Figure 227. Close-up of Block B East, showing the concentration of berm sediments within a swath of dark vegetation and along the area of the Ward Estate *‘auwai*

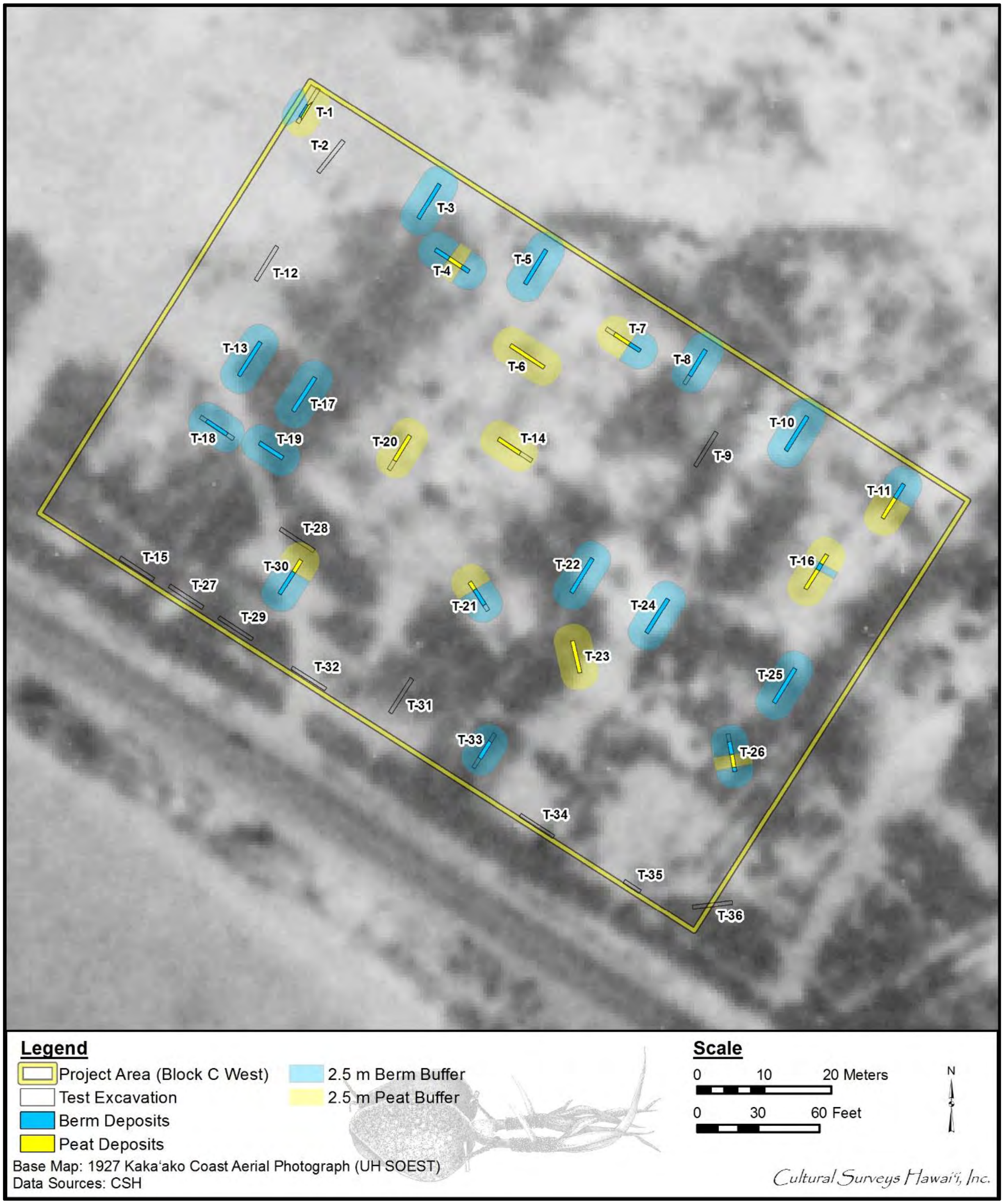

Figure 228. Close-up of Block C West, showing interspersed man-made berm structures and salt pan beds (UH SOEST: 1927 Kaka'ako Coast Aerial Photograph)

6.1.1.2 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 214). 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 216, Figure 217).

6.1.1.3 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 229, Figure 230). 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 231, Figure 232).

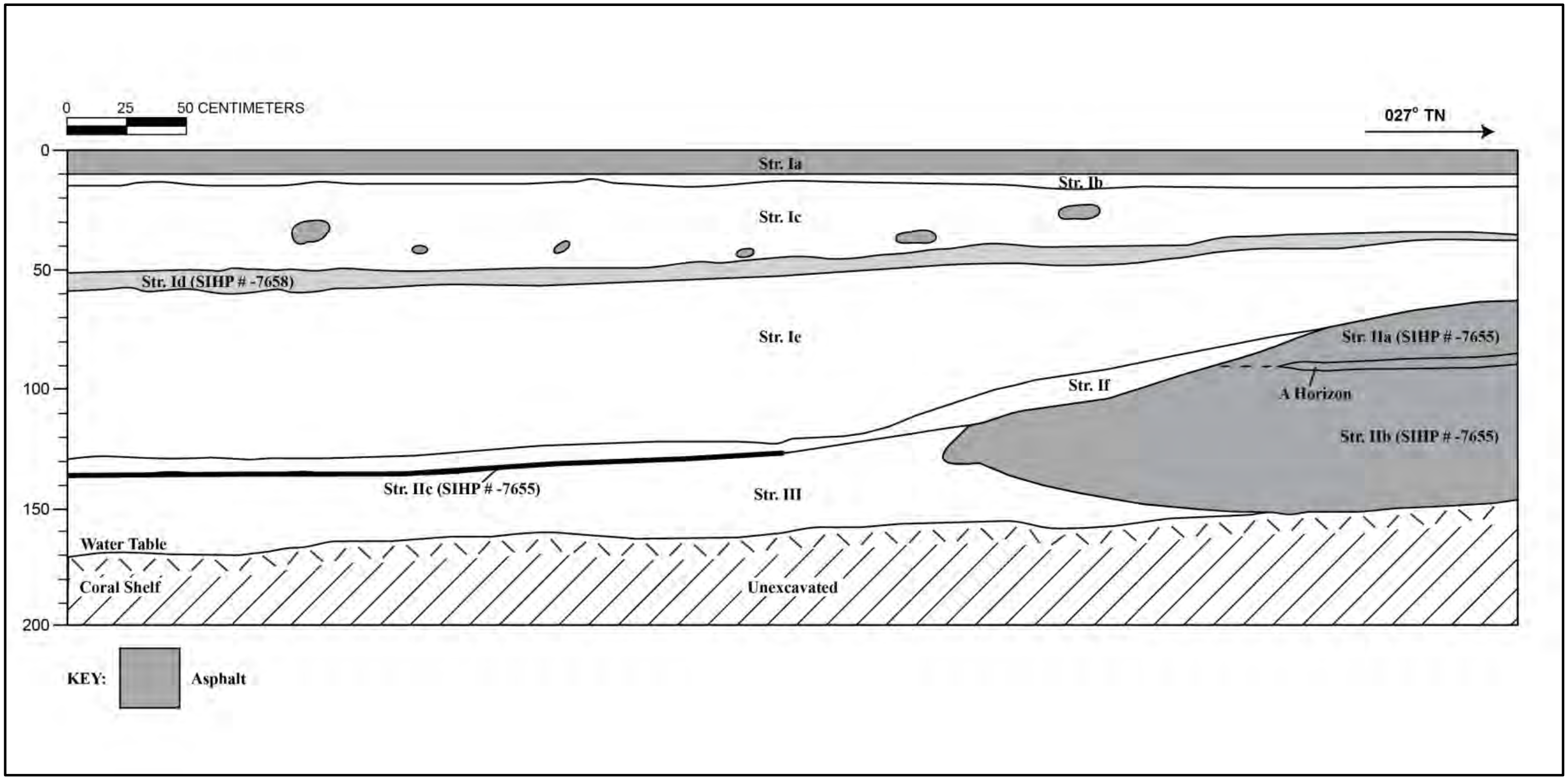

Figure 229. Profile of TE 11 (Block C West) northwest sidewall, showing two berm events (Strata IIa and IIb/SIHP # -7655)), including a forming A horizon at the upper boundary of the earlier (lower) berm deposit

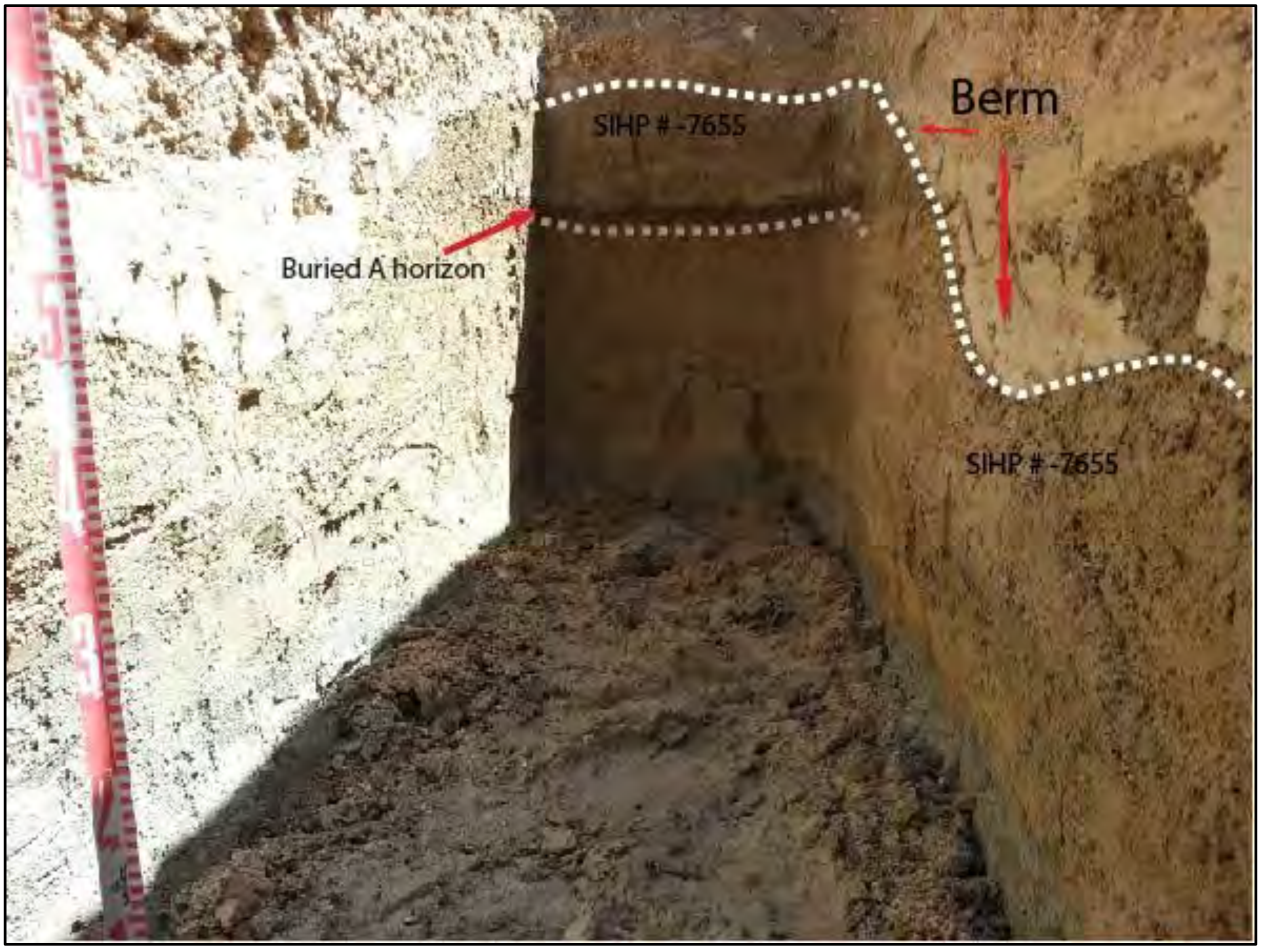

Figure 230. Photograph of TE 11 *mauka* wall (Block C West), showing two berm deposits separated by a dark-stained A horizon, SIHP # -7655

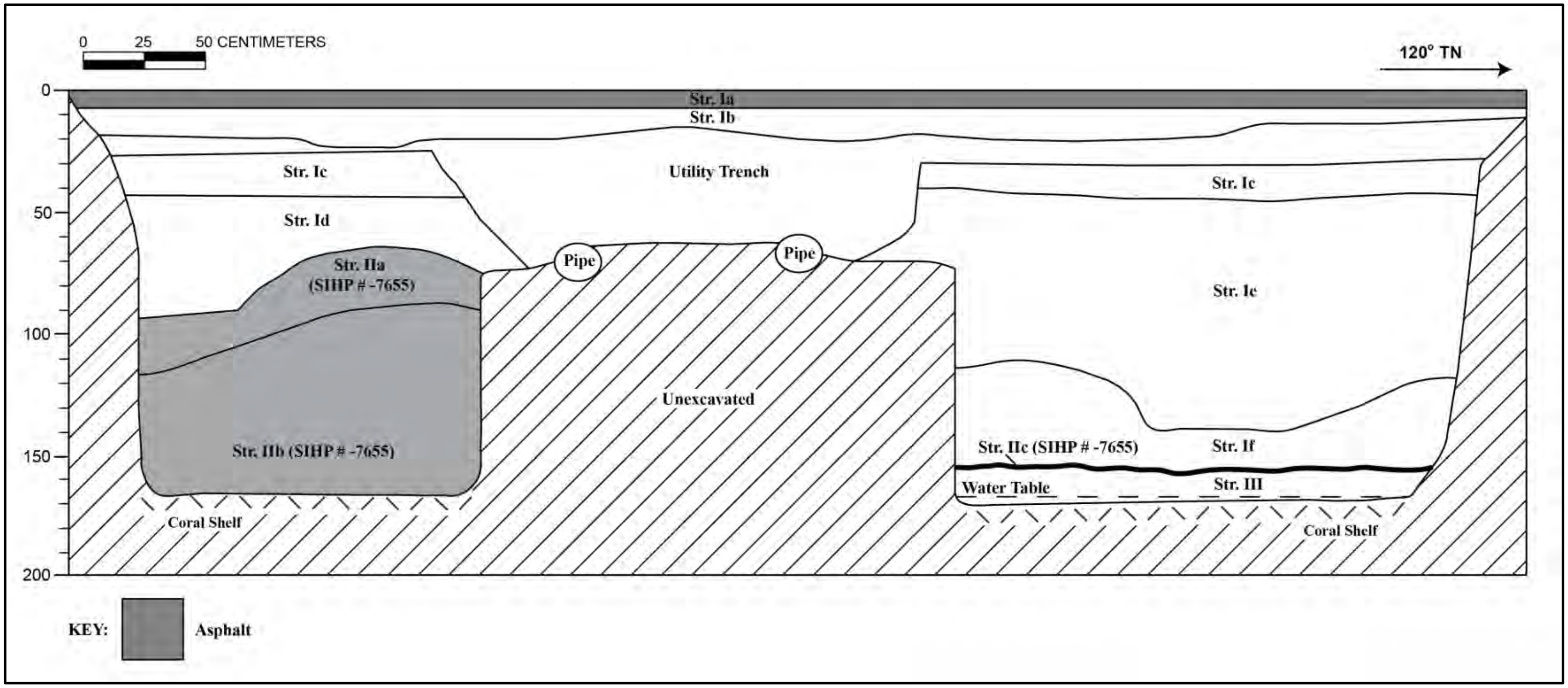

Figure 231. Profile of TE 23 northeast sidewall (Block B East), showing two berm events (Strata IIa and IIb/SIHP # -7655)

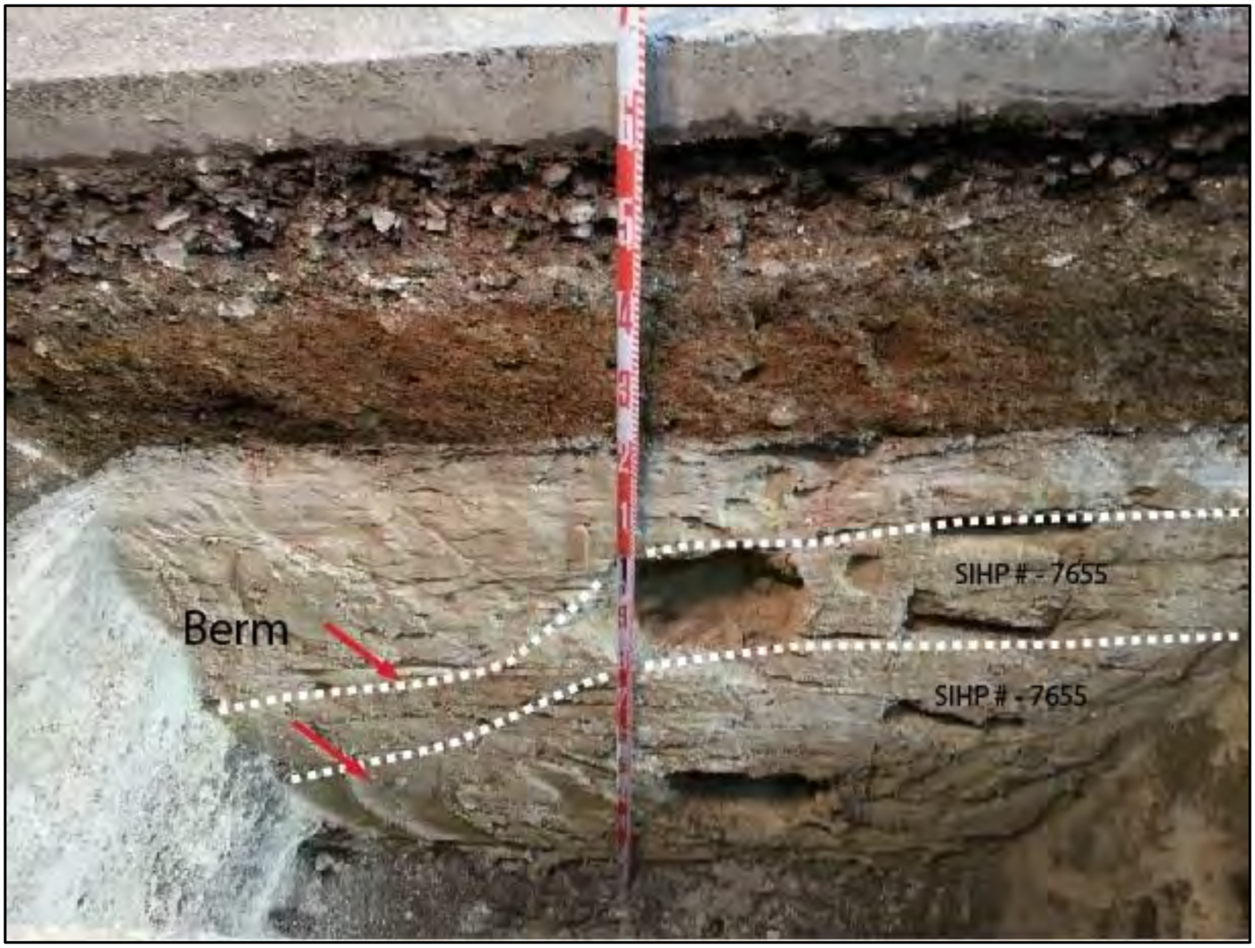

Figure 232. Photograph of the northwest end of the TE 23 northeast sidewall, showing the two berm building events (Strata IIa and IIb), SIHP # -7655

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.

6.1.1.4 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 233 through Figure 236). 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 237 and Figure 238). 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.

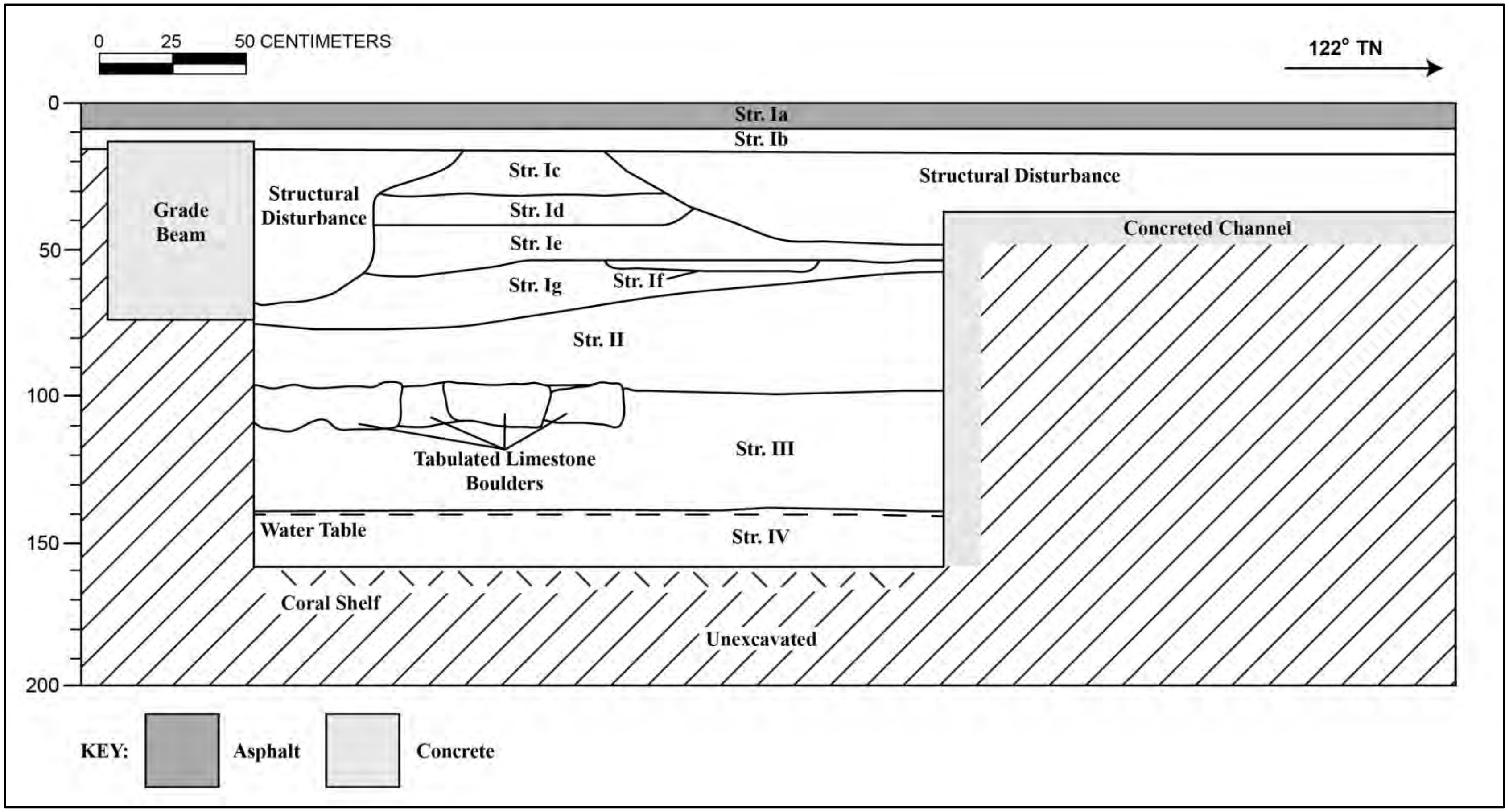

Figure 233. Profile of TE 15 northeast sidewall (Block B East), showing a berm event over tabular limestone from Feature 1(Strata IIa and IIb/SIHP # -7655)

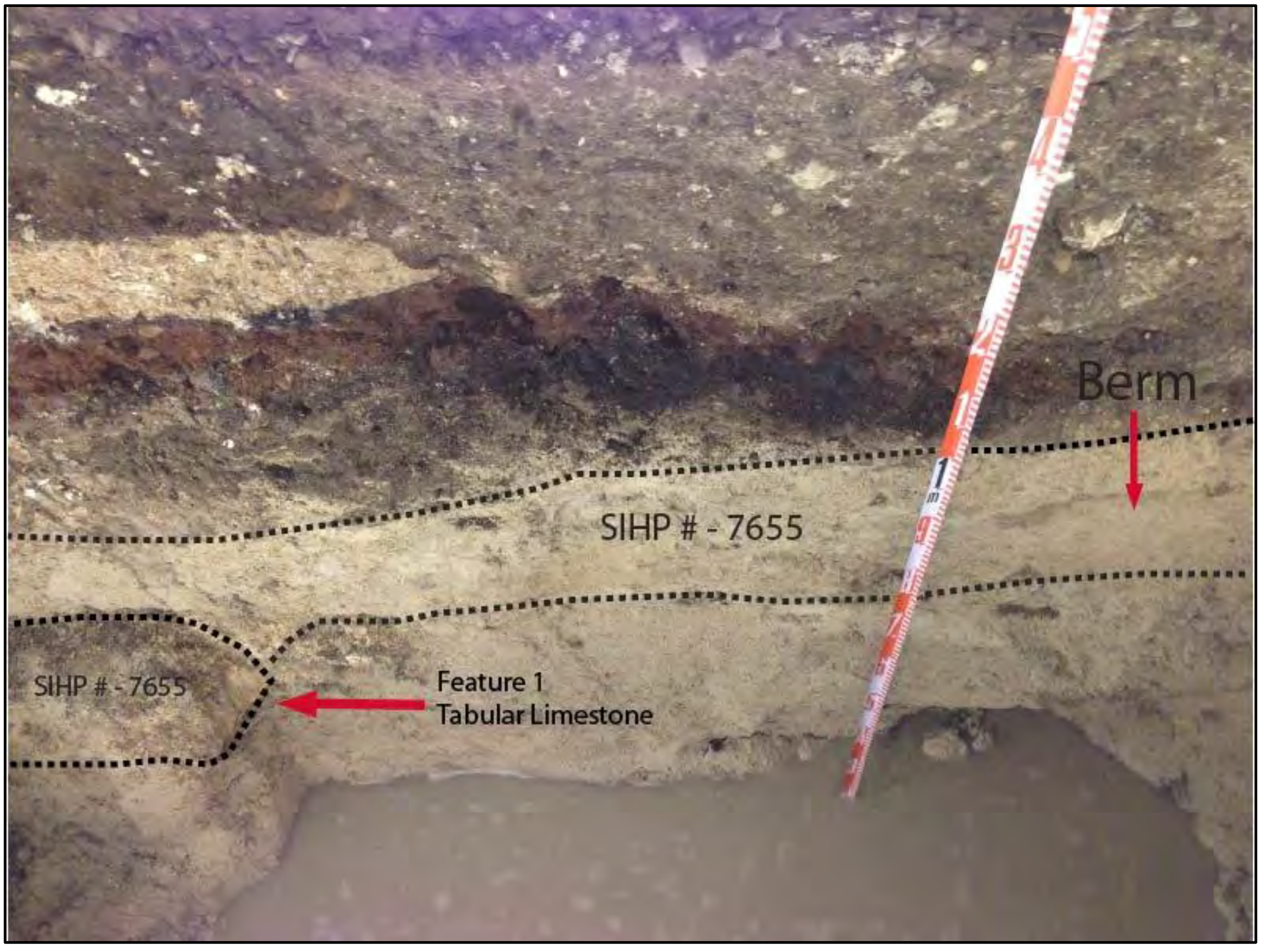

Figure 234. Photograph of TE 15 northeast side wall (Block B East), showing a berm event over tabular limestone from Feature 1(Strata IIa and IIb/SIHP # -7655)

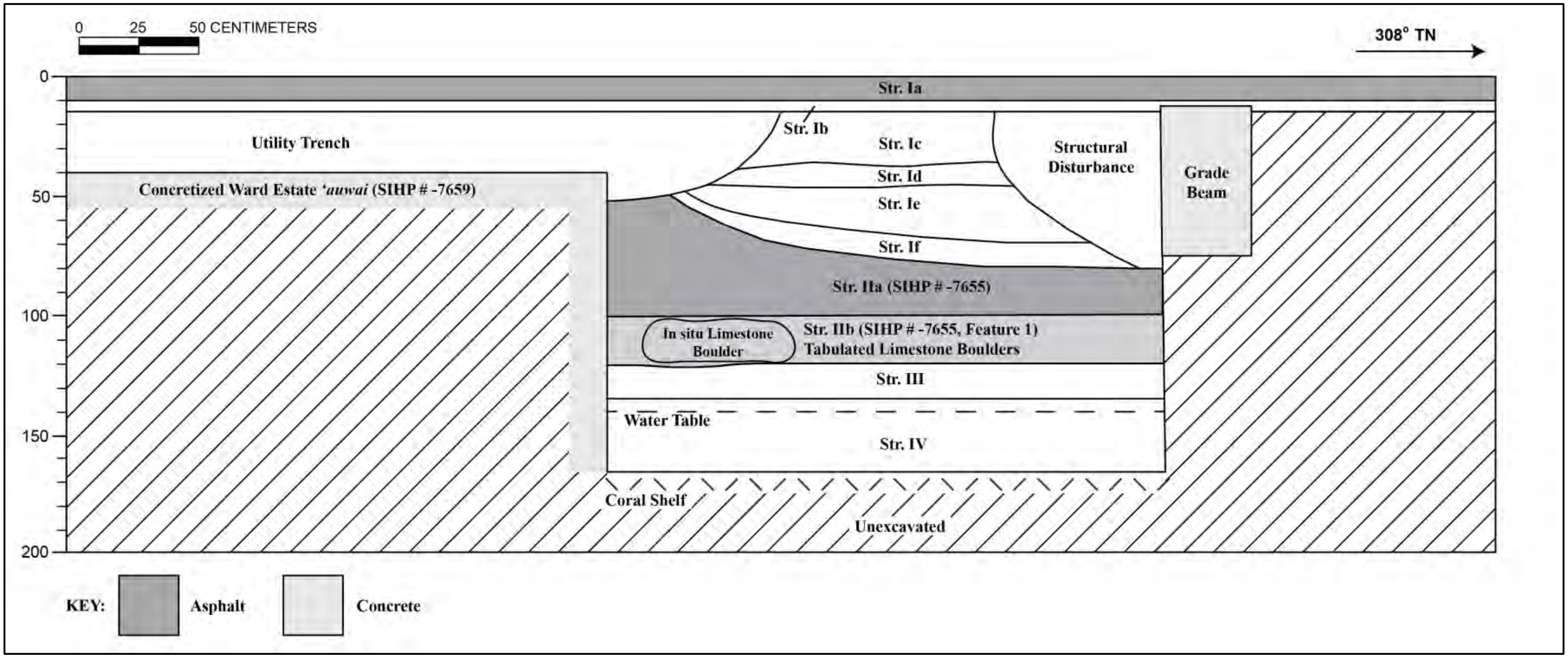

Figure 235. Profile of TE 17 southwest wall (Block B), showing the Ward *‘auwai* (SIHP # -7659) laterally associated with a berm event in Stratum IIa (SIHP # - 7655) over tabular limestone boulders in Stratum IIb (SIHP # -7655

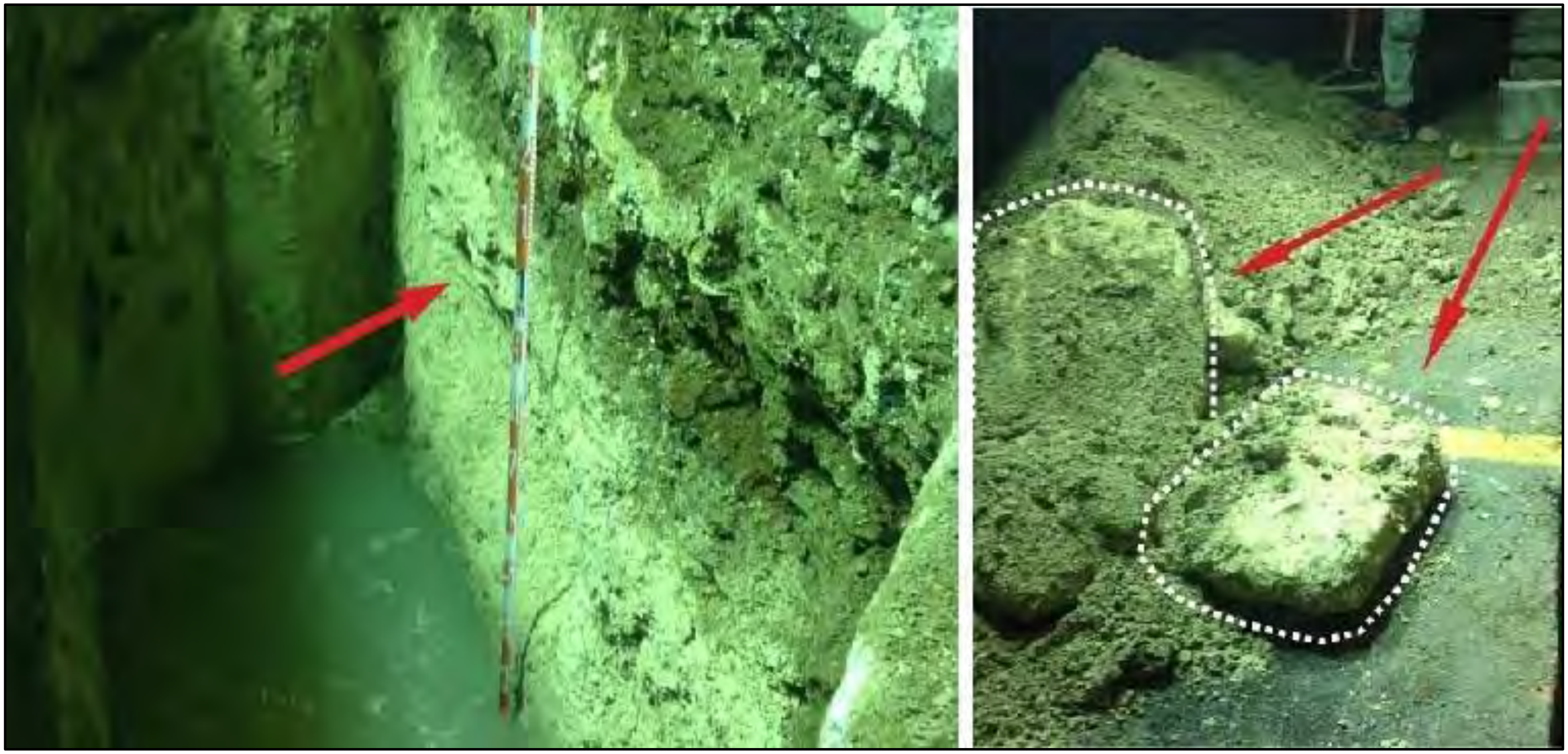

Figure 236. (Left) Photograph of TE 17 southwest wall (Block B), showing the location of tabular limestone boulders in Stratum IIb (SIHP # -7655); (Right) Photograph of tabular limestone after removal from TE 17

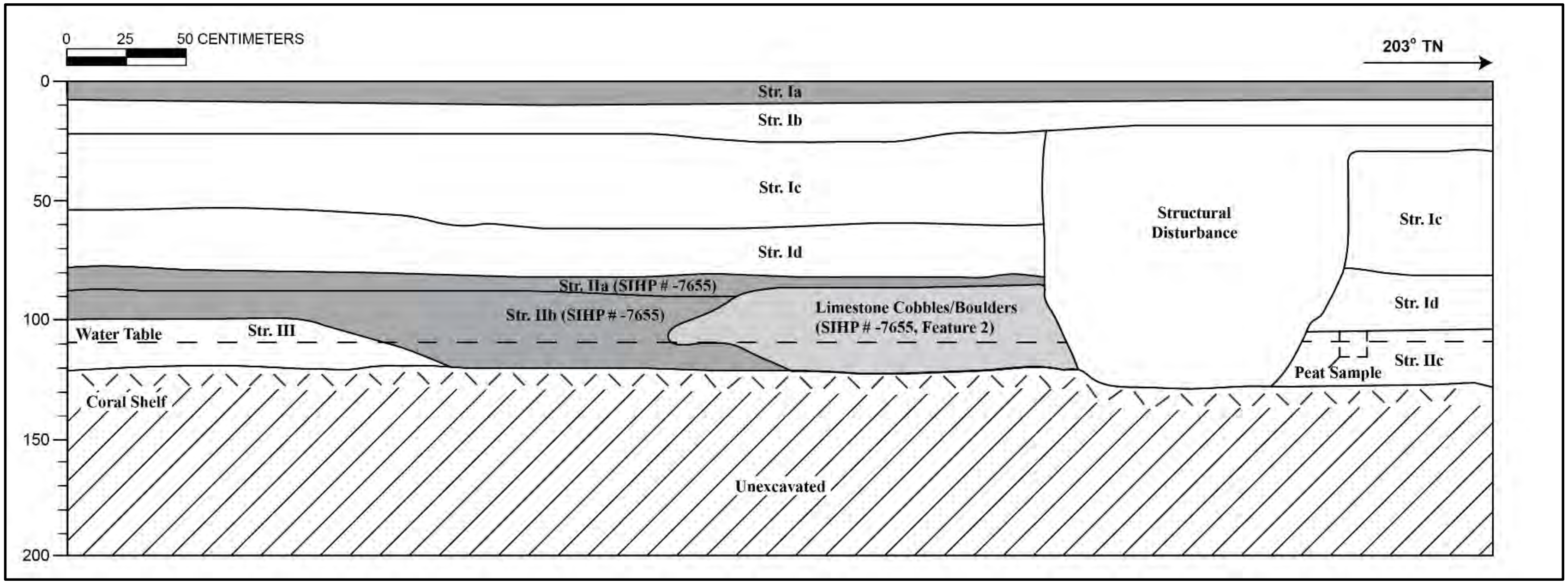

Figure 237. Profile of TE 38 east wall (Block B), showing the limestone boulders and cobbles of Feature 2 (SIHP # -7655) located at the edge of a salt pan berm in Strata IIa and IIb (SIHP # - 7655).

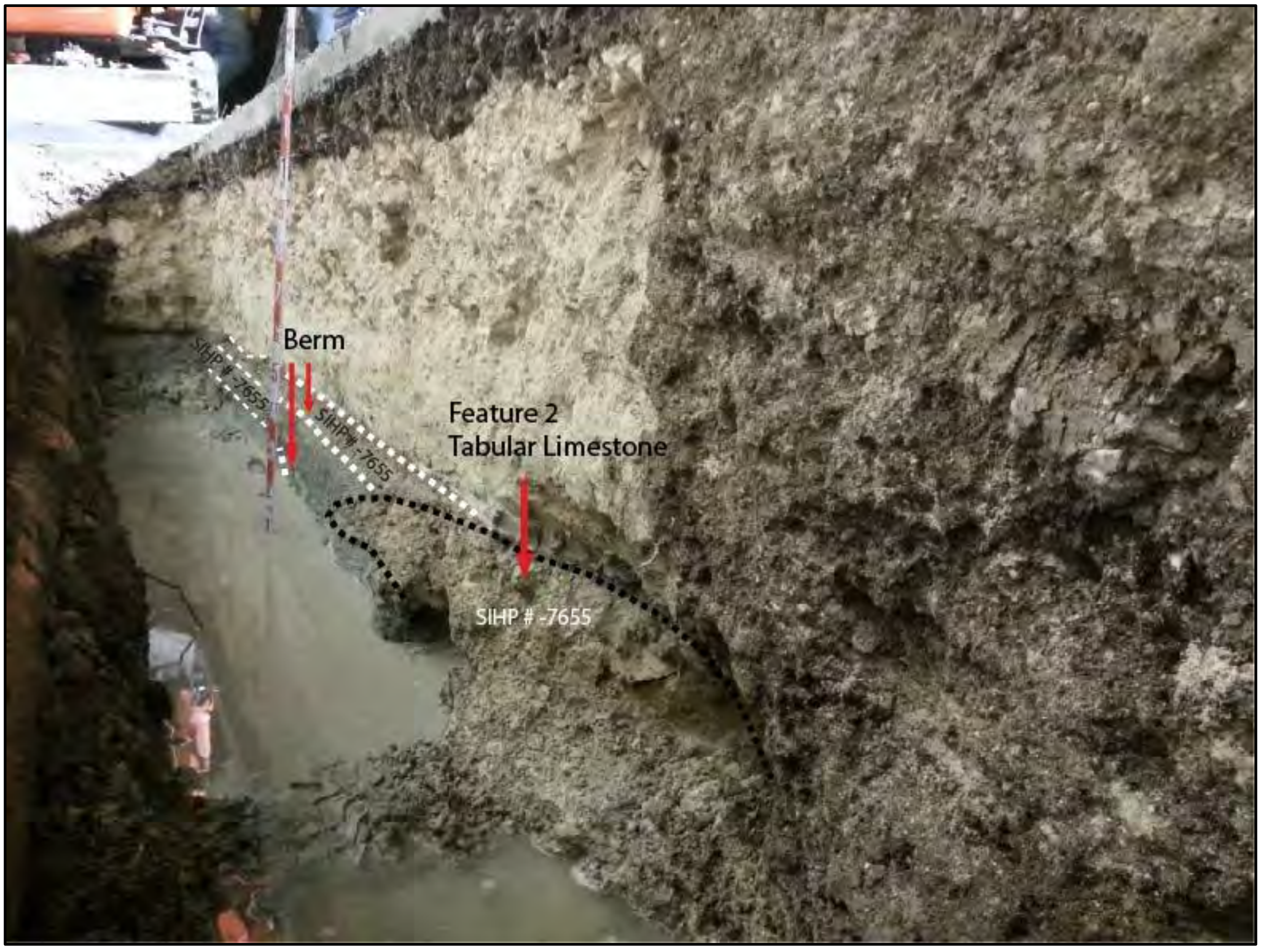

Figure 238. Photograph of TE 38 east wall (Block B), showing the limestone boulders and cobbles of Feature 2 (SIHP # -7655) located at the edge of a salt pan berm in Strata IIa and IIb (SIHP # - 7655).

6.1.2 Salt Pan Beds Description

6.1.2.1 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 239 through Figure 244). 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 245 and Figure 246). 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 247 and Figure 248). 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 249 and Figure 250).

Figure 239. Photograph of laminated organic deposit within TE 21 (Block B East) (Stratum II/ SIHP # -7655), measuring 3 cm thick

Figure 240. 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 241. Close-up of laminated layer within the TE 1 sidewall (Block C West) (Stratum IIb/ SIHP # -7655), overlying natural wetland sediments

Figure 242. 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 243. Photograph of laminated organic deposit within TE 23 (Block C West) (Stratum II/ SIHP # -7655), measuring 1 cm thick

Figure 244. Close-up photograph of multiple laminated deposits within TE 14 (Block C West) (Stratum II/ SIHP # -7655)

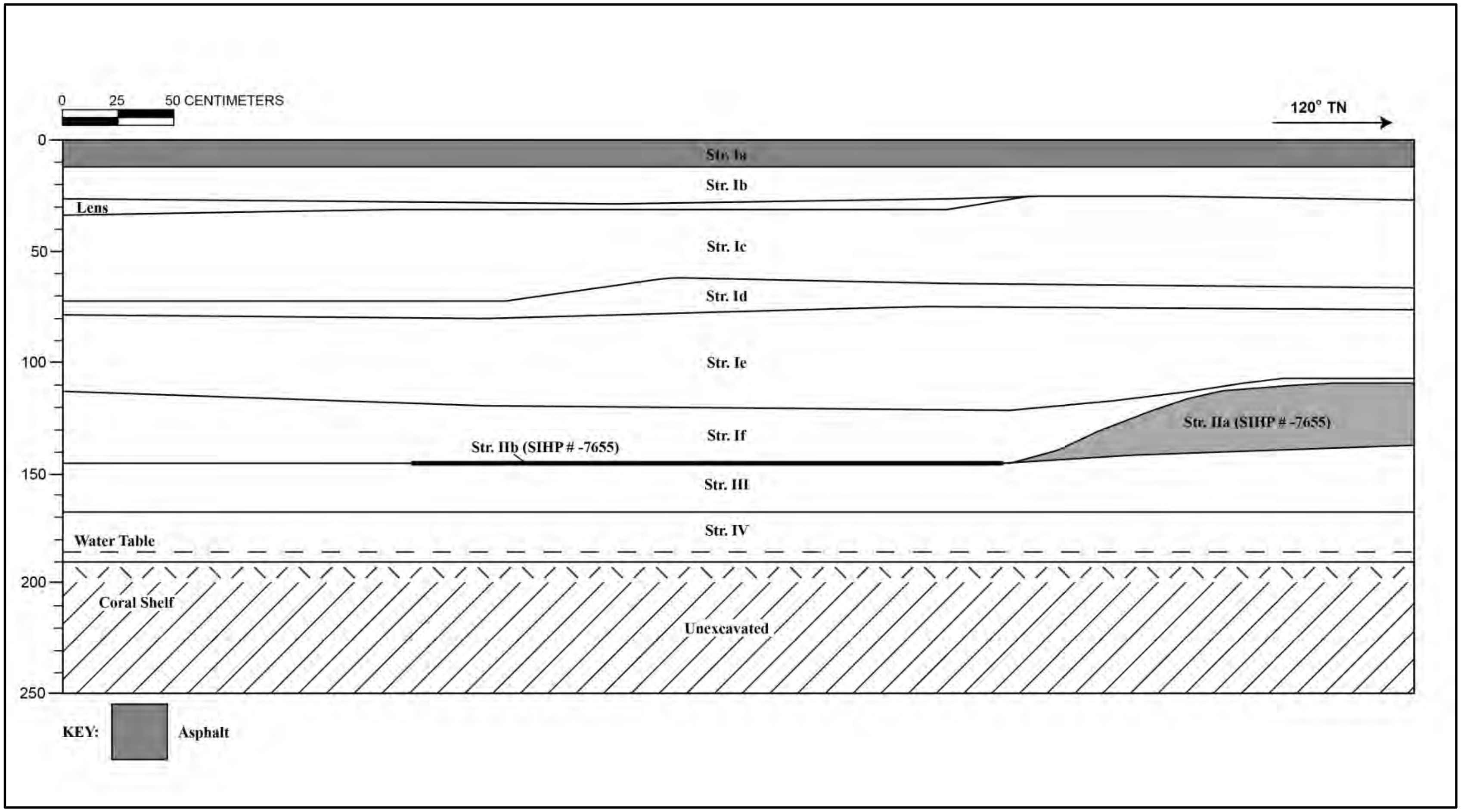

Figure 245. Profile of TE 7 northeast wall (Block C West), the showing the laminated organic deposit (Stratum IIb/SIHP # -7655) located 43 cm above the coral shelf, overlying two in situ, natural sandy clay wetland deposits (Strata III and IV)

Figure 246. 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)

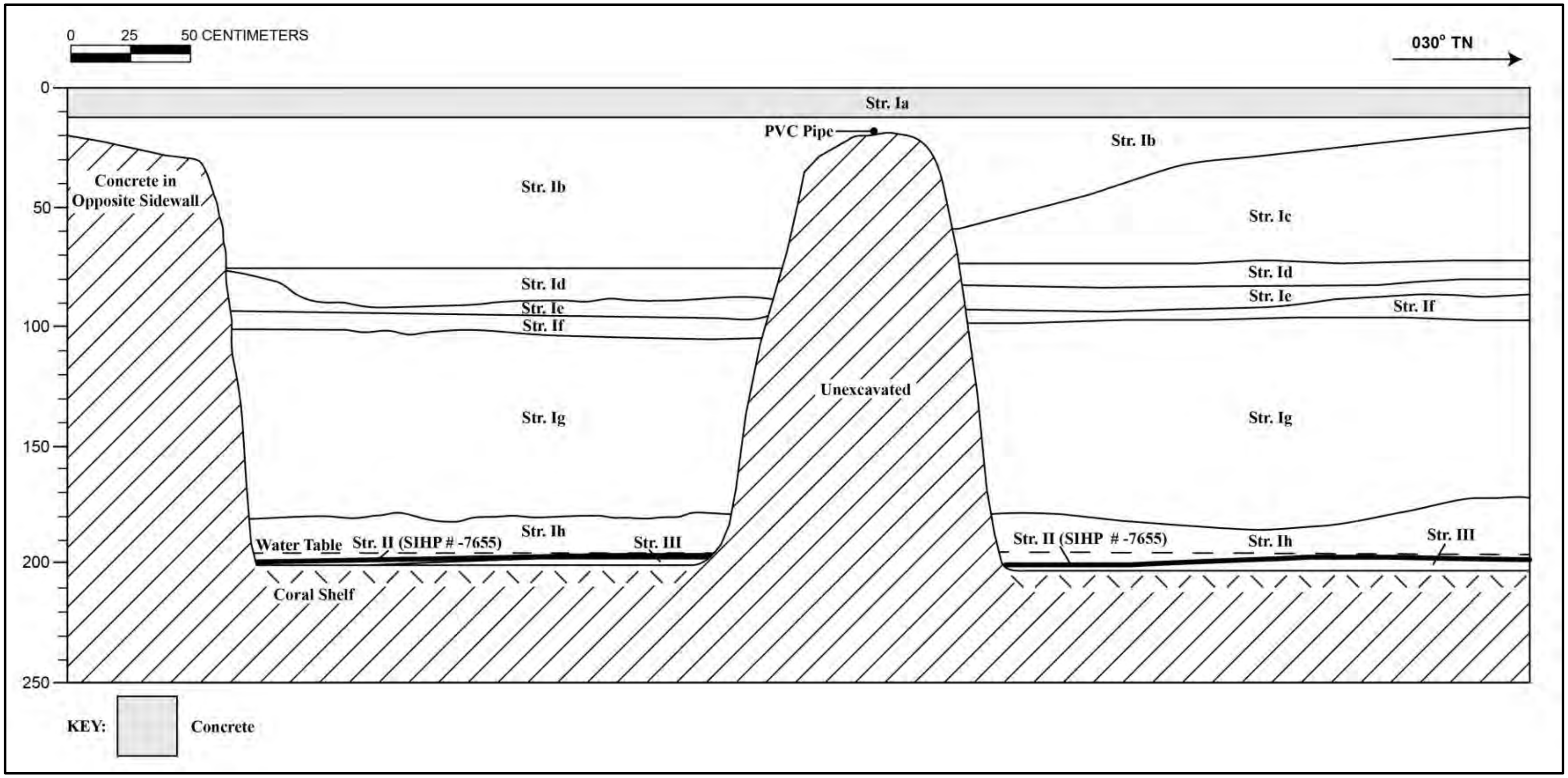

Figure 247. Profile of TE 26 west wall (Block B East), showing laminated organic deposit (Stratum II/SIHP # - 7655), approximately 4 cm above the coral shelf

Figure 248. Photograph of TE 26 west wall, showing laminated organic deposits (Stratum II/SIHP # -7655), just above the coral shelf

Figure 249. 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 250. Photograph of multiple layers of laminated organic material within TE 14 (Block C West) (Stratum II/SIHP # -7655)

6.1.2.2 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.

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.

6.1.3 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 and is presented in Appendix E (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).

6.1.3.1 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*) (Figure 207). *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.

6.1.4 Comparison with Other Salt Pan Historic Properties within Kakaʻako

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 Kakaʻako area (Hammatt 2013; and Morriss et al. 2013; Pammer et al. 2011).

Within the western portion of Kakaʻako, 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 251). The identified salt pan remnants consisted of alternating layers of clay and peat overlying natural marine clay (Figure 252). 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]

Similar potential salt pan stratigraphy was subsequently identified within Pohukaina Street by Hammatt (2013) during the Honolulu High-Capacity Transit Corridor Project AIS (Figure 253). 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 254, Figure 255). 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 256, Figure 257).

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.

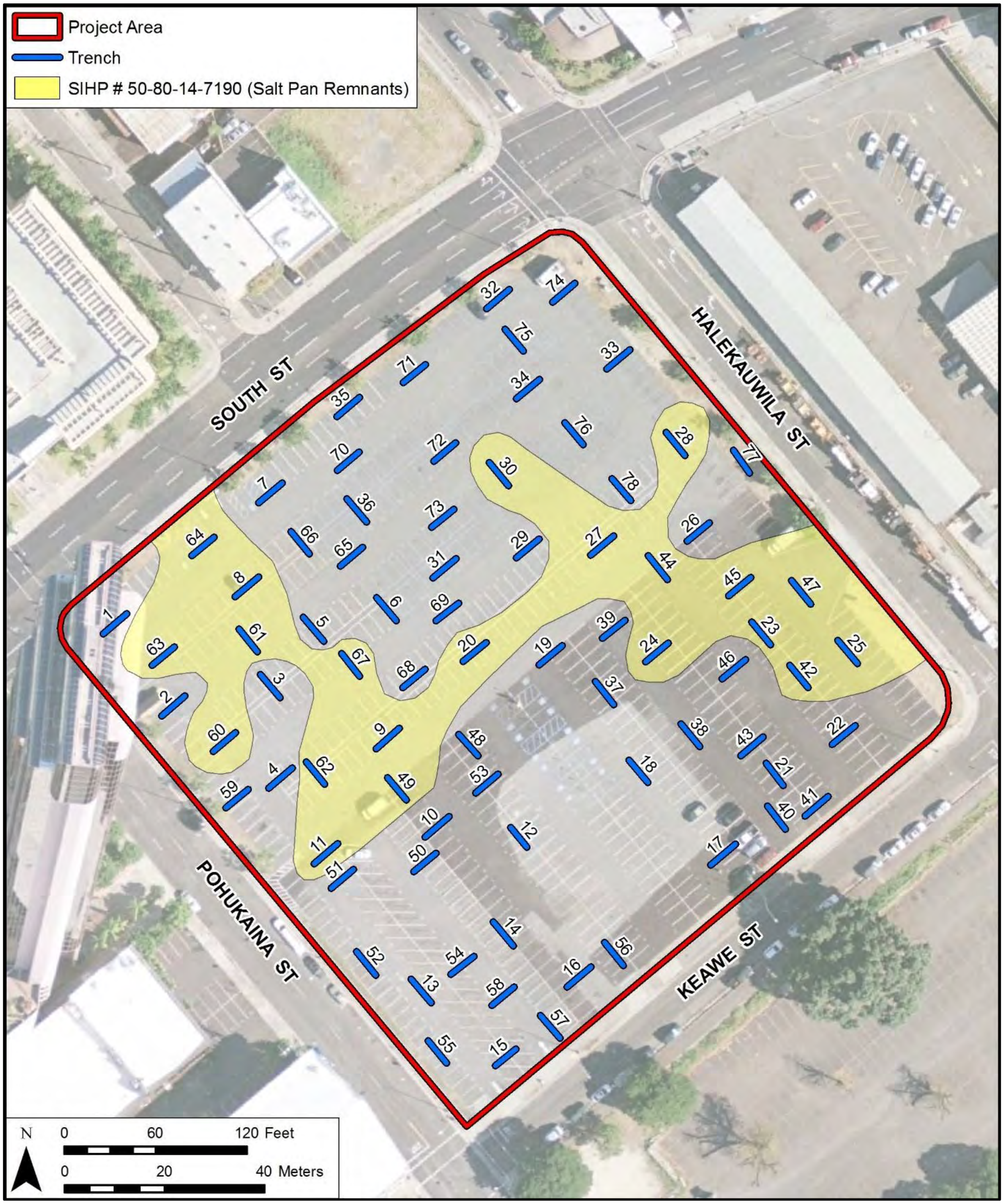

Figure 251. Figure from the Pammer et al. (2011) AIS report showing the location of potential historic salt pan remnants within western Kaka‘ako

Figure 252. Photograph of Test Trench 45 (Pammer et al. 2011) showing dark peat alternating with the lighter colored clay

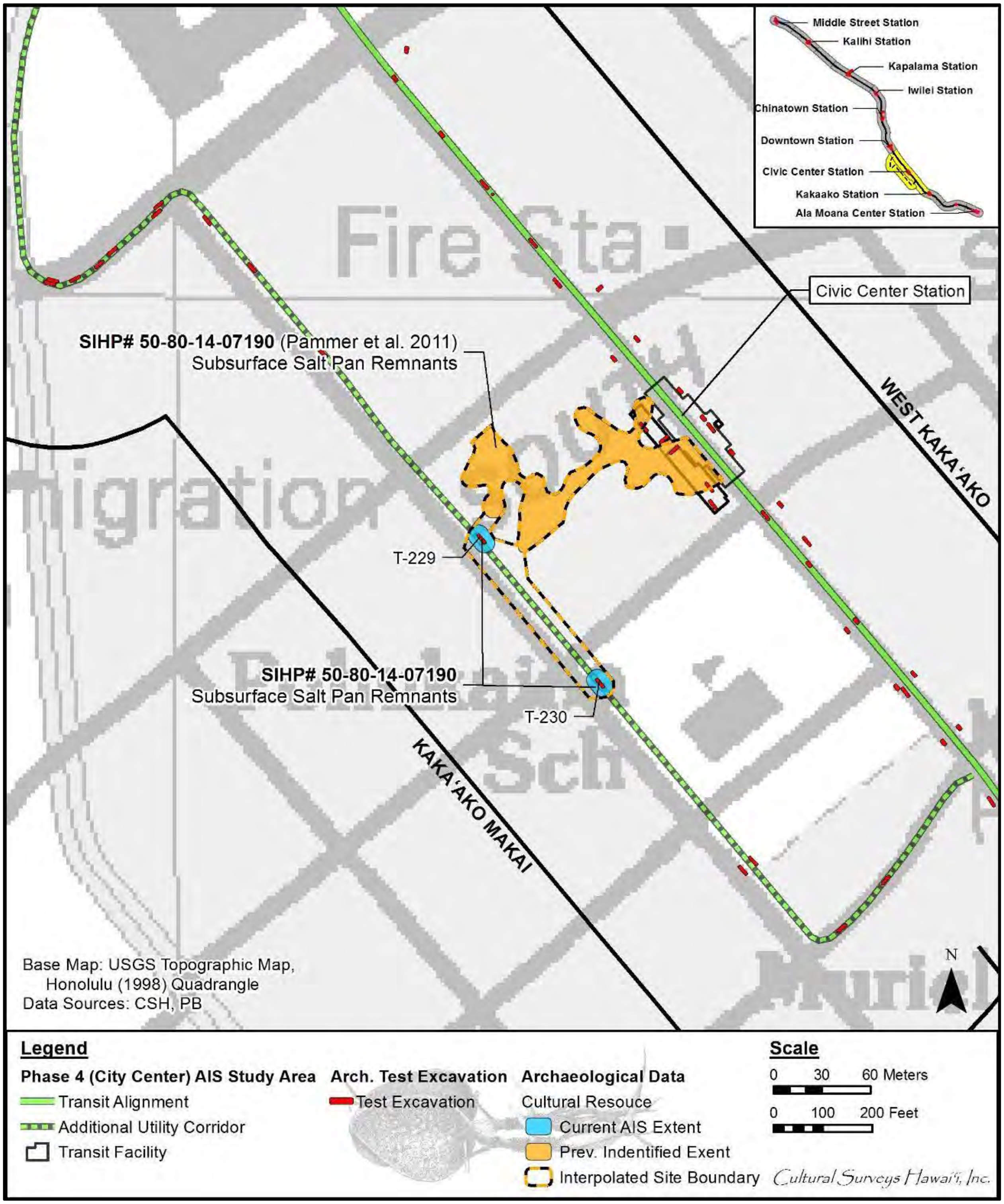

Figure 253. Figure from the Honolulu High-Capacity Transit Corridor Project AIS report, showing the location of SIHP # -7190 as identified by Pammer et al. (2011) and extended by Hammatt (2013)

Figure 254. Photograph of T-230 (Hammatt 2013), showing Stratum II clay and peat salt pan sediments (SIHP #-7190

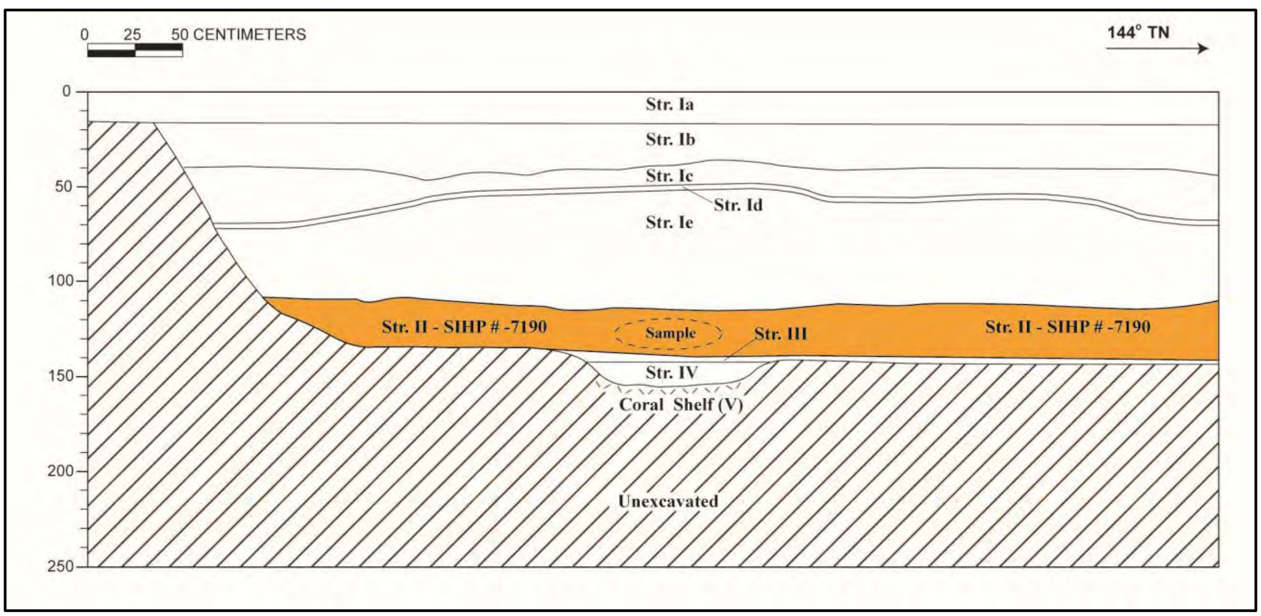

Figure 255. Profile of T-230 northeast wall (Hammatt 2013), showing Stratum II salt pan sediments (SIHP #-7190)

Figure 256. 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)

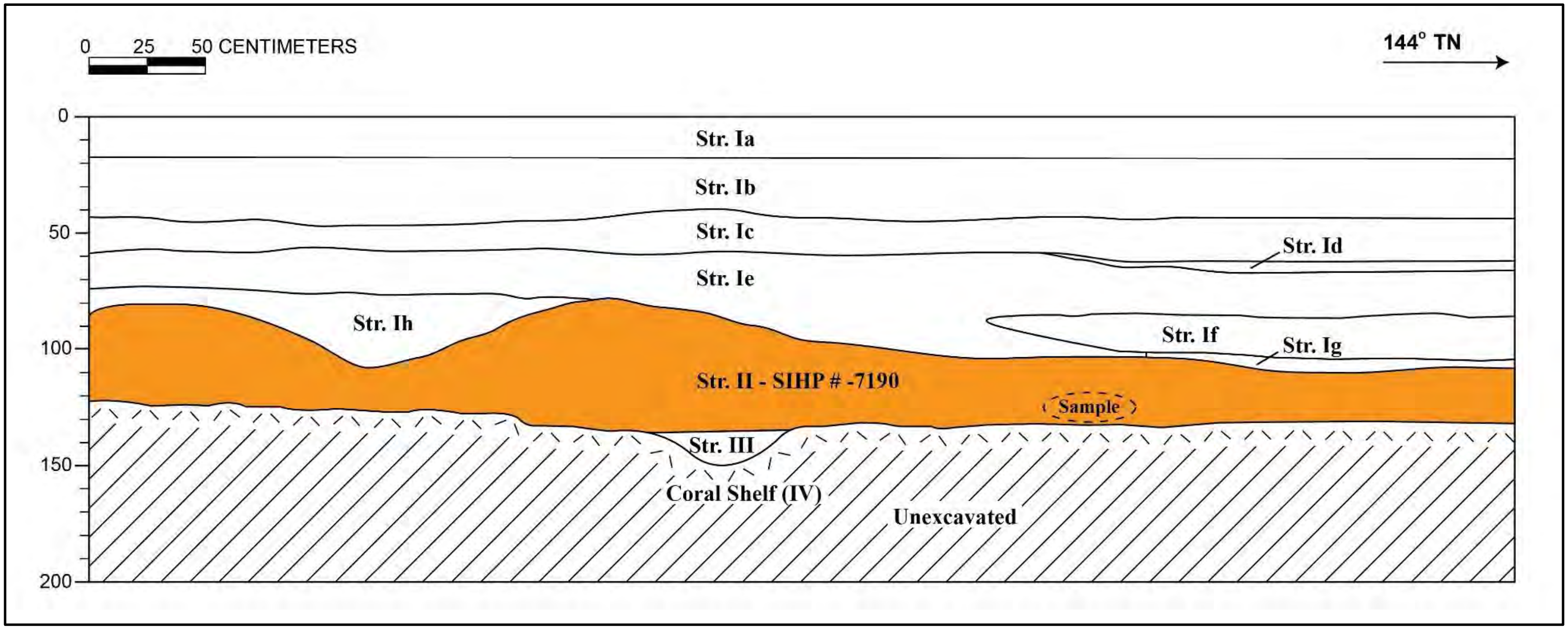

Figure 257. Profile of T-229 northeast wall (Hammatt 2013), showing a possible salt pan berm (Stratum II) designated as a component of SIHP #-7190

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 258). 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]

6.1.5 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.

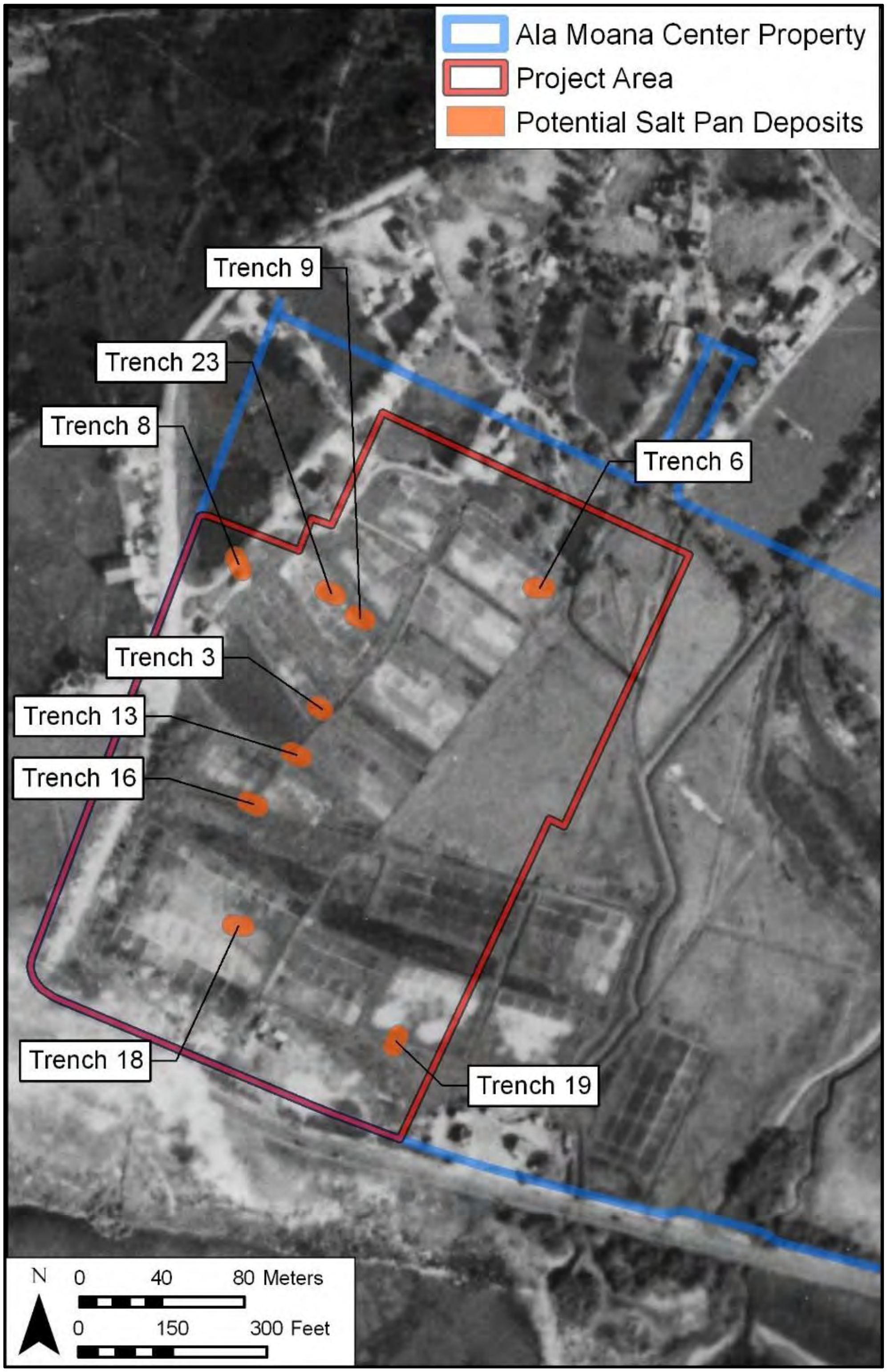

Figure 258. Figure showing the location of potential historic salt pan remnants documented by Morriss et al. (2013) within the Ala Moana Shopping Center area

6.2 SIHP # 50-80-14-7656

FORMAL TYPE:	Human skeletal remains
FUNCTION:	Burial (disturbed)
NUMBER OF FEATURES:	1
AGE:	N/A
TEST EXCAVATIONS:	Test Excavation 31
TAX MAP KEY:	[1] 2-3-001:005 (por.)
LAND JURISDICTION:	Private; Howard Hughes Corporation (HHC)
PREVIOUS DOCUMENTATION:	N/A

SIHP # -7656 consists of a previously identified human skeletal fragment, encountered near the western end of Test Excavation 31 (Figure 157 and Figure 158). SIHP # -7656 was discovered during exploration of Test Excavation 31, within a disturbed and reworked sand layer (Stratum II).

SIHP # -7656 consists of an isolated cranial fragment, observed at 0.72 mbs. No associated pit feature was observed; however, the sand was carefully inspected and hand troweled. The fragment was positively identified by a qualified osteologist. Following the complete excavation of TE 31, a clean sand pedestal was constructed at 0.8 mbs and lined with *tī* leaves. The fragment was wrapped in muslin, secured in a *lauhala* basket, and placed on the pedestal by the on-site cultural monitor. Clean sand was then deposited over the basket, followed by a wooden board and additional clean sand to the current ground surface. The remaining portions of TE 31 were then backfilled to the current ground surface level. No additional human skeletal fragments or undisturbed Jaucas sand were identified within TE 31 or the surrounding excavations.

SIHP # -7656 appears to be an isolated human cranial fragment. Ethnicity is presumed to be probable Hawaiian based on its geographic context. SIHP # -7586 is assessed as significant under Hawai‘i state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) and criterion “e” (historic property has cultural significance to an ethic group, including, but not limited to, religious structures, burials, and traditional cultural properties) pursuant to HAR §13-284-6. This assessment was based exclusively on the information it has provided and its cultural significance.

Figure 259. Photograph of west end of TE 31, showing interim protection location of the SIHP # -7656 isolated skeletal fragment, view to south

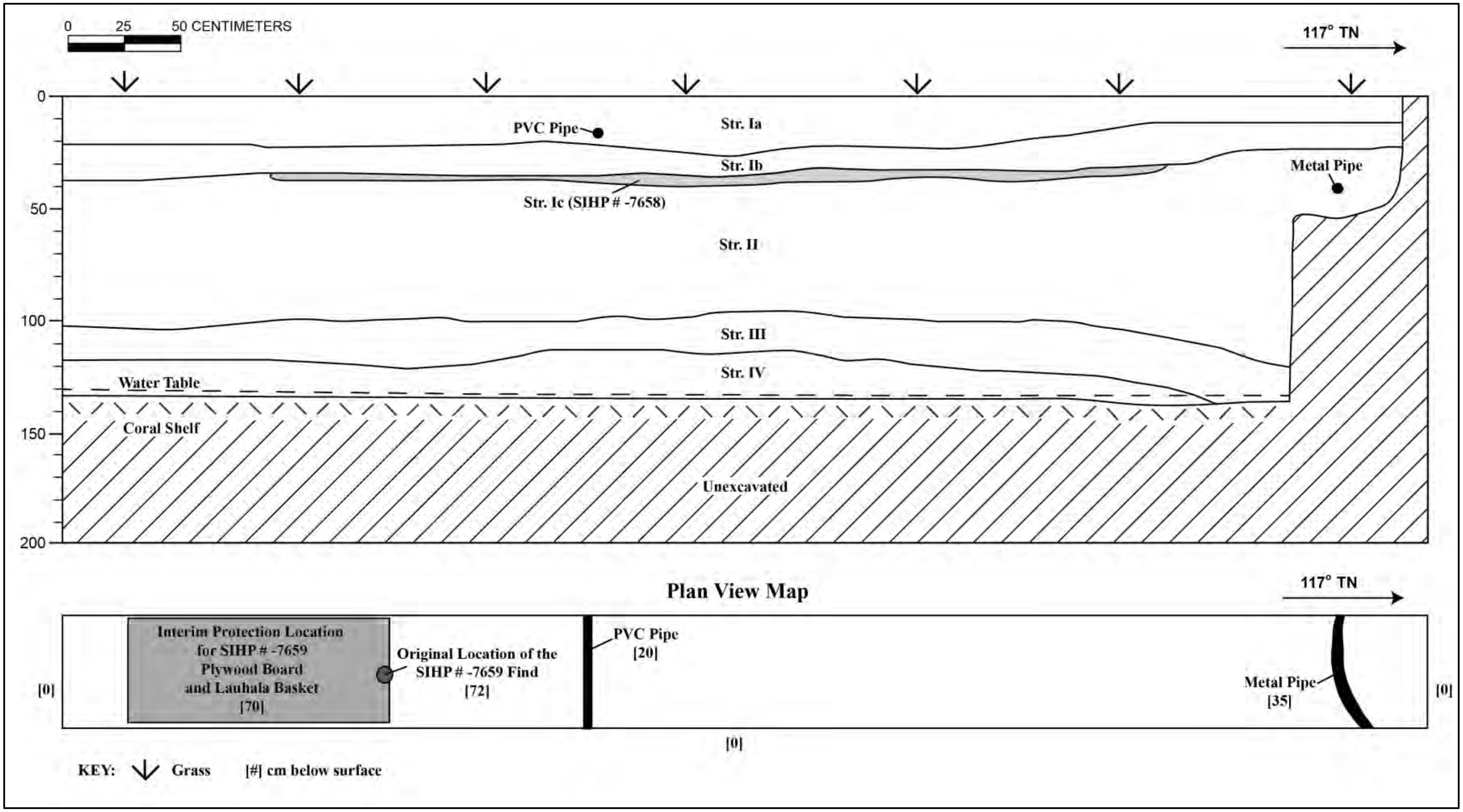

Figure 260. Profile of TE 31, north sidewall, showing the location of the burial find and its interim protection location

6.3 SIHP # 50-80-14-7658

FORMAL TYPE:	Historic buried surfaces
FUNCTION:	Commercial surface
NUMBER OF FEATURES:	42
AGE:	Mid- to late twentieth century
TAX MAP KEY:	[1] 2-3-001:005 (por.)
LAND JURISDICTION:	Private; Howard Hughes Corporation (HHC)

SIHP # -7658 consists of buried structural remnants possibly associated with several periods of development during the late nineteenth to mid-twentieth century. This noncontiguous historic property is distributed throughout the project areas of Block B East and Block C West (Sroat et al. 2014).

SIHP # -7658 is composed of 42 subsurface structures: three buried oil-rolled surfaces, a highly compacted cinder surface, 17 layers of buried asphalt surface, four layers with disturbed asphalt chunks, three layers of buried asphalt surfaces overlying three buried concrete slabs, four buried concrete slabs not associated with an asphalt surface, three buried coral and tar pavement surfaces, and four buried wooden post remnants (Figure 261). There are 18 buried surfaces associated with Block B East and 24 buried surfaces associated with Block C West. Continuity of the structures could not be established except for a concrete surface observed in Block B East Test Excavations (TE) 7 and 37, in which TE 37 intersects TE 7.

From the late nineteenth to the late twentieth century, the project areas of Block B East and C West underwent a variety of changes, including land reclamation and multiple stages of urban development. The subsurface structures are remnants of the numerous building events that took place following infilling associated with the Kewalo reclamation (1919–1926) and prior to the 1976 construction of the current Ward Warehouse structures. Aerial photos were used to aid in estimating a date range for each of the buried surfaces; however, due to the time span between each of the aerial photos, the observed buried surfaces may have been associated with country roads and structures not shown.

SIHP # -7658 contains three buried oil-rolled surfaces within the project areas of Block B East and C West (Figure 262 and Figure 263). Two oil-rolled surfaces were identified in Block B East, located within Test Excavations 18 and 20, at depths ranging from 45 to 50 cmbs. The average thickness of these surfaces was 2-3 cm. The single oil-rolled surface identified in Block C West Test Excavation 17 was found at a depth of 41 cmbs with a thickness of 13 cm. The oil-rolled surfaces were all observed overlying crushed coral fill and hydraulic fill associated with the 1919–1926 land reclamation.

It is difficult to determine the exact time frame related to the oiled surface. No indication of a roadway or paved surface is seen on a 1927 aerial (Figure 264), which shows the two project areas as relatively barren with the white dredge material clearly visible. On a 1939–1941 aerial (Figure 265), the two project areas remain relatively barren, although development can be seen beginning along the western corner of Block B East. By the time a 1952 UH SOEST aerial map was taken (Figure 266), a parking lot in Block B East and a roadway in Block C West were already

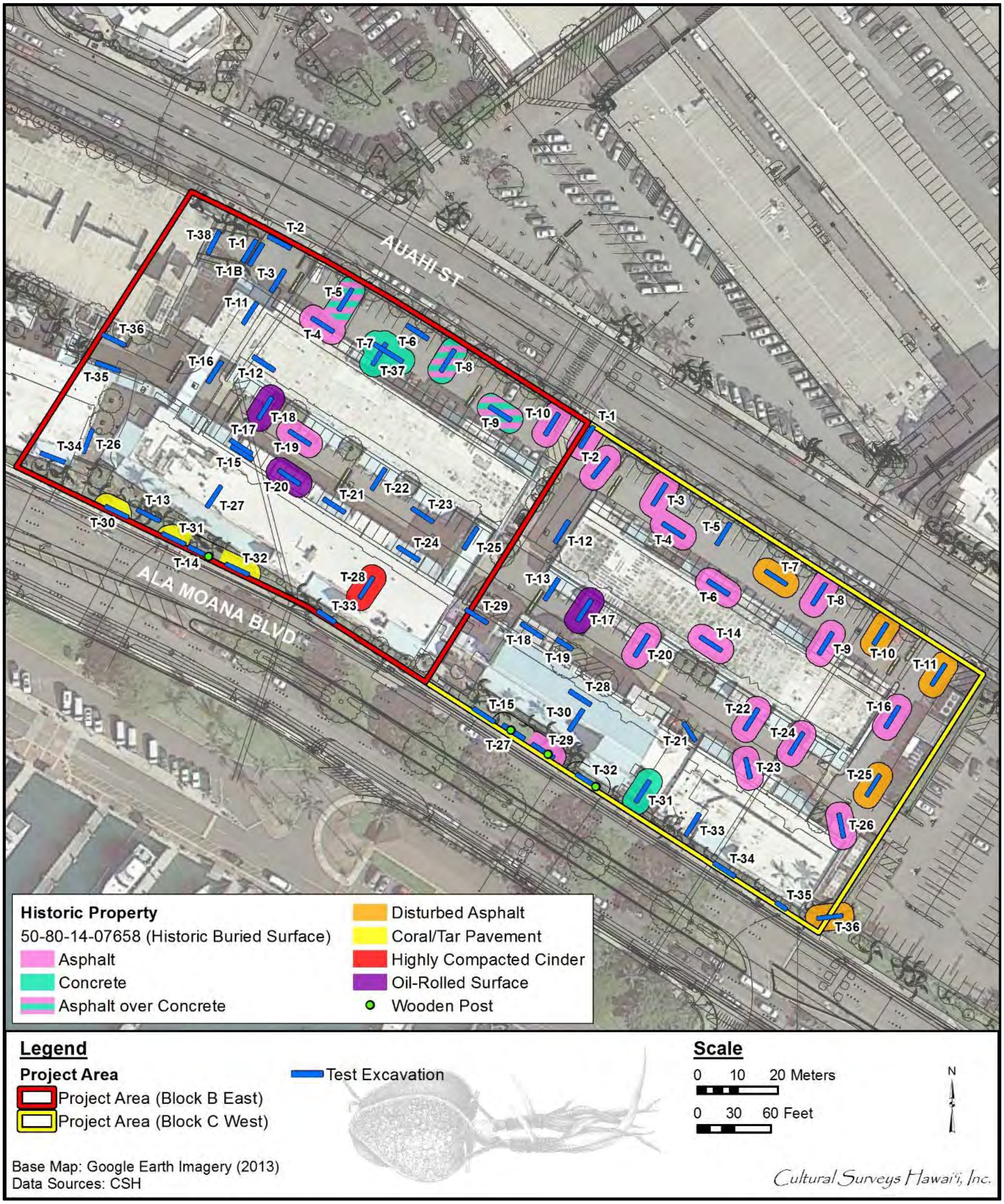

Figure 261. Aerial photograph showing the extent of the historic buried surfaces (SIHP # -7658) documented within the Block B East and Block C West project areas (source: Google Earth Imagery 2013)

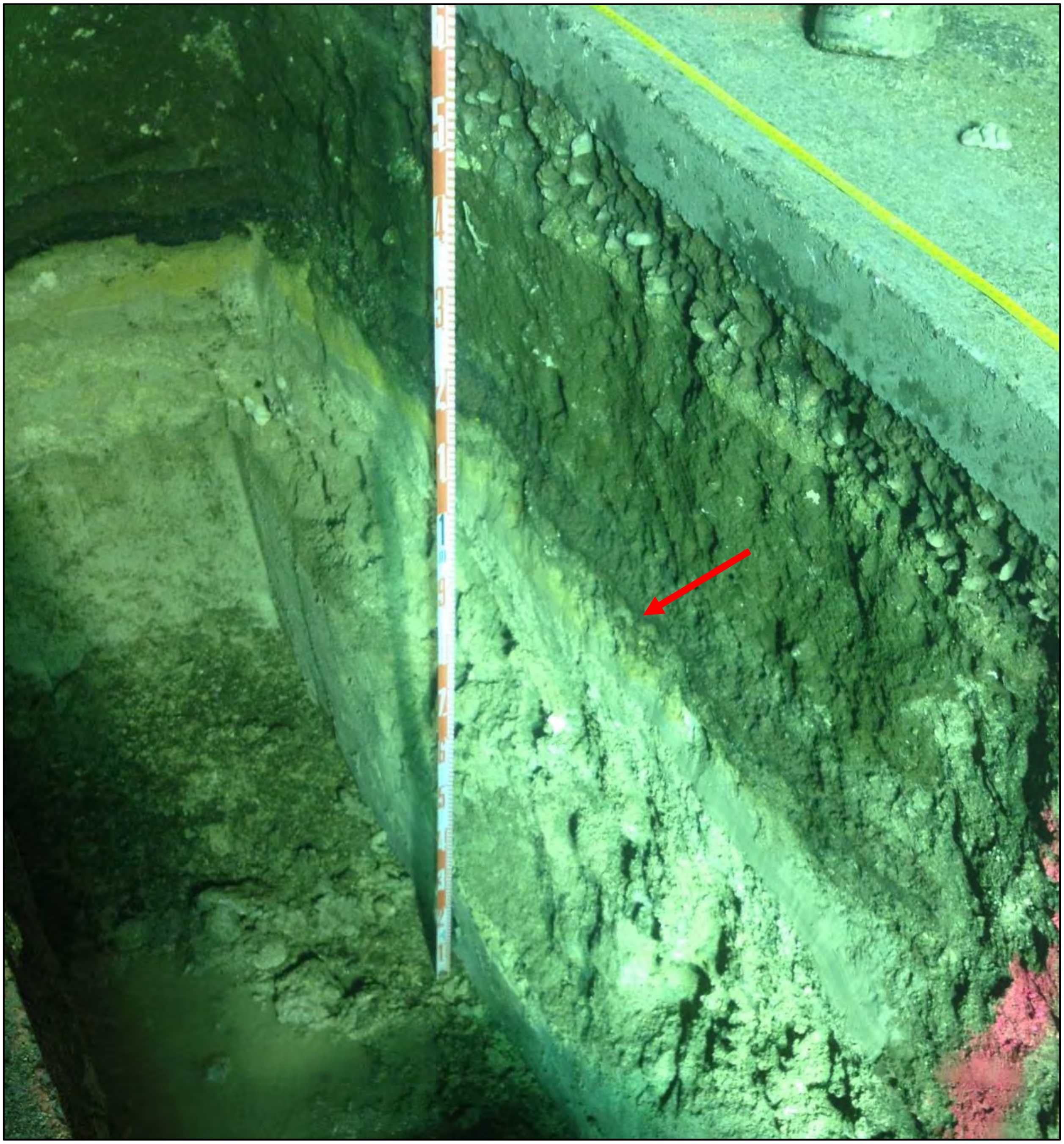

Figure 262. Close-up of an oil-rolled former land surface (SIHP # -7658) within the Block B East TE 20, southwest sidewall, indicated by a red arrow

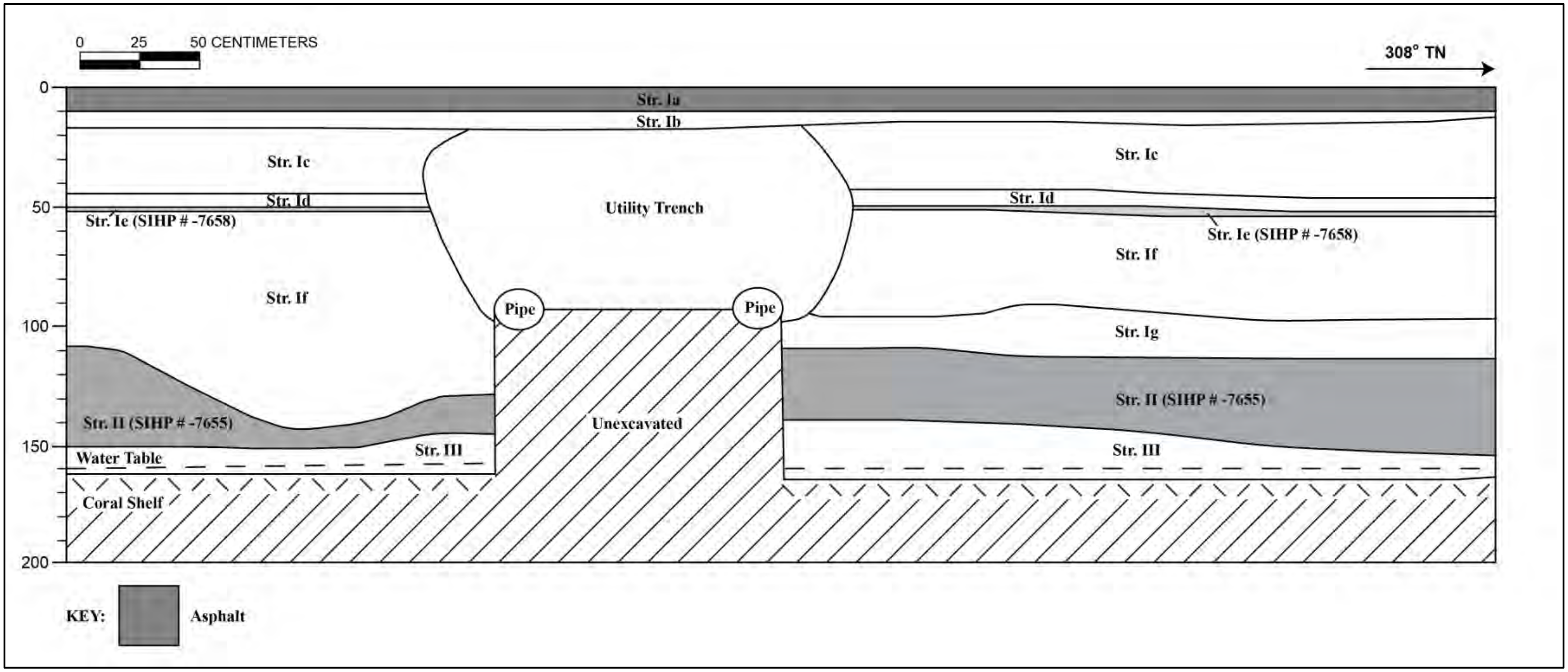

Figure 263. Profile of Block B East TE 20, showing the oil-rolled former land surface (SIHP # -7658) within the, southwest sidewall

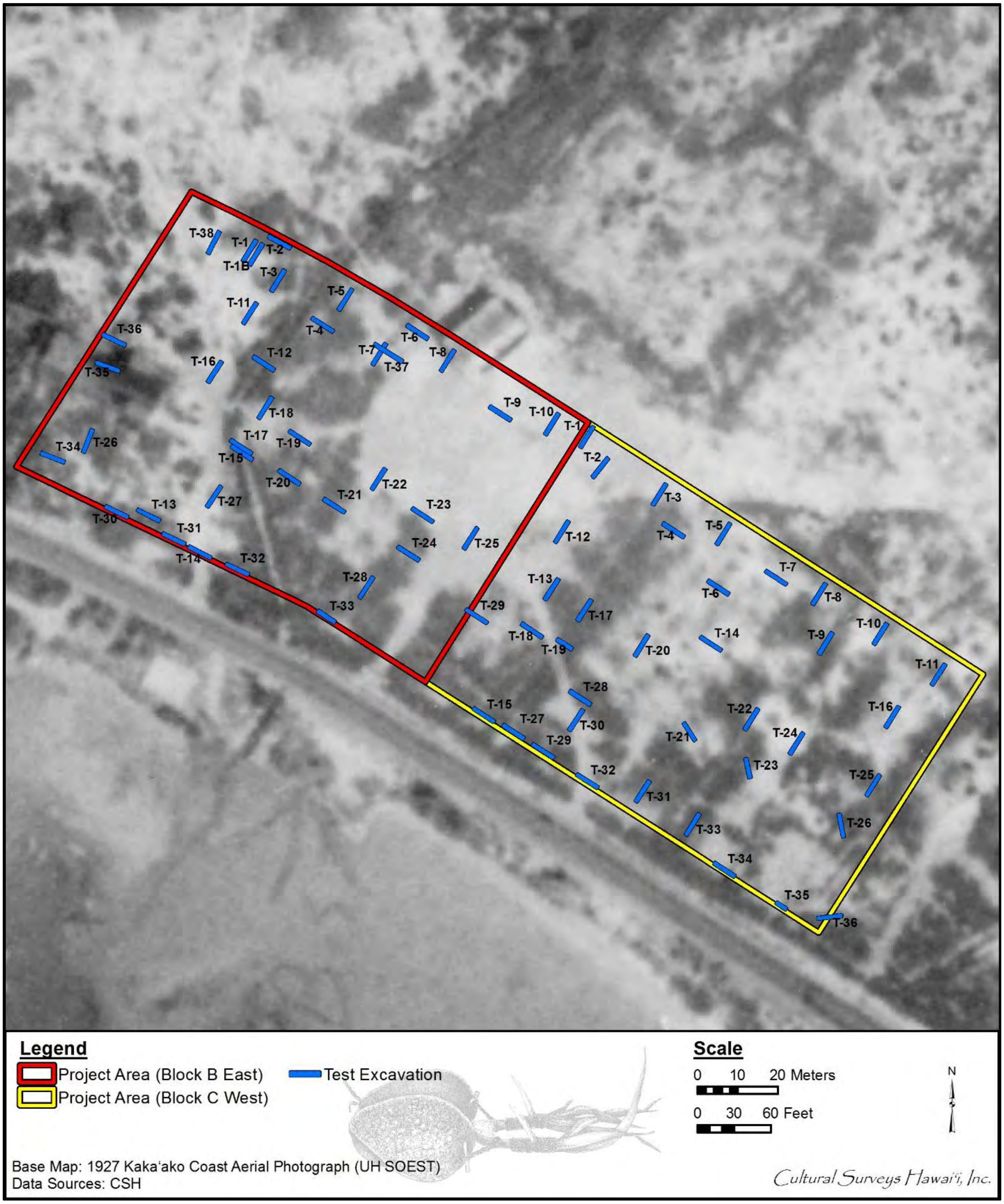

Figure 264. 1927 USGS aerial photograph of the Kaka‘ako area with an overlay of the Block B East and Block C West project areas and test excavations locations (USGS; mosaic of photograph sheets from Hawai‘i Coastal Geology Group)

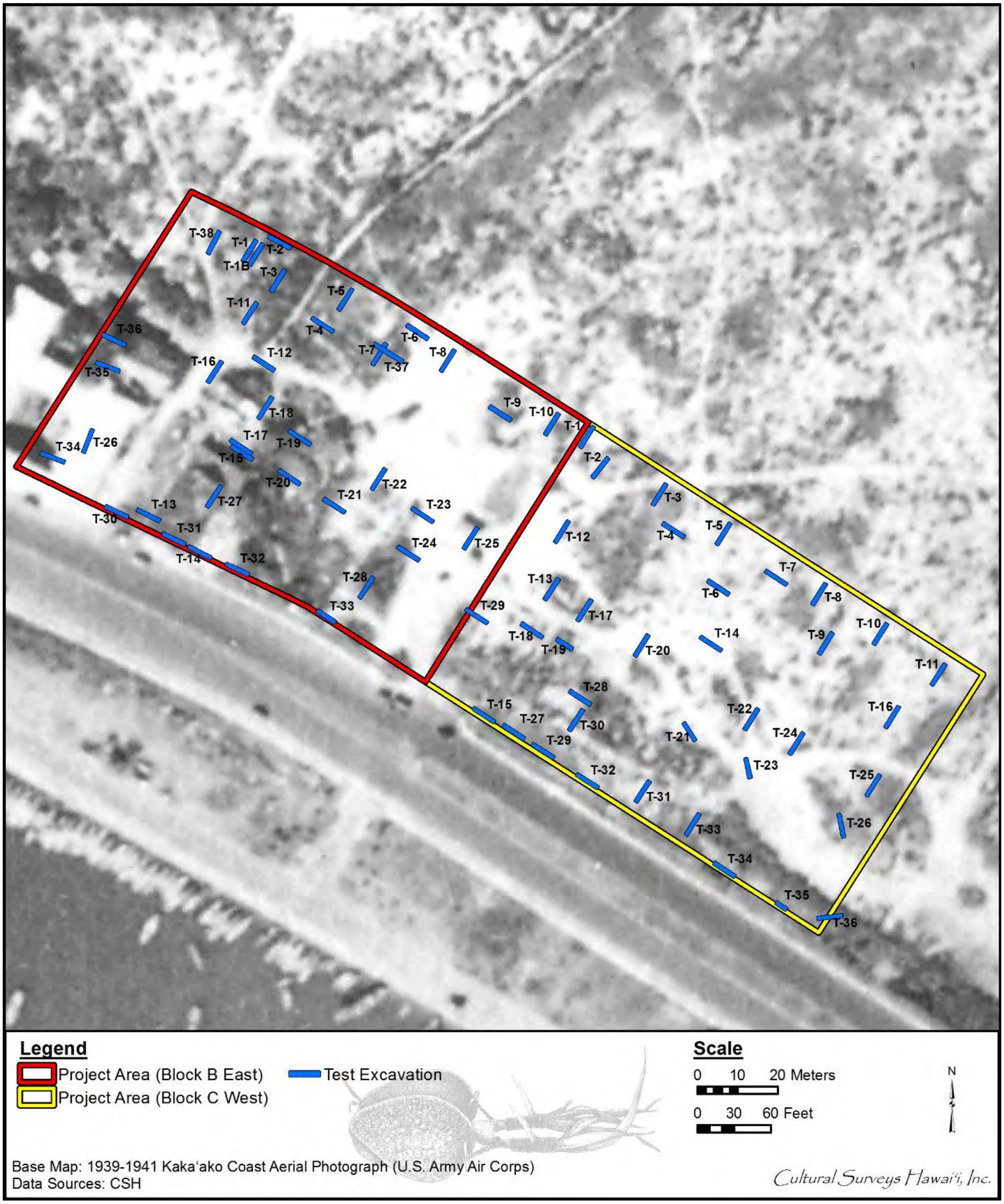

Figure 265. 1939–1941 aerial photograph (U.S. Army Air Corps) of Kakaʻako with an overlay of the Block B East and Block C West project areas and test excavations locations

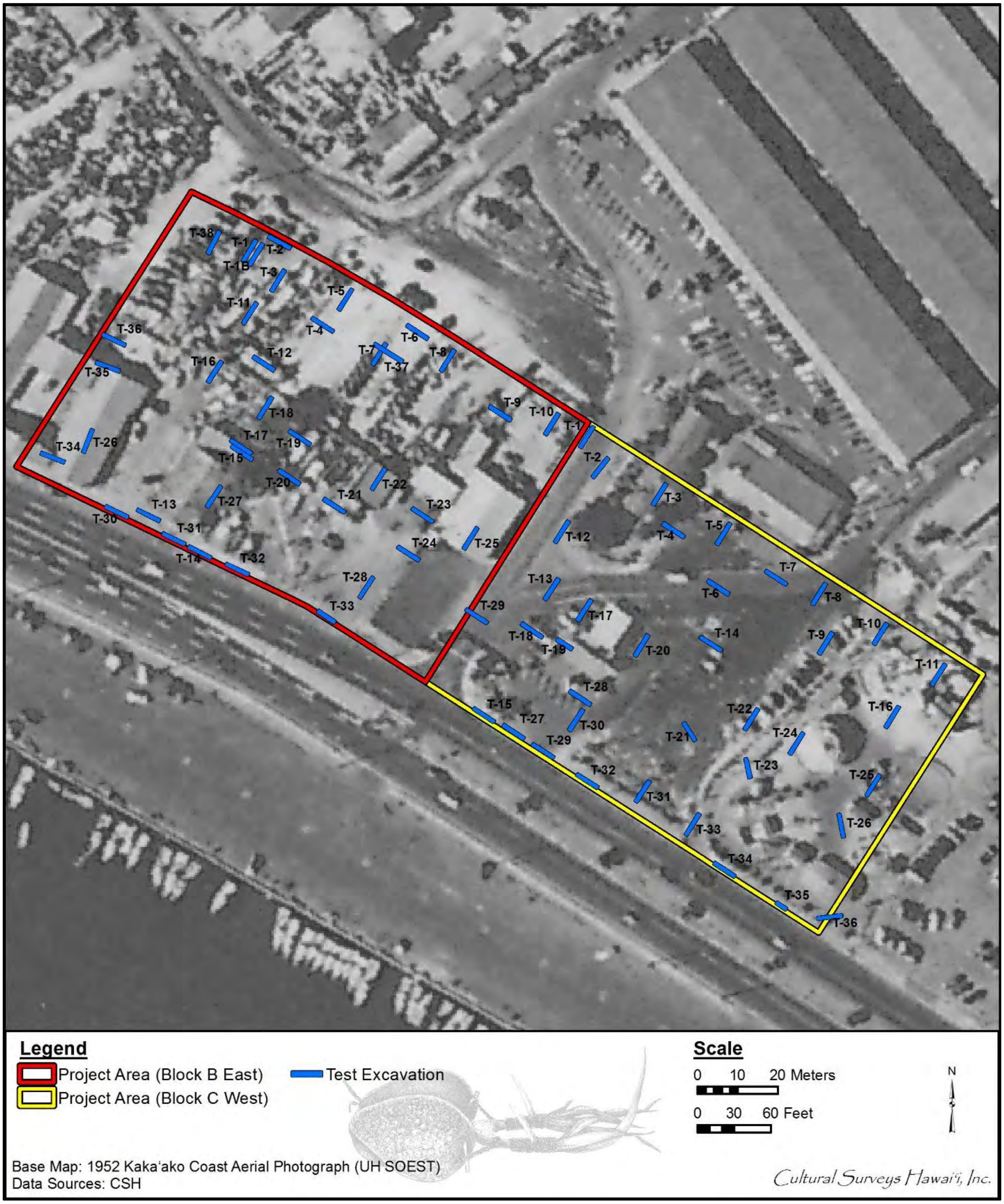

Figure 266. 1952 aerial photograph with an overlay of the Block B East and Block C West project areas and test excavations locations (U.S. Army Air Corps, mosaic of sheets from Hawaiʻi Coastal Geology Group)

constructed, along with several more buildings. If the oiled surface was related to the surfaces seen on the 1952 aerial, it likely would have been more widespread than these three test excavations, suggesting the oil-rolled surfaces likely date between 1927 and 1952.

SIHP # -7658 contains a thin, highly compacted cinder structure observed in Block B East Test Excavation 28, located in the southern portion of Block B East (Figure 268 and Figure 269). The upper boundary of the buried, highly compacted cinder surface in Block B East was observed at 87 cmbs, 125 cm above the coral shelf. Additional components of the buried, highly compacted cinder surface were not identified. The cinder material and associated basalt gravel base course were observed overlying the 1919–1926 land reclamation fill. The first evidence of roadways within the Block B East project area can be seen on the 1952 UH SOEST aerial photograph (see Figure 266); a subsequent 1970 aerial (see Figure 267) depicts a new series of structures and parking areas. Although filling of the project area was complete by 1926, no evidence of a roadway or surface is visible on the 1927 or the 1939–1941 aerial photos (see Figure 264 and Figure 265), suggesting the cinder roadway likely post-dates 1939–1941 and pre-dates construction of the current Ward Warehouse structure (1976).

SIHP # -7658 contains a total of 17 buried asphalt surfaces within the project area boundaries of Block B East and Block C West (see Figure 261). Two of the buried asphalt surfaces were observed in Block B East Test Excavations 10 and 19 (Figure 270 and Figure 271). The upper boundaries of the buried asphalt surfaces in Block B East were observed between 35 and 87 cmbs and between 100 and 130 cm above the coral shelf. Continuity of the buried asphalt surfaces could not be identified and the asphalt surfaces are distributed throughout the project area. Asphalt parking areas are not visible on the 1939–1941 aerial photo (see Figure 265), indicating these surfaces date between 1939 and 1976. The surface may be associated with several parking lots and structures observed on the 1952 (see Figure 266) and 1970 (Figure 267) aerial photos.

Fifteen of the buried asphalt surfaces were observed in Block C West Test Excavations 1, 2, 3, 4, 8, 9, 11, 14, 16, 20, 22, 23, 24, 26, and 29 (Figure 272 and Figure 273). The upper boundaries of the buried asphalt surfaces in Block C West range from 25 to 105 cmbs face and between 110 and 148 cm above the coral shelf. The wide range of depths below the current land surface are mostly attributed to differences of elevation of the current surface due to raised surfaces such as sidewalks, the grade of the parking lot for drainage, and high building foundations. The smaller range of upper boundary heights above the coral shelf shows less variability in the stratigraphic position of the asphalt surfaces in SIHP # -7658. The asphalt surfaces are distributed primarily in the northeast (*mauka*) portion of the project area; however, continuity of the asphalt could not be identified. Asphalt parking areas are not visible on the 1939–1941 aerial photo (see Figure 265), indicating these surfaces date between 1939 and 1976. The surfaces may be associated with several roadways, parking lots, and structures observed on the 1952 (see Figure 266) and 1970 (see Figure 267) aerial photos.

SIHP # -7658 includes four layers with disturbed asphalt chunks, all of which are located within the Block C West project area (Figure 274 and Figure 275). The four layers were identified in Block C West Test Excavations 7, 10, 25, and 36. Due to the nature of disturbance, the upper boundary depths for the layers ranged between 43 and 60 cmbs, and between 111 and 162 cm above the coral shelf, with an average thickness of 36 cm. The buried asphalt surfaces and

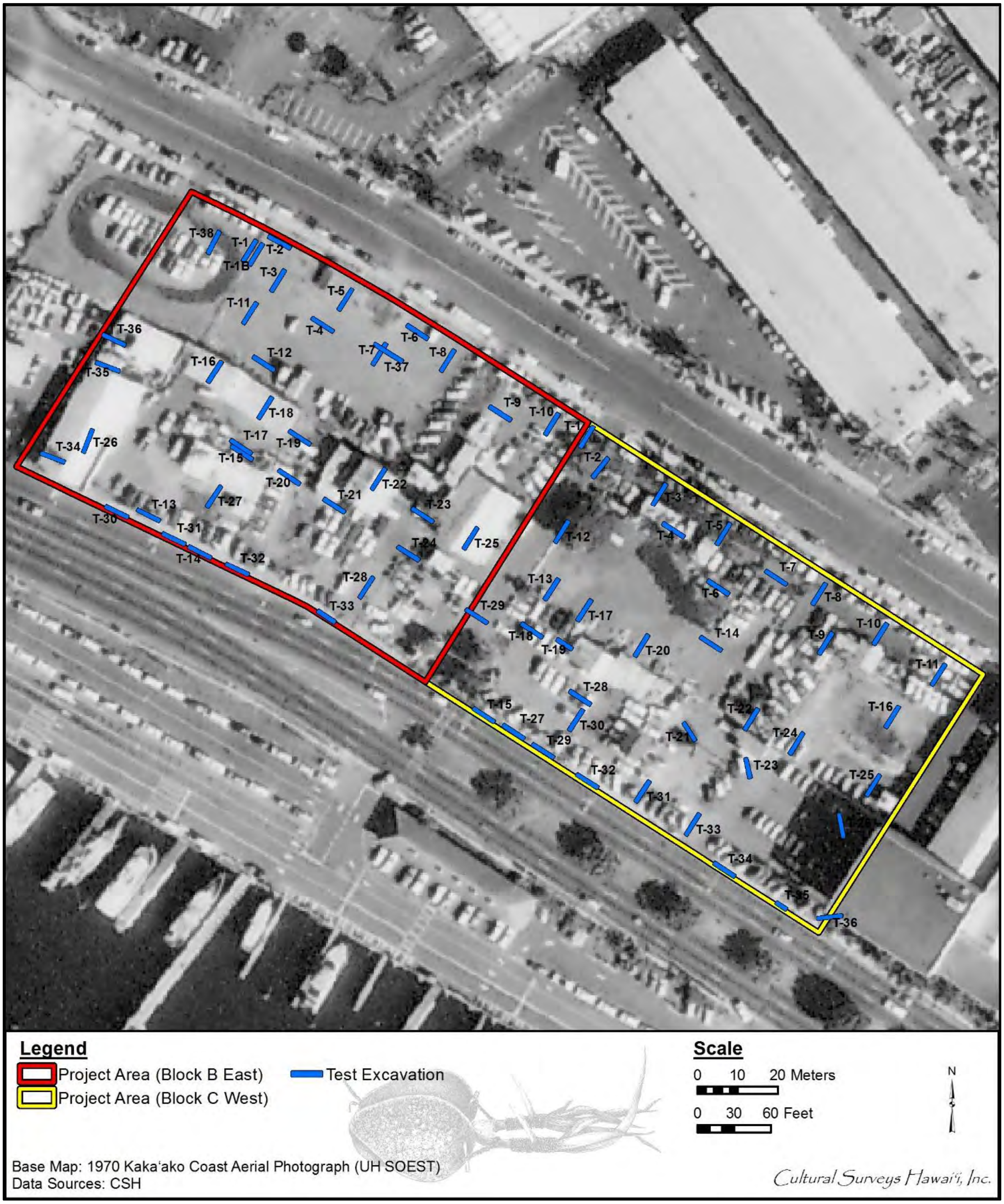

Figure 267. 1970 aerial photograph (R.M. Towill), Block B East and Block C West project areas and test excavations locations

Figure 268. Photograph of the buried compacted cinder layer (SIHP # -7658) within the Block B East TE 28 northwest sidewall, indicated by the red arrow

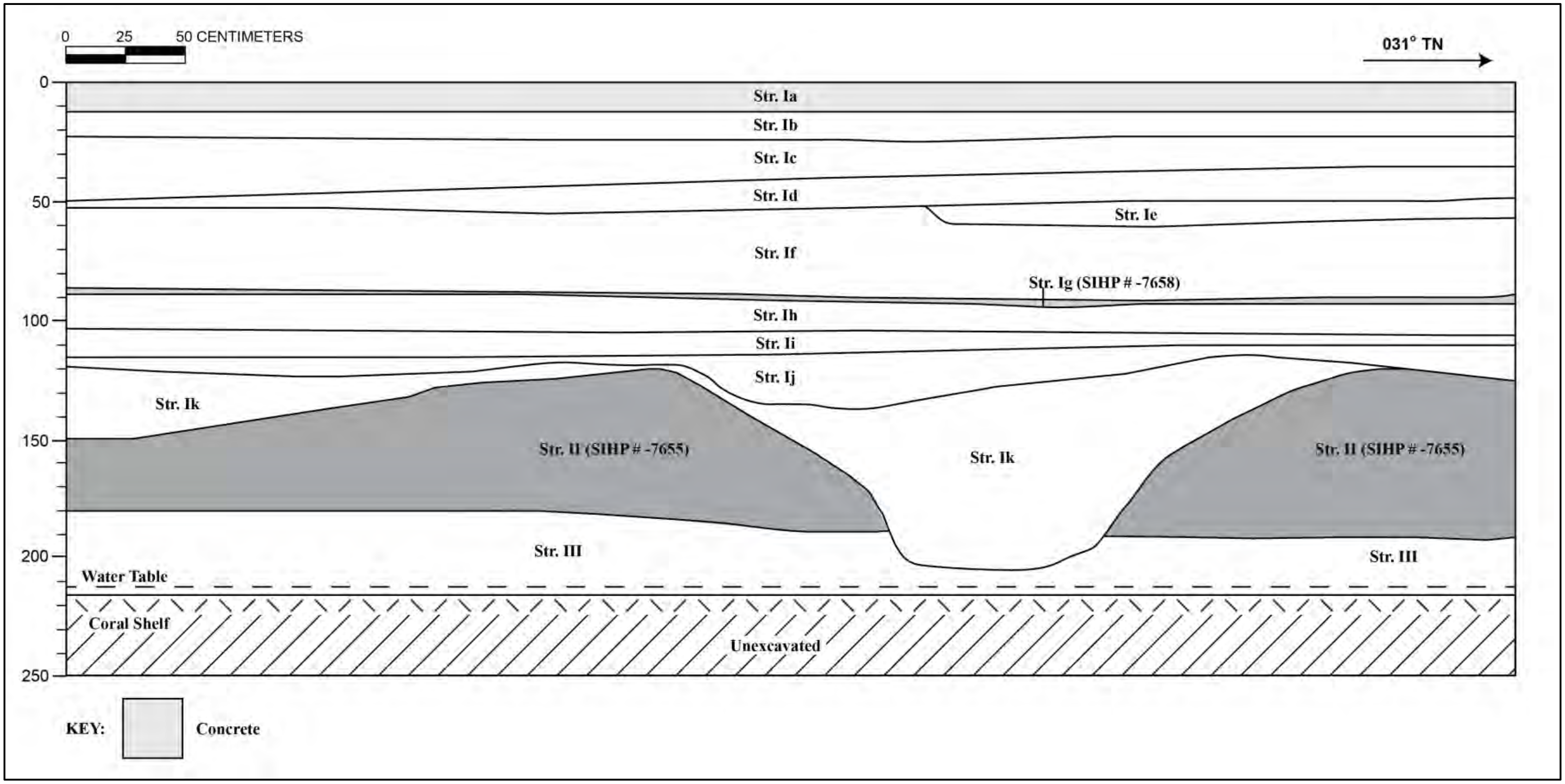

Figure 269. Profile of Block B East TE 28, showing the compacted cinder layer (SIHP # -7658) within the northwest sidewall

Figure 270. Photograph of a buried asphalt surface (SIHP # -7658) in the northwest end of Block B East TE 19, indicated by the red arrow

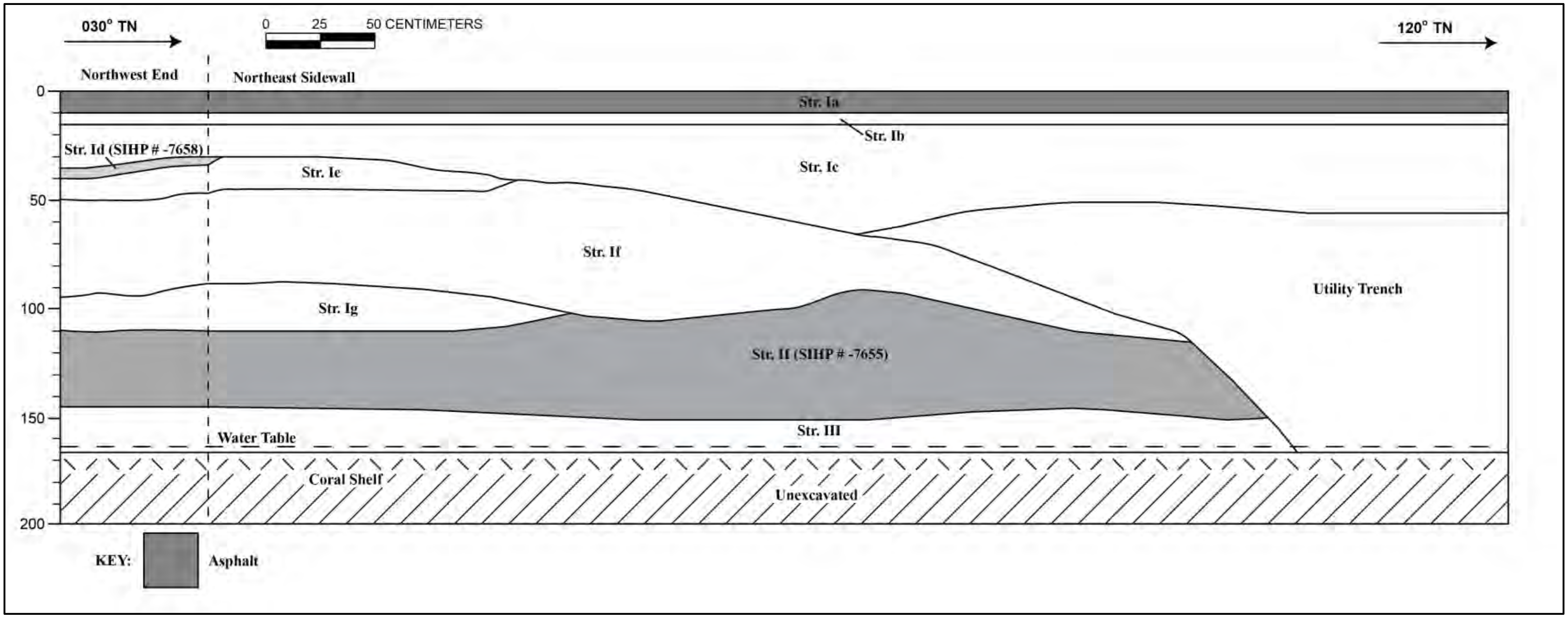

Figure 271. Profile of Block B East TE 19, showing the buried asphalt surface (SIHP # -7658) in the northwest end of the excavation

Figure 272. Photograph of a buried asphalt surface (SIHP # -7658) in the northeast end of Block C West TE 8, indicated by the red arrow

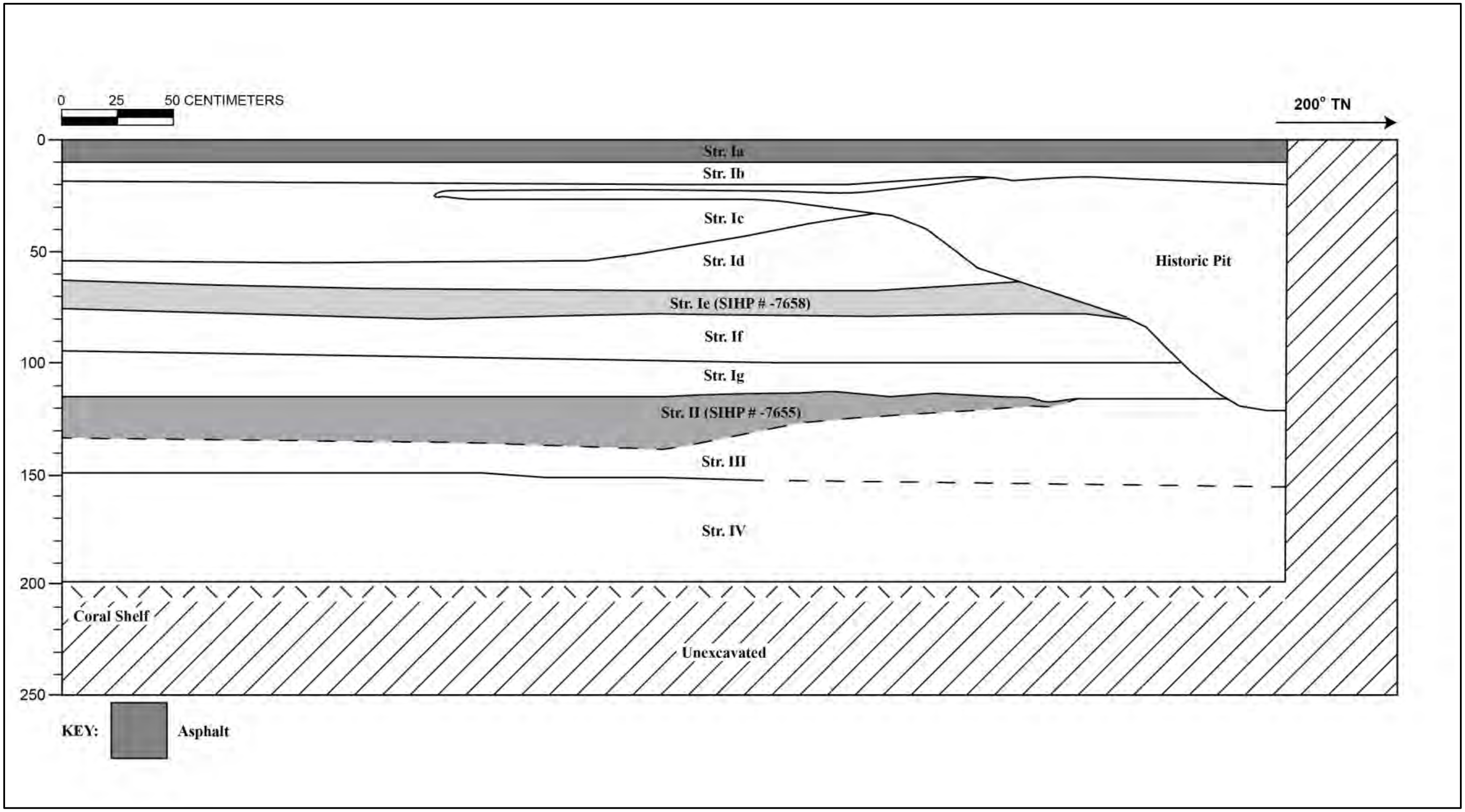

Figure 273. Profile of Block C West TE 8, showing the buried asphalt surface (SIHP # -7658) in the eastern sidewall

Figure 274. Photograph of a disturbed asphalt surface (SIHP # -7658) within Block C West TE 25, indicated by the red arrow

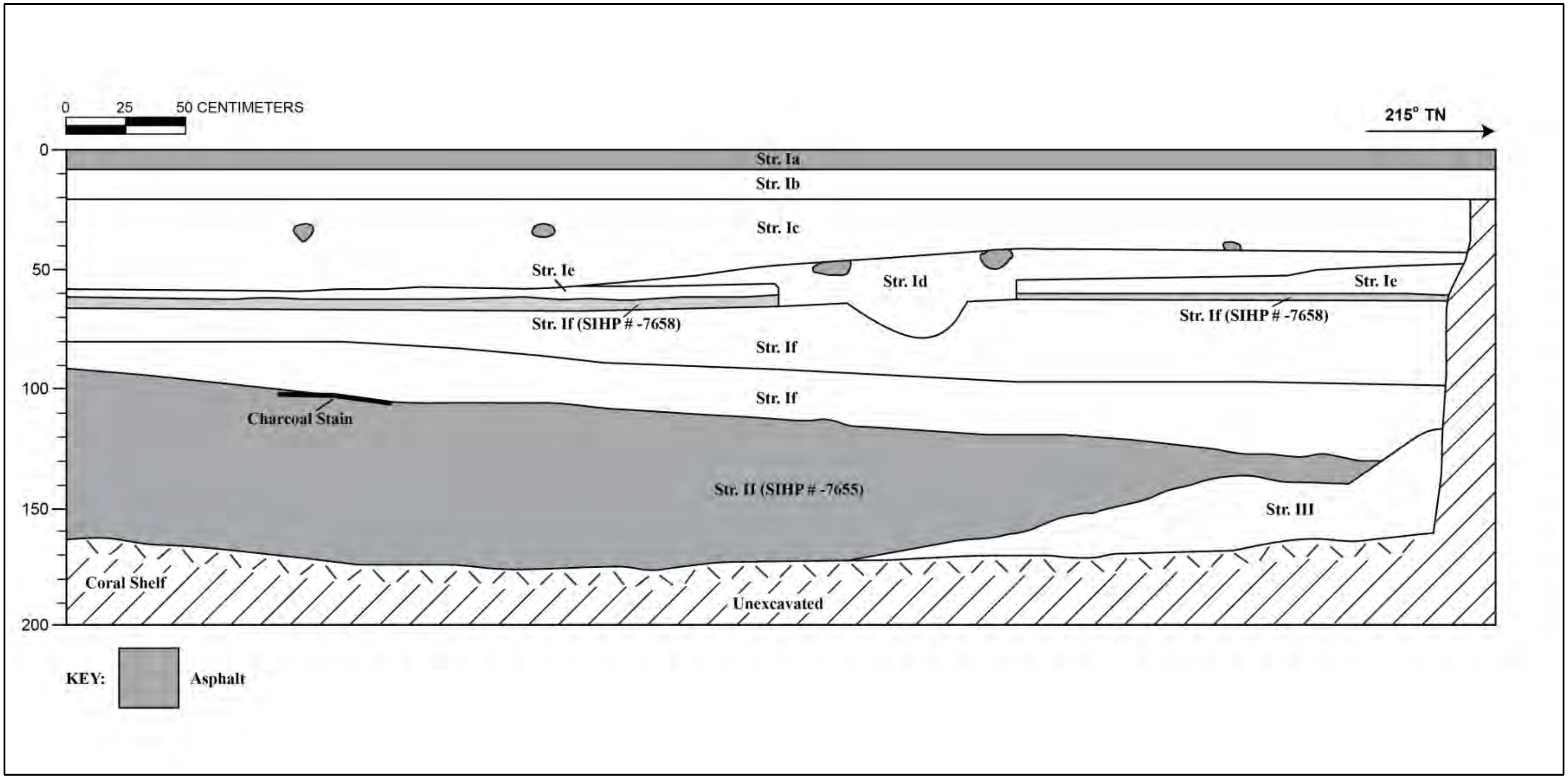

Figure 275. Profile of Block C West TE 25, showing the disturbed asphalt surface (SIHP # -7658) in the southeast sidewall

subsequent disturbance are likely associated with building activity between the 1939–1941 aerial photograph (see Figure 265) and the 1976 construction of Ward Warehouse.

In addition to the two aforementioned asphalt surfaces observed within the Block B East project area (TE 10 and 19), three additional test excavations were conducted in which a buried asphalt surface was identified overlying former concrete foundation slabs (Figure 276 and Figure 277). The three asphalt structures and three concrete structures were identified in Block B East Test Excavations 5, 8, and 9. The upper boundary depths for the asphalt layers were between 20 and 50 cmbs, with a range in thickness from 5 to 12 cm. The upper boundary depths for the concrete surfaces below the asphalt layers have a range of 45 to 63 cmbs, with an average thickness of 14 cm. The concrete surfaces are directly overlying the crushed coral fill and hydraulic fill associated with land reclamation events.

The first possible structure can be seen on the 1927 aerial (see Figure 264), overlapping with the northern portion of TE 8; however, this structure was likely a shed or storage facility rather than a permanent structure with a concrete slab foundation. No structures can be seen in the 1939–1941 aerial photograph (see Figure 265); however, the 1952 aerial shows structures and parking areas present across the entire project area (see Figure 266). The 1952 map, in conjunction with the presence of an asphalt parking area across the *mauka* side of the project area on the 1970 aerial (see Figure 267), suggests the concrete slabs are associated with structures dating between 1939 and 1952. The buried asphalt surfaces located above the concrete slabs are therefore likely associated with later building activity, ranging between the 1952 aerial photograph and the 1976 construction of Ward Warehouse.

SIHP # -7658 includes four layers of buried concrete slabs within the Block B East and C West project areas. Three of the concrete slabs were identified within in Block B East, Test Excavation 4 and the intersecting Test Excavations 7 and 37 (Figure 278 and Figure 279). TE 4 is located approximately 10 m from TE 7 and 37. The upper boundary depths for the concrete layers ranged between 45 and 90 cmbs with thickness ranging from 10 to 15 cm. The concrete surfaces are directly overlying the crushed coral fill and hydraulic fill associated with land reclamation events. As with the concrete slabs observed within Test Excavations 5, 8 and 9, no structures can be seen on the 1927 and 1939–1941 aerials (see Figure 264 and Figure 265), with the exception of the single building near TE 8, likely representing a less substantial structure. Structures can first be seen on the 1952 aerial (see Figure 266), while a parking area is present in the area on the 1970 aerial (see Figure 267). This suggests the concrete slabs are likely associated with structures dating between 1939 and 1952, however, they could be associated with unknown structures present anytime between 1939 and the 1976 construction of Ward Warehouse.

The concrete structure identified in Block C West was located in TE 31. This structure consists of a shallow concrete slab, scored with a decorative pattern and red paint visible in two areas (Figure 280 and Figure 281). The concrete surface has a high step in the northeast portion of the test excavation, which transitions into a grouted paving stone surface. The grouted paving stone surface and high step were observed at 15 cmbs, while the remaining portion of the concrete slab was present at 41 cmbs. This concrete slab appears to be associated with the first phase of a walkway constructed as part of the existing Ward Warehouse structure, eventually filled over and reworked during varying additions and landscaping changes between 1976 and the present.

Figure 276. Photograph of a buried asphalt surface (SIHP # -7658) (red arrow), overlying a concrete slab (SIHP # -7658) (yellow arrow) within Block B East TE 5

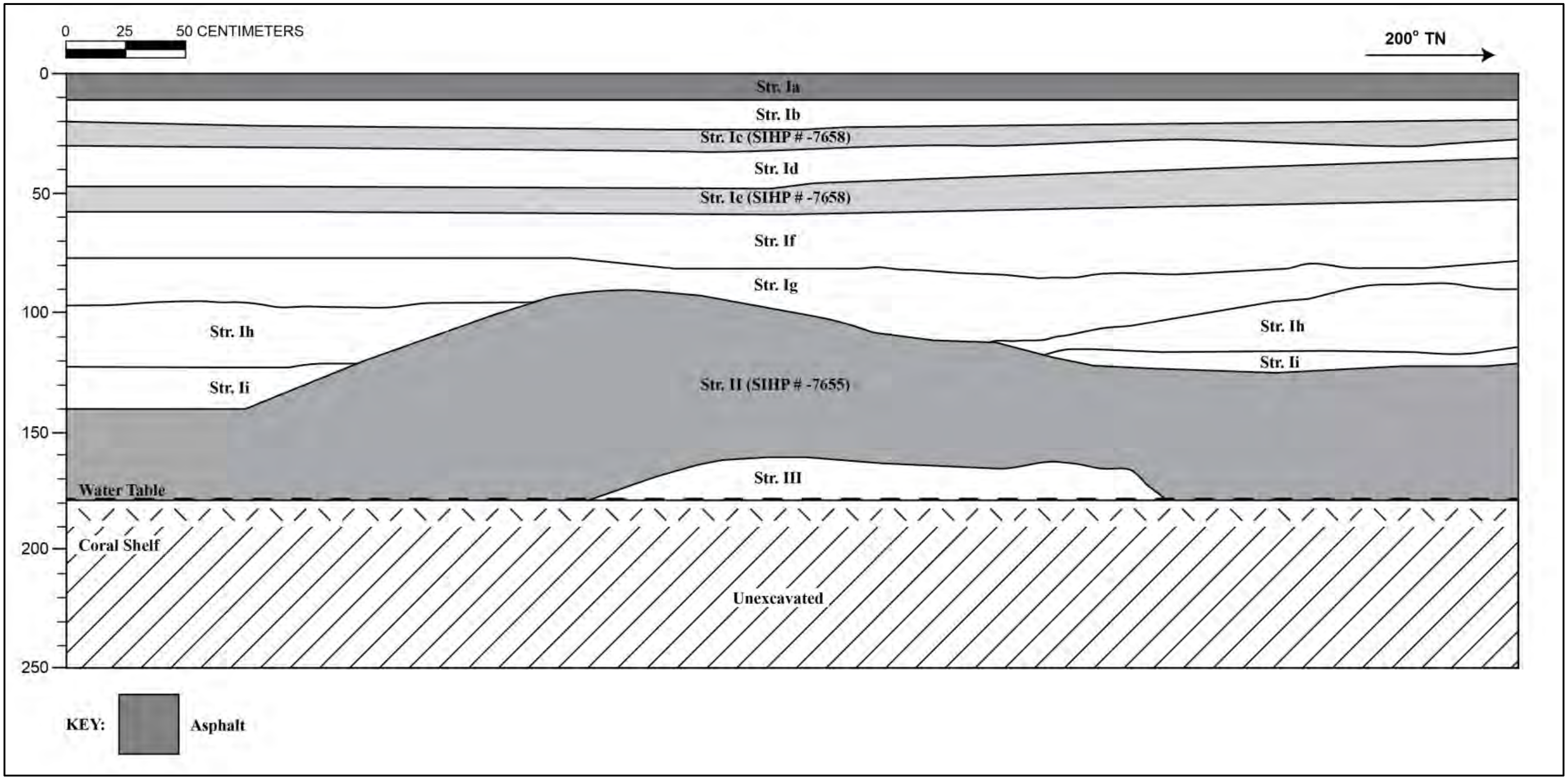

Figure 277. Profile of Block B East TE 5, showing the buried asphalt surface (SIHP # -7658), overlying a concrete slab (SIHP # -7658) in the southeast sidewall

Figure 278. Photograph of a buried concrete slab (SIHP # -7658) within Block B East TE 7

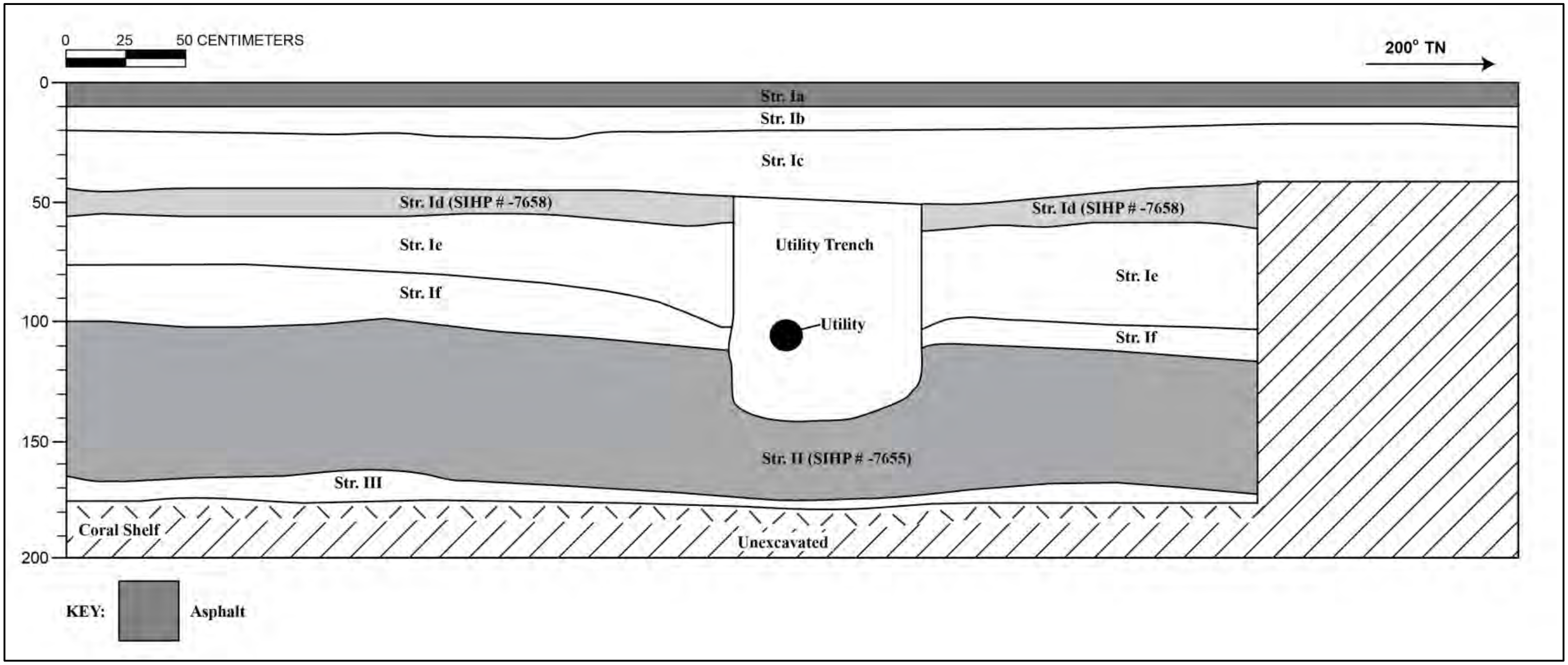

Figure 279. Profile of Block B East TE 7, showing the buried concrete slab (SIHP # -7658) in the east sidewall

Figure 280. Photograph of the buried concrete walkway (SIHP # -7658) within Block C West TE 31. Note the red pain at the far end (red arrow), and the grouted paving stones in the near end (yellow arrow)

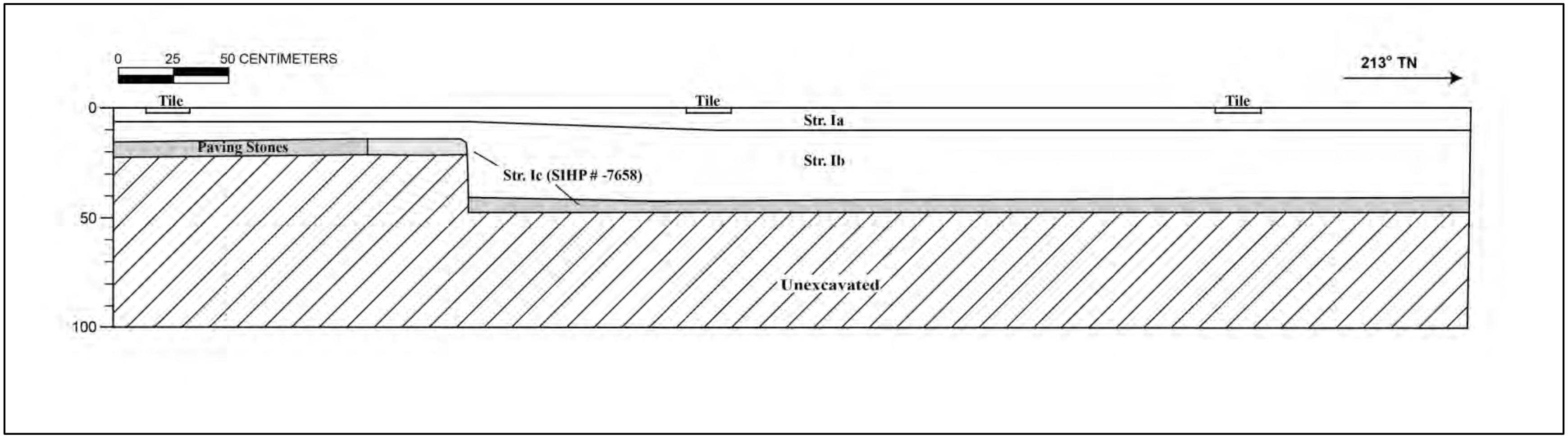

Figure 281. Profile of Block C West TE 31, showing the buried concrete walkway (SIHP # -7658), in the southeast sidewall

Three buried coral and tar pavements associated with SIHP # -7658 were encountered along the *makai* edge of the Block B East project area, within Test Excavations 30, 31, and 32 (Figure 282 and Figure 283). These buried former surfaces were encountered at depths ranging from 27 to 43 cmbs, with a thickness ranging from 5 to 10 cm. These observed pavements differ from the buried asphalt surfaces and are overlying a disturbed and reworked sand layer, possibly associated with the former shoreline. An old beach road can be seen on the 1897 Monsarrat Map (Figure 284) located near TEs 30, 31, and 32, replaced by the current Ala Moana Boulevard by 1939 (see Figure 265). These buried surfaces may be associated with the old beach road; however, due to disturbance to the underlying sand, which was thought to be a result of land restructuring associated with land reclamation and the surrounding urban development, it may be associated with various roadways and parking areas following the 1919–1926 land reclamation.

In addition to the buried former land surfaces, SIHP # -7658 includes four buried wooden posts observed along the *makai* edge of both the Block B East and Block C West project areas. Of the four posts, only one was observed within Block B East (Test Excavation 14), while three were observed within the Block C West project area (Test Excavations 27, 29, and 32). The wooden remnants collected from the posts appeared to consist of milled wood, all extending through the natural sediment to approximately 5 cm above the coral shelf (Figure 285, Figure 286, and Figure 287). The upper boundaries ranged from 35 and 70 cmbs, beneath imported fill overlying the disturbed natural sediments. The wooden post remnants may represent portions of a fence line formerly located along the southwest boundary of the two project areas. The exact time frame for these posts is difficult to determine, however, they may have been associated with a fence bordering the old beach road first identified on an 1884 map (Figure 288), or with the various stages of development including the current Ward Warehouse structure. It can only be determined, based on their milled characteristics, that they represent a post-Contact structure.

In summary, SIHP # -7658 contains 42 buried former land surfaces, consisting of asphalt, concrete, coral and tar pavement, oil-rolled surfaces, and wooden posts, associated with multiple historic land use periods. With the exception of the wooden posts, the buried structures are all overlying the hydraulic dredge and crushed coral fill associated with the 1919–1926 Kewalo reclamation. The fill overlying SIHP # -7658 is associated with grading and construction of the current Ward Warehouse structures. Urban development within the Block B East and Block C West project areas changed drastically between the 1927 and the 1970 aerial photographs, indicating that construction within the project areas was constantly on-going and changing. It is likely addition structures and surfaces were present within the project areas that are not pictured on any maps or aerial photos. SIHP # -7658 is assessed as significant under Hawaiʻi state historic property significance criterion "d" (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR §13-284-6. This assessment was based on the historic property's potential to provide additional information on twentieth century commercial infrastructure within Kakaʻako.

Figure 282. Photograph of a coral and tar buried surface (SIHP # -7658) within Block B East TE 30, indicated by the red arrow

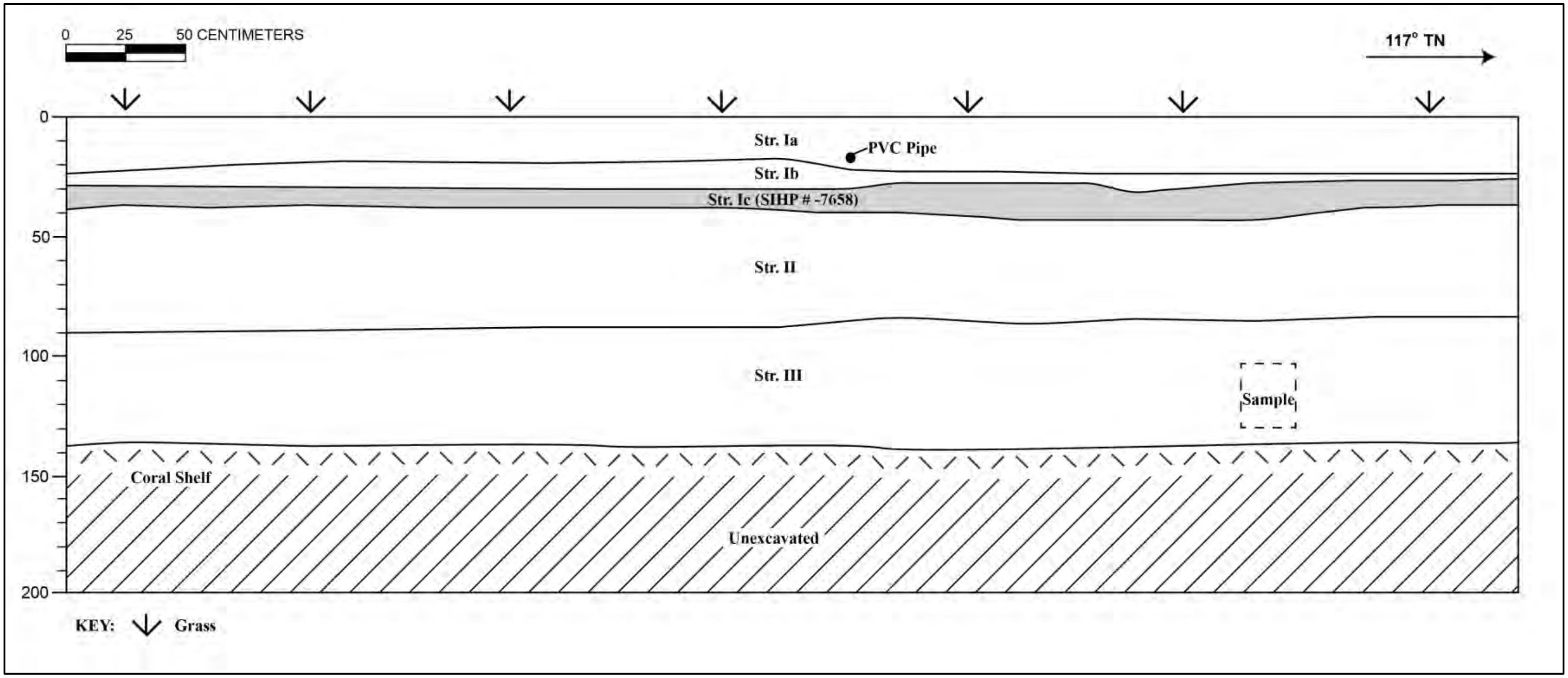

Figure 283. Profile of Block B East TE 30, showing the coral and tar buried surface (SIHP # -7658), in the north sidewall

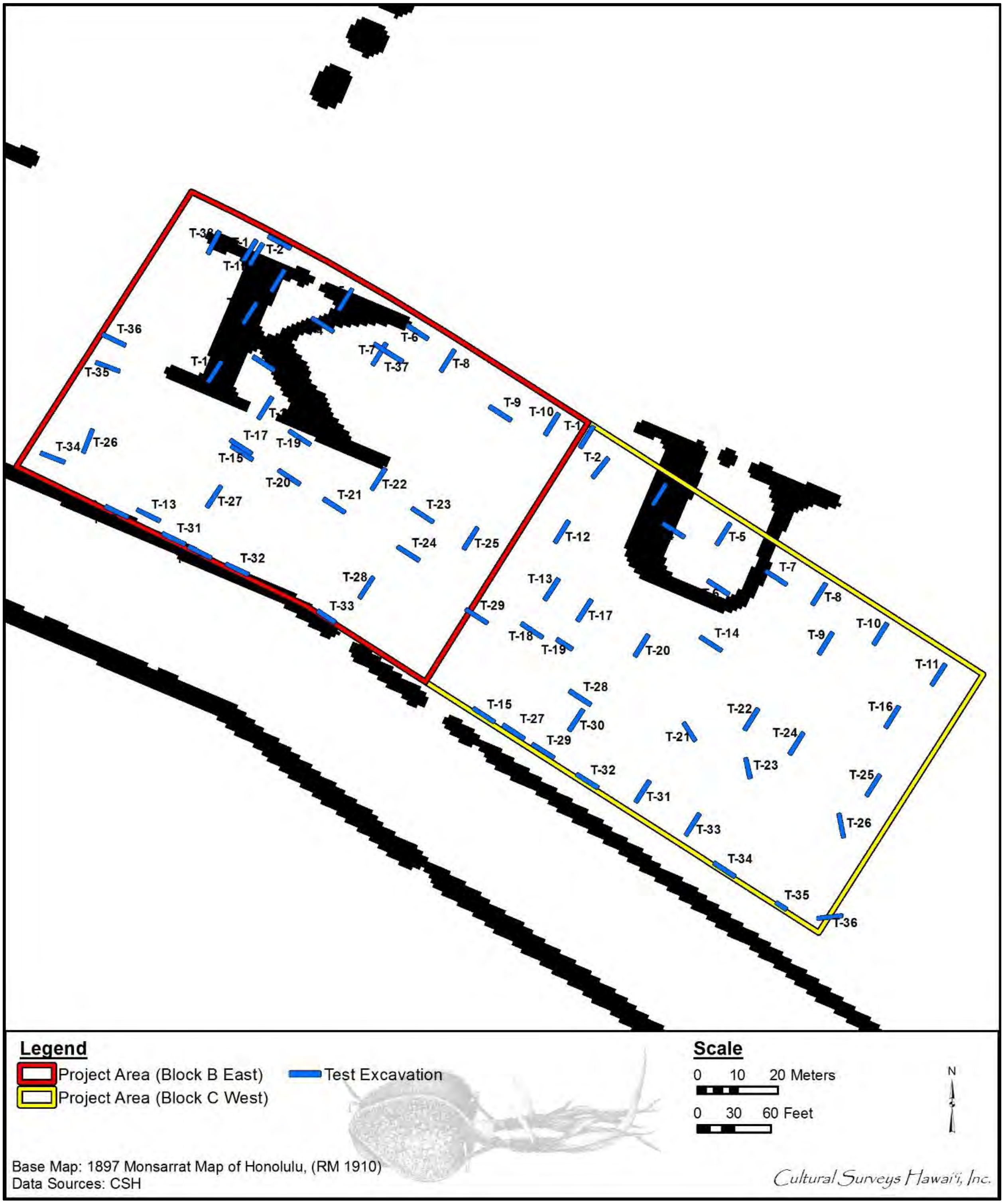

Figure 284. 1897 map of Honolulu by M.D. Monsarrat (Hawai'i Land Survey Division, Registered Map 1910), showing an overlay of the Block B East and Block C West project areas and test excavations locations

Figure 285. Photograph of a wooden post likely associated with a historic fence line (SIHP # -7658) within Block C West TE 31

Figure 286. Photograph of the sidewall within Block B East, TE 14, showing the former location of a wooden post (SIHP # -7658) within the sidewall

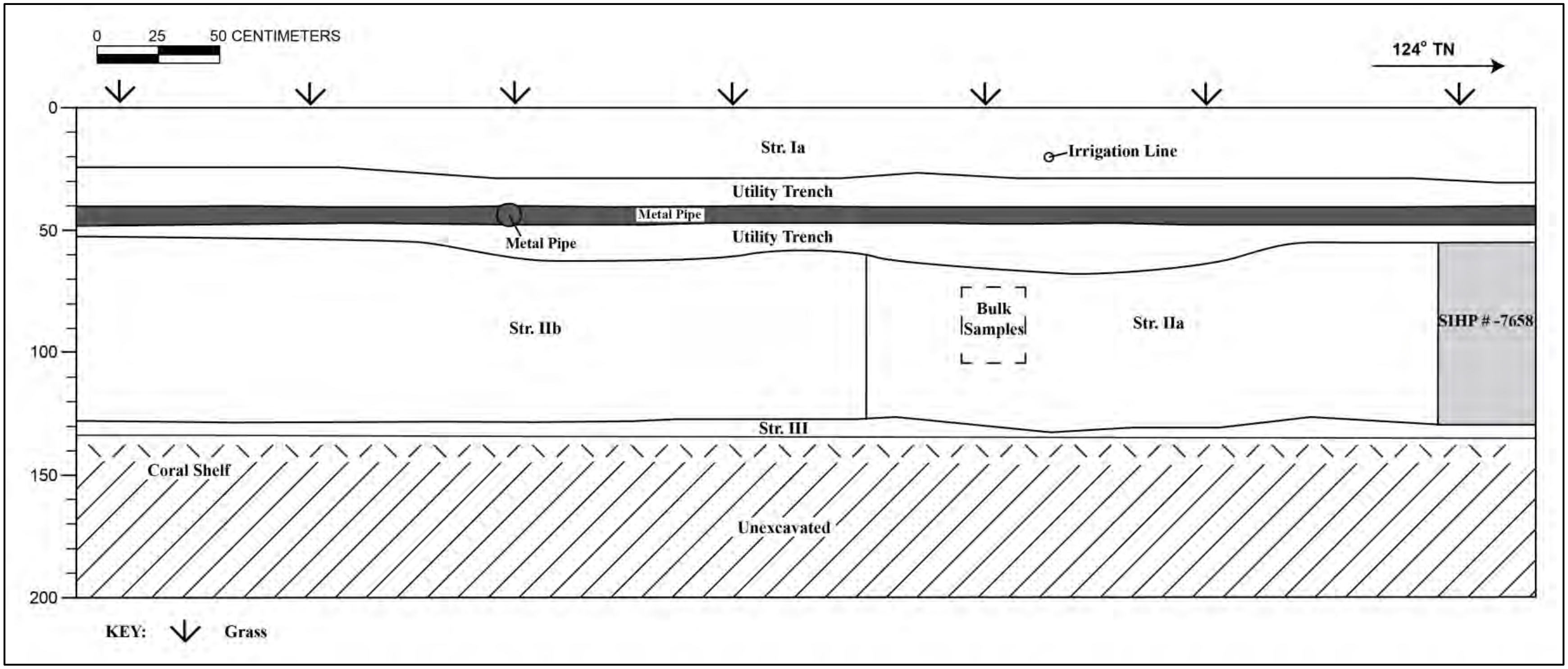

Figure 287. Profile of Block B East TE 14, showing the location of a wooden post (SIHP # -7658), in the north sidewall

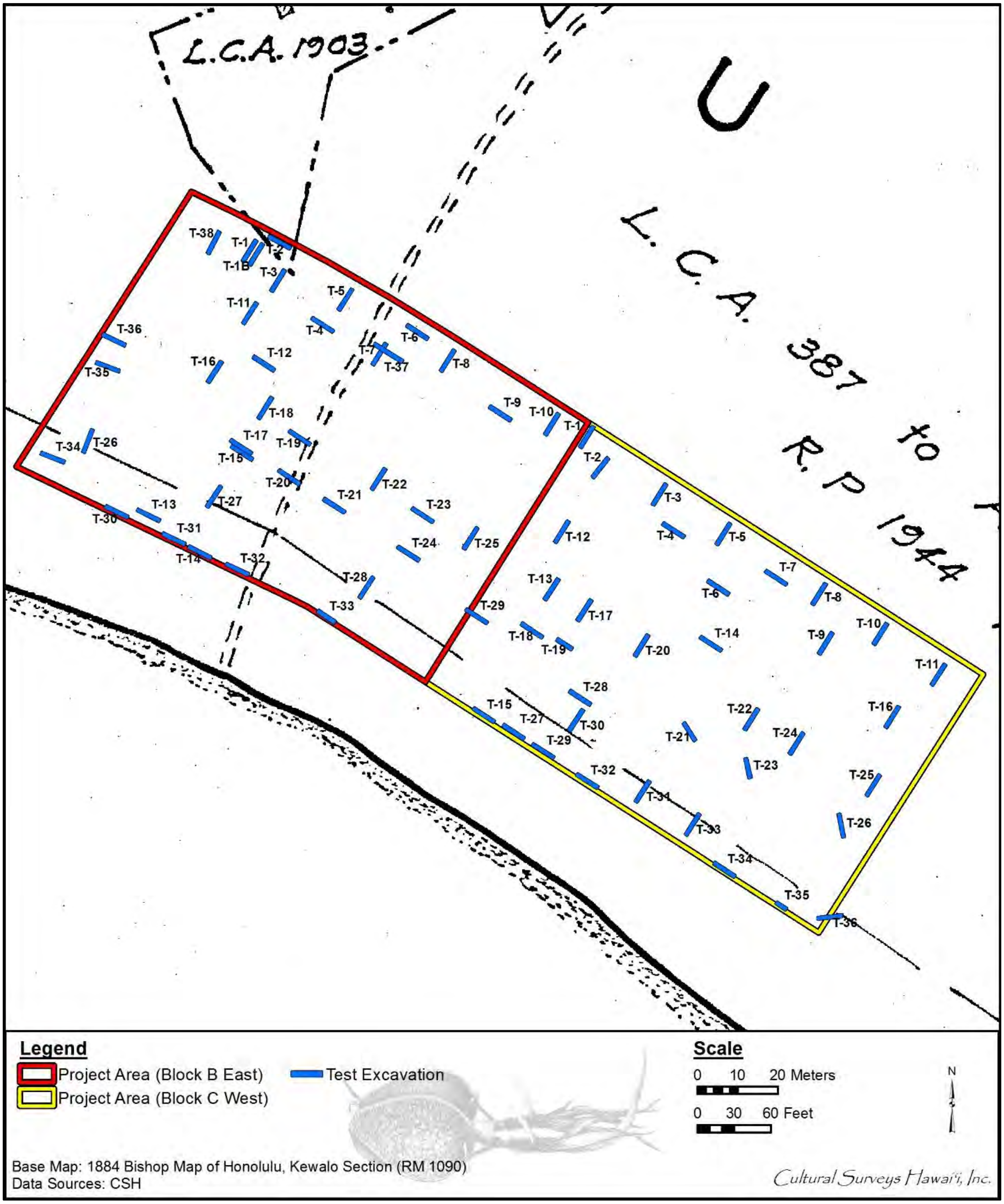

Figure 288. 1884 map of Honolulu, Kewalo Section (portion), by S.E. Bishop, with an overlay of the Block B East and Block C West project areas and test excavations locations (Hawai‘i Land Survey Division, Registered Map 1090)

6.4 SIHP # 50-80-14-7659

FORMAL TYPE:	Historic water channel
FUNCTION:	Drainage/irrigation (*‘auwai*)
NUMBER OF FEATURES:	N/A
AGE:	Historic (early twentieth century)
DIMENSIONS:	Approximately 4.4 acres (within the Blocks B East and C West contiguous project areas)
TAX MAP KEY:	[1] 2-3-001:005 (por.)
LAND JURISDICTION:	Private; Howard Hughes Corporation (HHC)

SIHP # -7659 consists of a buried concrete channel associated with the Ward Estate concretized *‘auwai* (ditch). SIHP # -7659 was observed in the southeast ends of Test Excavations (TE) 15 and 17, located parallel to each other within the central portion of the Block B East project area. The Ward Estate concretized *‘auwai* is a continuous feature running from Kapiolani Boulevard into Kewalo Basin. Its path runs *mauka*-*makai* between Ward Ave and Cummins Street, where it extends into the project area in a northeast to southwest direction, turning south near the center of the project area, exiting near the southern boundary and continuing to Kewalo Basin. This configuration of the concretized *‘auwai* can be seen extending through the Block B East project area on historic maps and aerial photos (Figure 289, Figure 290, Figure 291, Figure 292).

The concretized Ward Estate *‘auwai* was constructed in the early twentieth century to replace the existing Old Plantation *‘auwai,* prior to land reclamation activity within the Ward Estate lands (Figure 293). The former alignment of the Old Plantation *‘auwai* stretched from the *mauka* “lagoon” of the Ward Estate to Kewalo Basin, following a straighter, more natural path to the ocean than its later concretized version (SIHP # -7659). Hustace (2000) indicates the original *‘auwai* was an important part of the Ward Estate:

> An *‘auwai* (ditch) connected a large fishpond on the property to the ocean. Small fish from the inner reef swam up the *‘auwai,* and a *makaha* (gate) trapped them in the pond so they could be fattened for harvesting. [Hustace 2000:37–38]

The Wards had a permanent easement for the *‘auwai* (ditch) that extended from the long fishpond to the sea through the Kukuluāe‘o section. A source of income for the family included the *makaloa* grass growing along the *‘auwai*, commonly used to make mats and hats (Hustace 2000:7–55).

According to historic maps, aerial photos and documents, the Old Plantation *‘auwai* was rerouted and concretized in the early twentieth century. A 1912 State of Hawaii Sanitary Commission report states that, “Sheridan and Ward avenues both have open, walled ditches that drain a large area of the old plains” (State of Hawaii Sanitary Commission 1912:103). The Ward Avenue ditch refers to the Old Plantation *‘auwai* suggesting SIHP # -7659 was not yet constructed. On a subsequent 1919 fire control map, the *‘auwai* can be seen as a wavy stream extending on its original pathway through the project area (Figure 294). No signs of the concretized alignment are present; however, as reclamation of the project area was likely ongoing by the middle of 1920, construction of the concretized *‘auwai* had likely begun by this time.

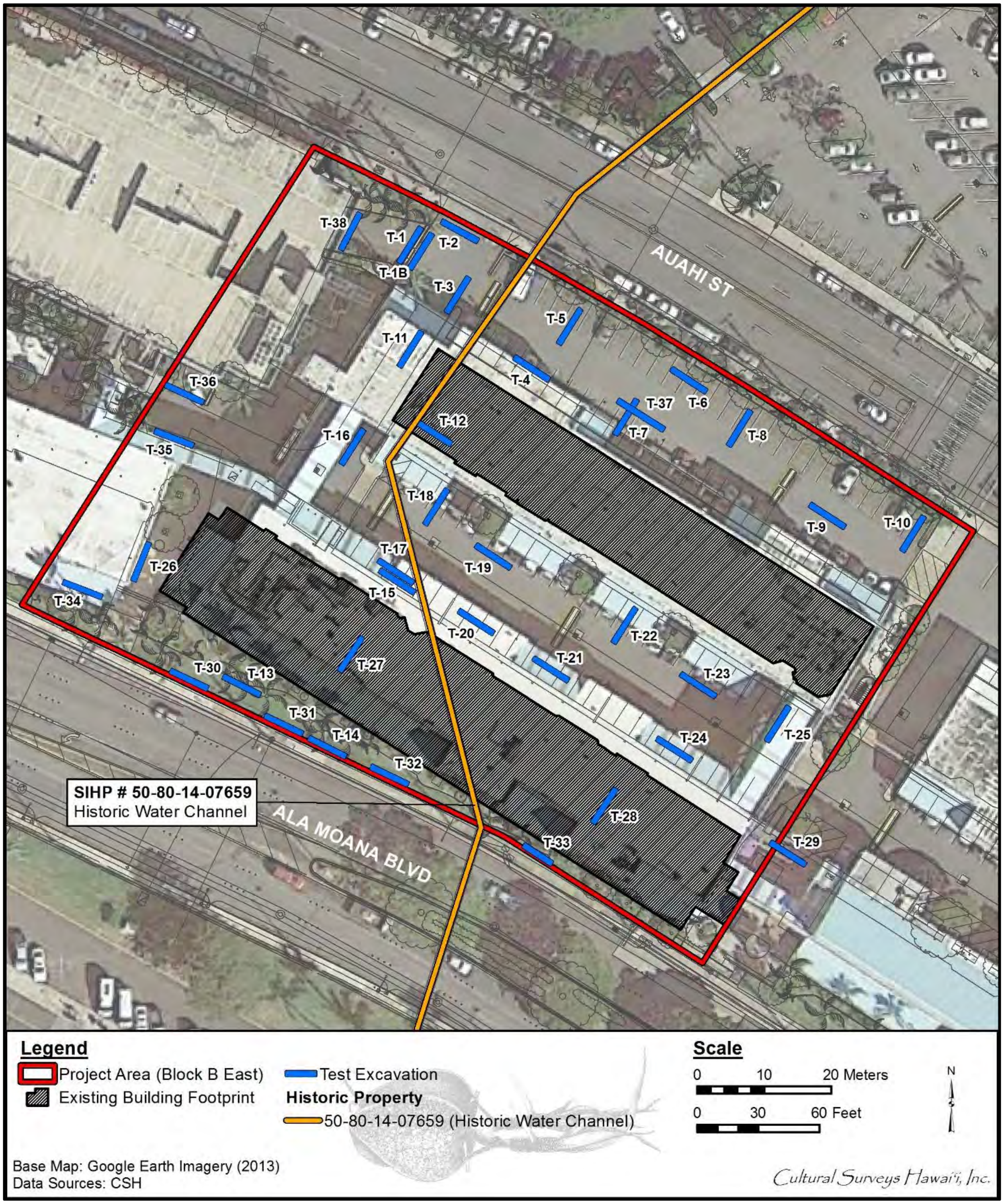

Figure 289. Aerial photograph showing SIHP # -7659 within the Block B East project area (base map: Google Earth 2013). Note the *‘auwai* was observed in the southeast end of TE 15 and 17, but not within TE 12

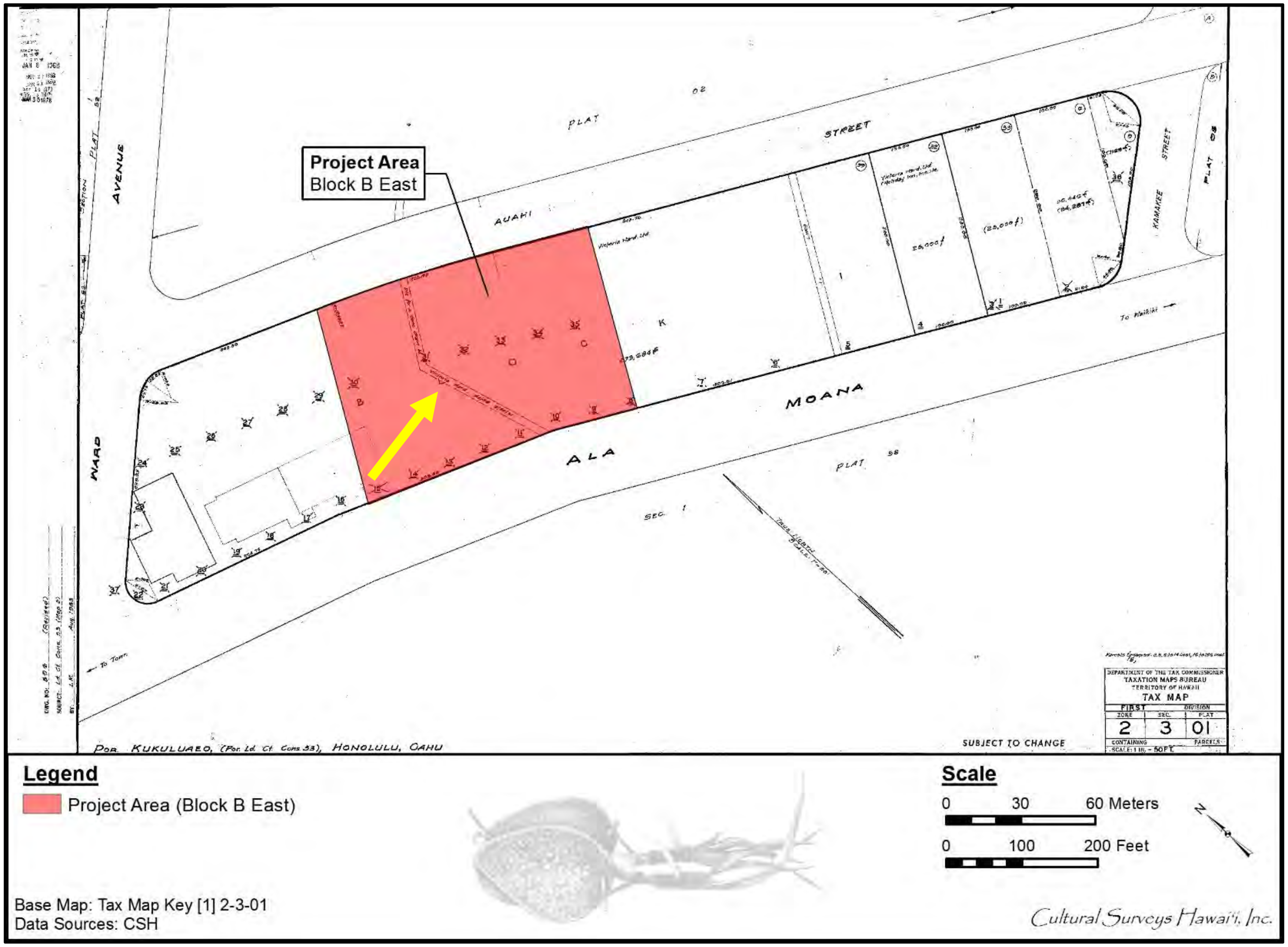

Figure 290. Tax map key (TMK): [1] 2-3-01, showing the concretized *‘auwai* (SIHP # -7659) (yellow arrow) within the Block B East project area

Figure 291. 1927 USGS aerial photograph of the Kaka‘ako area (USGS; mosaic of photograph sheets from Hawai‘i Coastal Geology Group); shows SIHP # -7659; concretized *‘auwai* is seen exposed and running in current alignment through the project area (yellow arrows)

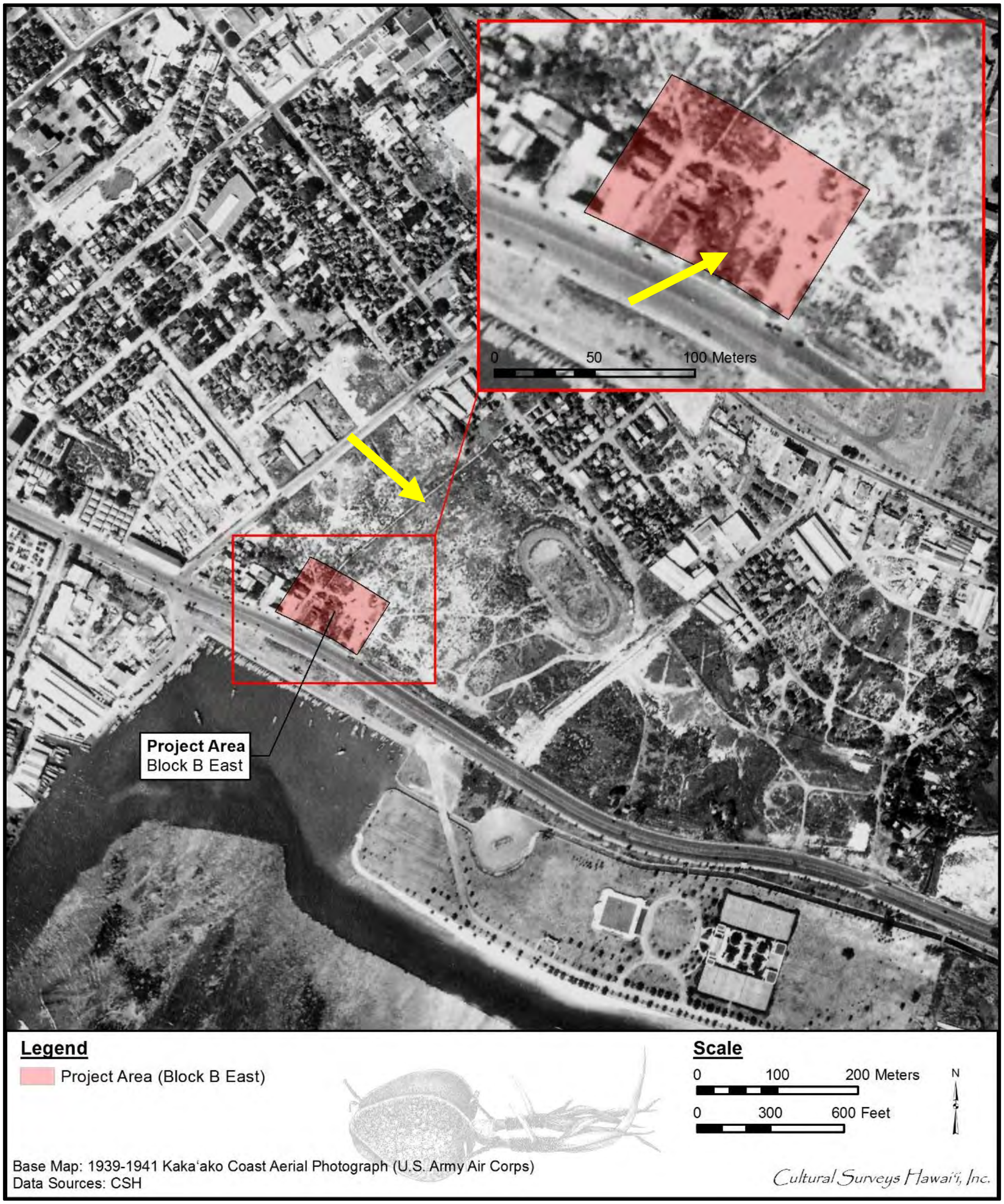

Figure 292. 1939-1941 aerial photograph (U.S. Army Air Corps) of Kaka‘ako; SIHP # -7659 (yellow arrows) is seen exposed through the project area

Figure 293. The Old Plantation *ʻauwai* of the Ward Estate, nineteenth century photograph, view north toward Punchbowl (Hustace 2000:51)

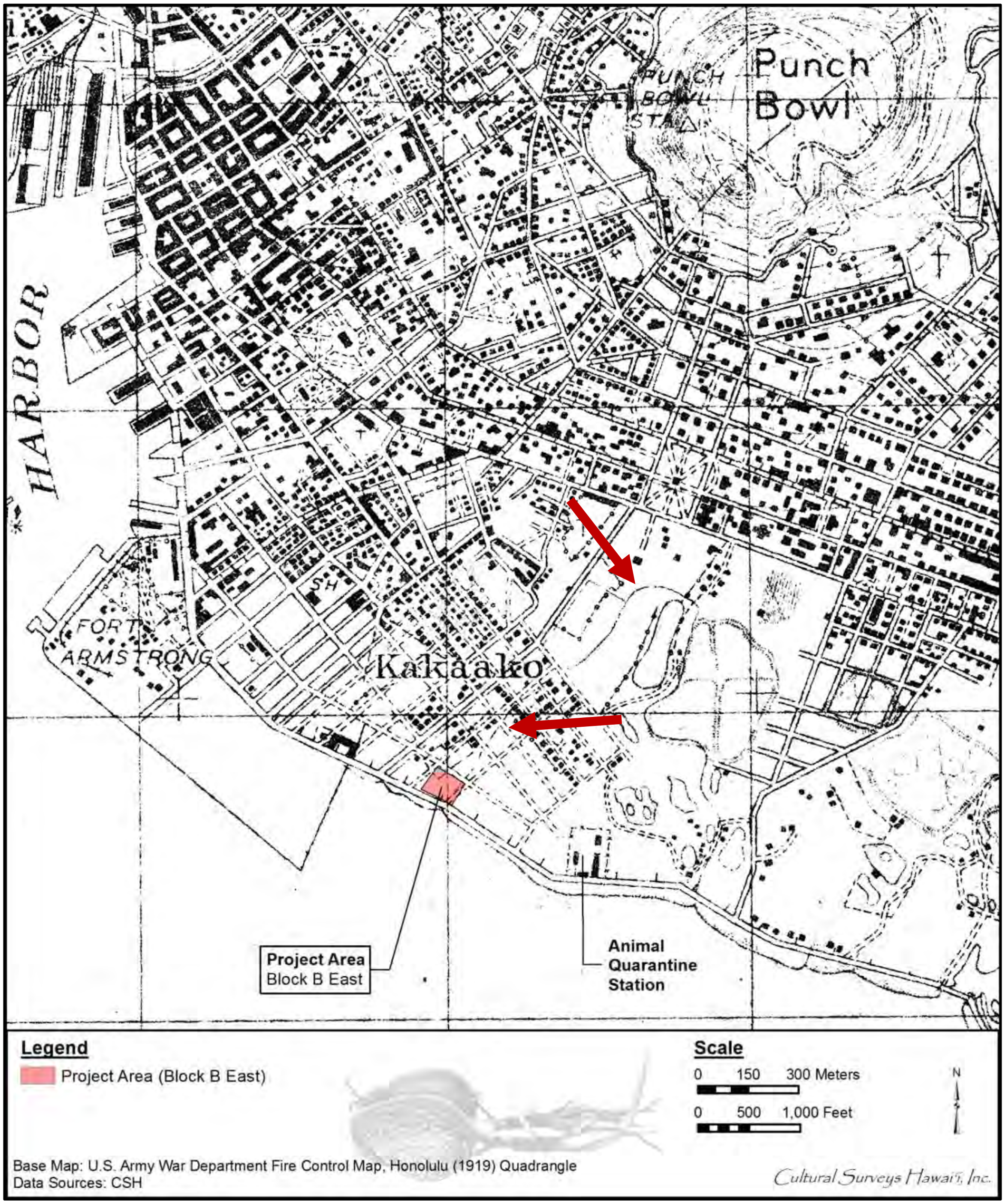

Figure 294. 1919 U.S. Army War Department Fire Control map of O'ahu, Honolulu Quadrangle, Old Plantation *'auwai* alignment is visible (red arrows); Ward Estate concretized *'auwai* (SIHP # -7659) is not present on map

A structure that follows the known Ward Estate concretized *‘auwai* path can be seen on a 1927 aerial photo (see Figure 291), indicating that by 1927, construction of SIHP # -7659 had been completed. The total date range for construction of SIHP # -7659 extends from 1919 to 1927; however, concretization of the *‘auwai* appears to have been undertaken in conjunction with the dredging and filling of the Ward Estate lands, suggesting it was completed soon after 1919. The new alignment of the concretized *‘auwai* (SIHP # -7659) extended from the artesian well, originating near the current location of the Neal S. Blaisdell Center, veering slightly to the west, and meeting back up with the original alignment near the southern boundary of the Block B East project area (Figure 295).

Within the Block B East project area, a portion of the Ward Estate concretized *‘auwai* was observed in TE 17, extending diagonally to the north-south in the southeastern end of the excavation. The structure was observed 45 cm below the existing asphalt parking lot surface and extends to, and possibly below, the coral shelf. The sides and top of *the ‘auwai* were formed, although the full width of the *‘auwai* was not determined (see Figure 106 and Figure 109).

Test Excavation 15 was placed adjacent to TE 17 in an effort to further document SIHP # -7659. The portion of SIHP # -7659 observed in TE 15 was consistent with TE 17, extending north-south within the southeast end of the test excavation, at 38 cm below the existing asphalt surface. A utility pipe was observed approximately 40 cm above the coral shelf within the southwest wall of Test Excavation 15, extending parallel to the test excavation, through the concretized *‘auwai*. An additional slab of concrete was observed at 64 cmbs, protecting the intersection of the *‘auwai* and the utility. Breakage of the pipe extending through the *‘auwai* could contaminate the *‘auwai* and the waters at the outflow (see Figure 98, Figure 99, and Figure 101).

The section of the *‘auwai* observed within both TE 15 and TE 17 is capped by utility trench backfill consisting of very gravelly loam sediment, which may be related to exposing the *‘auwai* and its location for utility installation and associated construction activity. The utility trench does not appear associated with construction of the *‘auwai* due to the lack of utility backfill surrounding the *‘auwai*.

In summary, SIHP # -7659 is a buried concrete channel (Ward Estate *‘auwai*), constructed in the early twentieth century to replace the existing Old Plantation *‘auwai*. A portion of the concrete structure associated with SIHP # -7659 was encountered within two test excavations within the Block B East project area (TE 15 and TE 17). SIHP # -7659 is assessed as significant under Hawai‘i state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR §13-284-6. This assessment is based on the historic property’s potential to provide information on land modification associated with the Kewalo reclamation project and subsequent urban development.

Figure 295. Photo of Ward Estate concretized *ʻauwai* where it flows into Kewalo Harbor

6.5 SIHP # 50-80-14-7660

FORMAL TYPE:	Historic fill layer
FUNCTION:	Refuse disposal, fill material
NUMBER OF FEATURES:	1
AGE:	Historic (mid-twentieth century)
TEST EXCAVATION:	Test Excavation 32
TAX MAP KEY:	[1] 2-3-001:005 (por.)
LAND JURISDICTION:	Private; Howard Hughes Corporation (HHC)

SIHP # -7660 is a historic fill layer, consisting of historic trash, including possible sampan related debris, within extremely gravelly silty loam sediment. This fill material, consisting of black, unburnt sediment, was only observed within an abandoned storm drain box, utilized to fill the concrete structure. The drain box and associated historic trash deposit were identified in the eastern half of Test Excavation 32, located along the *makai* edge of the Block B East project area (see Figure 296 and Figure 297). The SIHP # -7660 historic trash fill material extended from 0.18 to 1.15 m below the current land surface. The trash layer is capped by the current imported landscaping fill and associated grassy surface.

The concrete structure in which SIHP # -7660 lies is a square structure about 1.76 m by 1.76 m wide. The walls of the structure have a thickness of approximately 25 cm. Although a posthole was excavated in the center of the structure to 115 cmbs, the bottom of the structure could not be defined. The water table within the concrete drain box was observed at 75 cmbs, suggesting a bottom is present, allowing the water level to remain at a relatively shallow depth. The overall shape of the concrete structure appears consistent with a large storm drain box, which may have been abandoned following construction of Ward Warehouse in 1976.

The diagnostic trash observed within the SIHP # -7660 historic fill layer dates to the mid-twentieth century. A total of 16 diagnostic and non-diagnostic artifacts were collected, including glass bottle fragments, ceramic fragments, a boat tie, rebar, wire, nails, rubber, and wood fragments (Figure 298 and Figure 299) (see Section 5 for full artifact discussion). Although the observed glass and ceramic fragments were within a blackened sediment, it does not appear that the artifacts were charred, burned or melted. SIHP # -7660 does not appear to be associated with any incinerator or open air burn events.

The time frame provided by dateable artifacts collected from the current project extends from 1908–1980; however, a glass jar dated to a range of AD 1923–1964 (Acc. # 10/12). The fill that capped SIHP # -7660 is associated with the 1976 construction of Ward Warehouse. The glass fragments observed within the SIHP # -7660 fill were identified as having both Japanese and American origins. An aqua colored glass fragment with a small section containing Japanese character inscriptions was collected from the fill layer (Acc. # 13). In the early twentieth century, the Ward family leased parcels of their land to the Japanese for camps, schools, playground, temples and shrines (University of Hawai‘i 1978:847). Many of the Japanese immigrants living in the area in the early to mid-twentieth century may have worked in the sampan fleet, based within the adjacent Kewalo Basin after 1929.

Figure 296. Aerial photograph showing SIHP # -7660 within the Block B East project area (base map: Google Earth 2013)

Figure 297. Test Excavation 32; view of concrete structure and historic trash deposit (SIHP # -7660). Metal and debris can be seen in sidewall near structure.

Figure 298. Historic glass collected from SIHP # -7660; Aqua glass with Kanji inscriptions (Acc. # 13) and glass jar with makers mark on base (Acc. #s 10 and 12) are shown.

Figure 299. Metal collected from SIHP # -7660; Metal rods and cleat associated with Kewalo Basin fishing and canning activity

A Department of the Interior Report (1920) states, “The proposal scheme of development of this basin provides for a lumber wharf and a sampan wharf for the first unit” (1920:52). Following completion of the shipyard in 1929, fishing soon became a large industry in the Kewalo Basin (Figure 300). A large Japanese sampan fleet of over 50 vessels were relocated to the basin (Clark 1977:64).

A tuna cannery was operated by McFarlane Tuna Company at Kewalo Basin from 1907 to 1922. In “Hawaii at Work in the Tuna Schools” included in the book, *Hawaii: Story of Our Paradise*, the importance of Kewalo Basin to the fishing industry is described as follows:

> They head out for fishing grounds in early mornings from Kewalo Basin in Honolulu, site of the cannery and center of the tuna industry. Fishing season varies with the year, but ordinarily it begins in May and continues through November. Unlike other tuna areas, Hawaii's fishing grounds are close by; thus the tuna can be brought back to the cannery before nightfall, fresh from the sea and unfrozen. [Bye 1961:247]

In 1922, the cannery was purchased and renamed Hawaiian Tuna Packers; it operated until WWII when it was converted to produce gas tanks for military airplanes. After the end of WWII, fishing and canning came back in full swing and in 1961, Castle and Cooke acquired Hawaiian Tuna Packers (Castle and Cooke 1977). The cannery ceased operations in 1984.

In addition to the glass and ceramic fragments, boat-related trash was collected from SIHP # -7660, including a metal cleat consistent with a boat tie, large metal fragments, and what appears to be part of a broken boat engine (Figure 301). This boat-related trash may be associated with the Japanese sampan fleet. The historic trash found within SIHP #-7660 may be associated with trash disposal from the Kewalo Basin due to the boat tie and associated metal debris; however, due to the small sample size of diagnostic artifacts, sufficient information is not available to determine the exact nature or age of this fill event.

In summary, SIHP # -7660 represents the fill material utilized to fill in an abandoned storm drain box. The historic trash collected from within this fill material was not burned, charred or melted, indicating it was not from an incinerator or open air burn pit. The observed trash included historic glass, ceramic, and what appears to be debris related to a boat. Due to the presence of the boat-related debris and associated debris that may be related to the nearby Japanese lease lands, the SIHP # -7660 historic fill material may be associated with the fishing industry and tuna cannery formerly within the Kewalo Basin. SIHP # 50-80-14-7660 is a historic trash fill deposit, utilized to fill in an abandoned storm drain box. SIHP # -7660 is assessed as significant under Hawai‘i state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR § 13-284-6. This assessment was based on the historic property’s potential to provide information on the urban expansion of Honolulu into Kaka‘ako.

Figure 300. 1939-1941 aerial photograph (U.S. Army Air Corps) of Kaka‘ako; Japanese sampans can be seen along dock in Kewalo Basin (yellow arrow).

Figure 301. Historic debris observed in TE 32 associated with SIHP 7660; large metal fragments and possible boat engine parts are shown.

Section 7 Research Objectives

Based on historic background research and previous archaeological investigations, the AISP for the Block B East project formulated four research objectives. Information obtained from the AIS investigation greatly informed each of these objectives and is presented below for each question.

7.1 Research Question 1

An 1883 map of Honolulu Water Works System shows an extensive system of grid-like salt pans within Kakaʻako, extending at its southern limit across the majority of the Block B East project area. To what extent are these salt pans still extant beneath twentieth century reclamation fill deposits? Are remnant salt pans similar in depositional sequence (alternating layers of peat and clay) to documented salt pans in the northern portion of Kakaʻako (refer to Pammer et al. 2011)? Can salt pan structures be identified (e.g., berms, drainage channels)? Have nineteenth century historical salt pans significantly altered or removed underlying natural strata and/or cultural deposits?

Evidence of the historic salt pan remnants were encountered throughout the central and *mauka* portions of the Block B East project area, and were designated SIHP # -7655. The salt pan remnants presented as a series of man-made berms consisting of locally procured natural sediment modified slightly into a low structural feature. The complex of berm structures were observed extensively throughout the contiguous Block B East and Block C West (Sroat et al. 2014) project areas, typically in a *mauka/makai* pattern. Within the Block B East project area, 26 of the 38 test excavations contained berms, which varied widely in height and width.

In addition to the man-made berms, laminated organic material overlying natural wetland sediments was observed in 13 test excavations, and determined to be associated with the salt pan beds. The organic laminations consisted of distinct micro-layers, observable as variations of color and texture. Some of the layers contained flat leaf-like organic material. In general, these laminated organic deposits ranged from 1 to 4 cm in thickness. The laminated organic material appeared similar to the evidence of salt pans observed within previous studies, including SIHP # -7190 recorded by Pammer et al. (2011); however the distinct layers of clay material between the leaf structures was not as prominent within the current project area. Similar peat and clay laminations were observed during the Hammatt (2013) and Morriss et al. (2013) studies, overlying the natural wetland and marine clay sediments.

The natural sediments within the Block B East project area have been heavily disturbed by the salt pan activities, typically as a result of construction of the man-made berms. Mixing of the natural gleyed wetland sediments is seen within the man-made berm features (see), and in many instances the natural wetland sediments had been completely removed. The salt pan beds were typically observed between 43 cm above the coral shelf to directly over the shelf, indicating a majority of the natural marine clay sediments had been completely removed. Pollen analysis performed on both the laminated organic material and the underlying wetland showed the presence of introduced species within both strata, including Australian pine, *koa haole*, and *kiawe*. The presence of at least one or more of these in each of the samples indicates both the laminated organic material and the underlying wetland sediments are most likely historic.

7.2 Research Question 2

Does the Block B East project area contain culturally enriched deposits beneath the fill layers, in particular along the* makai *boundary of the project area? If so, how can we characterize the function, spatial distribution, and chronology of these deposits? Is there any evidence of traditional Hawaiian use of this coastal area (e.g., habitation, burials, fishing practices)?

Within Block B East, the observed natural sediments consisted of salt pan remnants (SIHP # -7655) or disturbed and reworked natural sand (Figure 302). The disturbed sand layer was only encountered along the *makai* edge of the project area; no undisturbed Jaucas sand or associated cultural layer were encountered.

The sand, observed within six test excavations, was previously disturbed and reworked with no remaining remnants of the original land surface. Disturbance to the sand layer may have resulted from extensive urban development, including expanding and raising the level of the old coastal road. Within three test excavations (Test Excavations 30, 31, and 32), a buried historic roadway was observed on the upper boundary of the reworked sand (SIHP # -7658), presenting as a compacted layer of mixed materials similar to an asphalt roadway. Although this former surface may be associated with the old coastal road, due to its location above the reworked sediments, it is most likely associated with development within the Block B East project area.

A single human cranial fragment was encountered within the disturbed sand (SIHP # -7656), located within Test Excavation 31 near the western half of the project area. The cranial fragment was located at approximately 72 cmbs, well within the reworked sand, suggesting the original burial location was within the associated sand prior to its disturbance. A total of four test excavations were located immediately to the east and west of Test Excavation 31, including two excavations placed in an effort to further test near the location of SIHP # -7656 (Test Excavations 13 and 14). No additional fragments of human skeletal material were encountered within the surrounding excavations, suggesting the original burial location may not be in the immediate vicinity, or that disturbance to the burial was minimal.

7.3 Research Question 3

Is there evidence of pre- and/or early post-Contact Hawaiian cultural use of the northern corner of the project area in the location of LCA 1903:2 (documented as containing a fishpond and house lot)?

Test Excavations 1B, 2, 3, and 38 were placed in an effort to locate evidence of LCA 1903:2. The results of TEs 1–3 were consistent with the majority of the project area, containing locally procured natural sediment modified into a structural feature (man-made berm) associated with the SIHP # -7655 salt pan remnants. It is unclear whether this berm was associated with the recorded LCA 14903 salt pans; however, it seems unlikely based on its similarities to the remainder of the project area.

Test Excavation 38, located in the northern corner of the Block B East project area, was unique among the four test excavations, containing stratigraphy differing significantly from the remainder of the project area. Although evidence of a man-made berm associated with the salt pan remnants was observed within TE 38, a limestone boulder feature was present along the edge of the man-

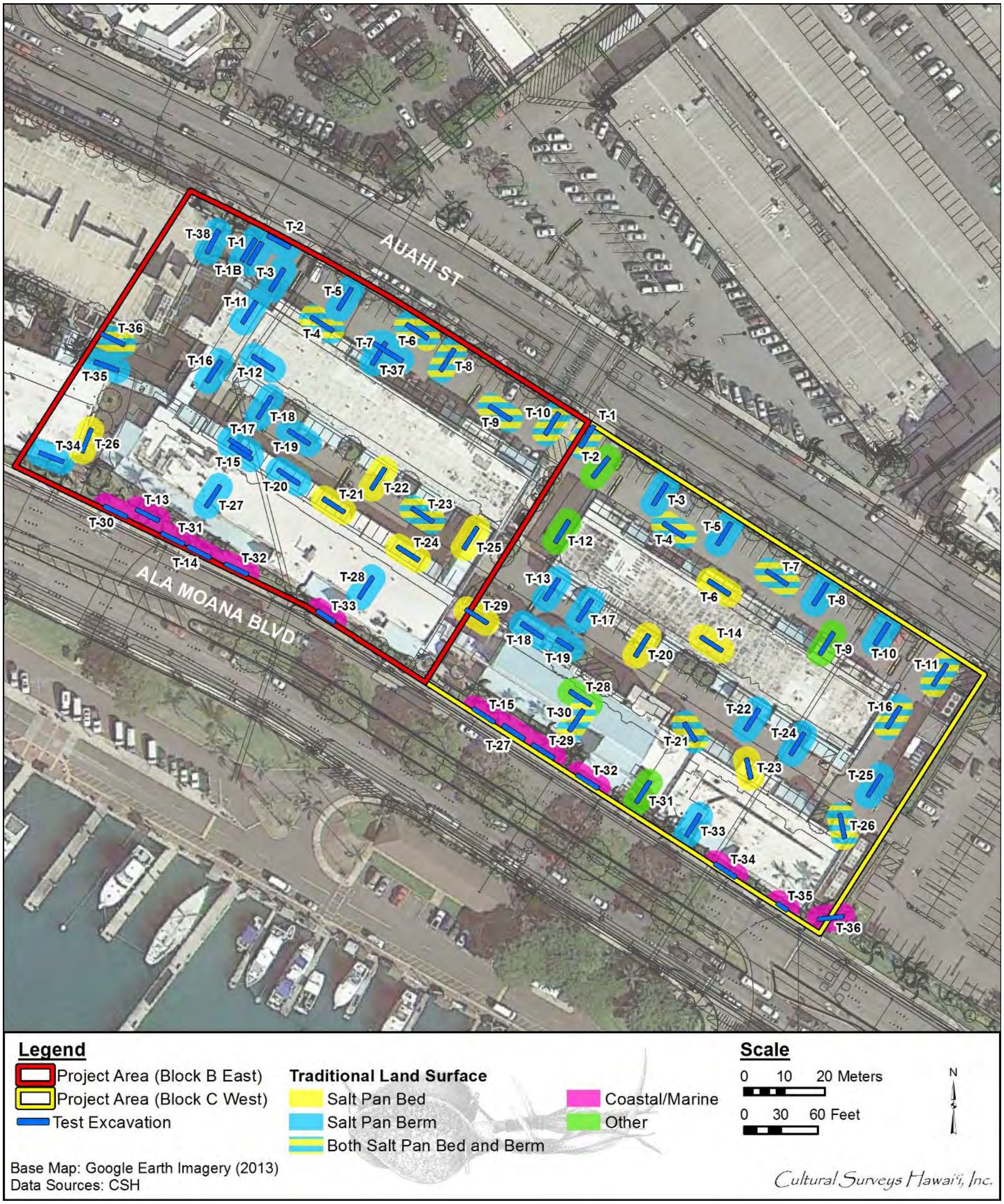

Figure 302. Aerial photograph showing the distribution of natural surfaces documented within the Block B East and Block C West project areas, including the salt pan beds and salt pan berms associated with SIHP # -7655 and the disturbed and reworked marine sand (source: Google Earth Imagery 2013)

made berm (SIHP # -7655, Feature 2). These limestone boulders created a level surface with the berm, near the transition to peaty pond-like material; however, the transition was not visible due to a previous disturbance. The pond-like sediment was only observed within the far southern edge of the test excavation, providing a minimal amount of information. This pond material was observed along the boundary of the Block B East project area, extending toward the Block B West project area. Due to its location along the northern corner of the current project area and the lack of information available from TE 38, trench placement during the Block B West testing will target this area in an effort to gain additional information. This information will include pollen analysis and investigation into whether additional limestone boulders are present along its border.

7.4 Research Question 4

What evidence exists of the various reclamation projects within the Block B East project area and can any deposits be correlated with specific reclamation projects?

The following discussion pertains to the combined Block B East and adjacent Block C West (Sroat et al. 2014) project areas. Land reclamation fill deposits were observed overlying natural sediments in a total of 59 of the combined 74 test excavations, 31 in the Block B East project area and 28 within the Block C West project area (Figure 303). A clear geographic distribution was observed in the central and *mauka* portions of the project area, and notably absent within the *makai* portion. The hydraulic dredge, which is derived from a combination of hydraulic pumping and truck dumping of sediment from the ocean floor, is comprised of platy lenses of sandy or silty clay, ranging from gleyed to pale yellow in color. The clearest observable characteristic of the hydraulic fill was the presence of microstratigraphic banding. The topmost layer of land reclamation fill typically consisted of a gravelly crushed coral fill material, differing from the hydraulic clays by providing a dry, permeable, and stable land surface. Land reclamation fill was largely absent in test excavations exhibiting a high natural ground surface (Block B East, Test Excavations 15 and 17; Block C West, Test Excavation 10).

Background research indicates that while land reclamation had begun in Kewalo prior to 1913, the Block B East and Block C West project areas remained fallow until dredging of the Kewalo Basin, which took place from 1919–1926. As the two project areas are located directly *mauka* of the Kewalo Basin, they were likely among the first pieces of land to be filled with this dredged material. A 1920 report by the Department of the Interior notes the following:

> The development of Kewalo Basin as a lumber trade terminal and fishing fleet base has been given considerable study and preliminary investigations have been carried on during this period. Surveys were made, including the necessary borings and soundings, for a channel into this basin from the sea 15 feet deep and 150 feet wide as the first unit of development. A contract was awarded for dredging this channel for $39,000. Part of the material dredged has been utilized for reclaiming a piece of land for the Territory 200 feet square at the southeast corner of the bishop estate fill now owned by the Territory; part of the material is being pumped ashore reclaiming some of the Ward estate lands and the balance wasted at sea. [Department of the Interior 1920:2:52]

The above report, pertaining to the fiscal year ending 30 June 1920, suggests land reclamation within the Ward Estate lands, which would include the current project area, was ongoing in the first half of 1920. A 1914 report on the Kewalo Reclamation describes the dredging process:

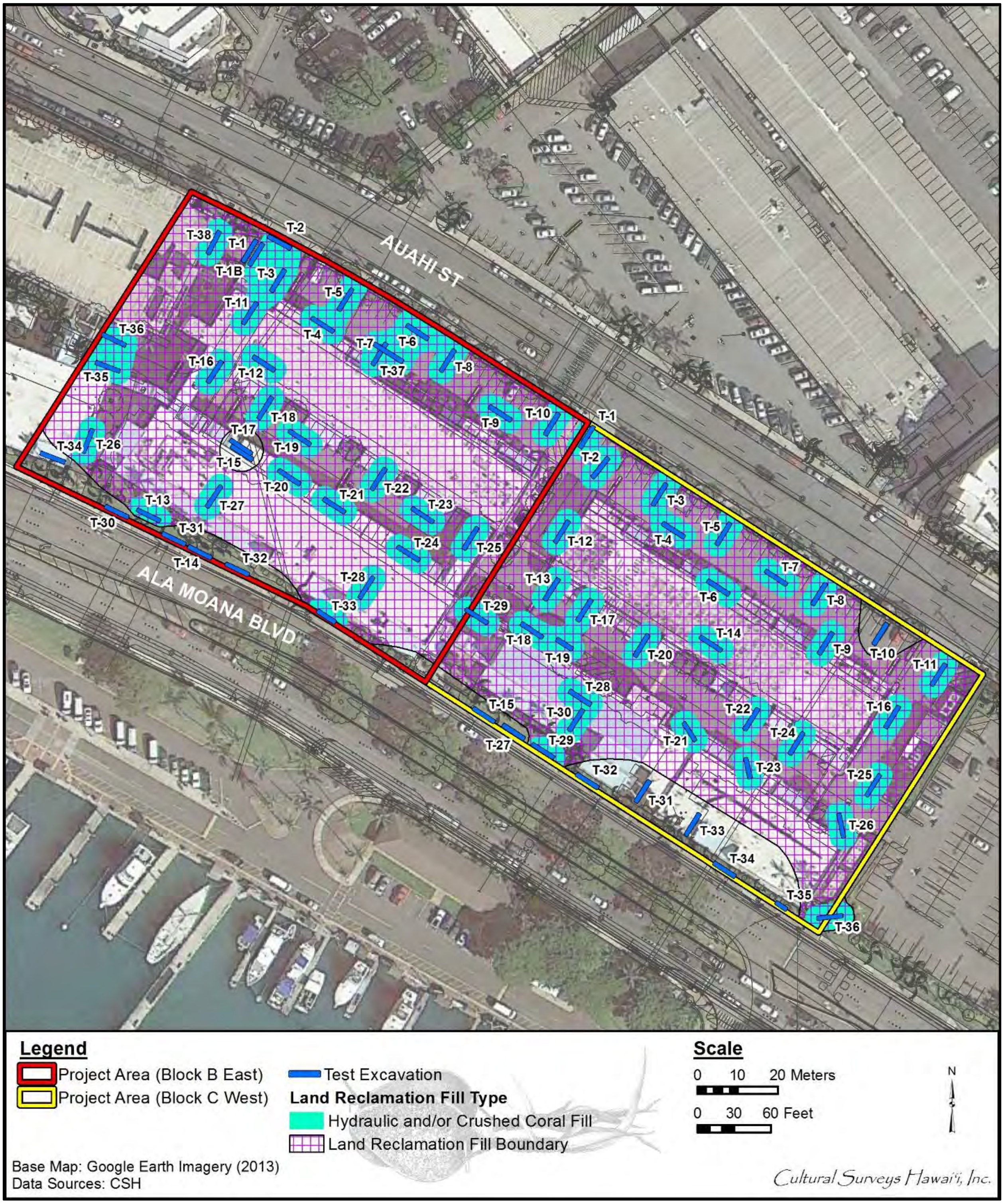

Figure 303. Aerial photograph showing the extent of the land reclamation fill, including both hydraulic fill and crushed coral fill, documented within the Block B East and Block C West project areas (source: Google Earth Imagery 2013)

> 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. . . .
>
> 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. . . [Hawaii Reports 1914:351]

This report suggests dredging and filling an area was relatively quick (three months total) indicating the two project areas may have been completely reclaimed by the end of 1920. It appears the hydraulic and crushed coral fill were placed as one reclamation event, the hydraulic clay proceeding the crushed coral in an effort to first “drain off” the marshy water. Figure 304, Figure 305, and Figure 306 depict the Block B East and Block C West project areas with an overlay of the trench locations, showing the distribution of the hydraulic fill (see Figure 304), crushed coral fill (see Figure 305), and the trenches that contained both (see Figure 306).

A 1927 aerial photograph depicts the filled and leveled Block B East and Block C West project areas, relatively barren with few to no structures (Figure 307). An active dredge is positioned within Kewalo Basin, a trough or pipeline extending from the dredge to the shore, continuing reclamation of the shoreline *makai* of the project area. A large, southwest-northeast trending swath of barren white dredge material is evident in the northeastern portion of Block B East, extending to the east through the northwest edge of Block C West.

This unique and easily identifiable, early to mid-twentieth century land reclamation deposit was used throughout excavations within the project area as an initial relative dating technique. The strata and deposits overlying the hydraulic fill post-date the 1919–1926 land reclamation events, most likely completed within the project areas by the end of 1920. Therefore, the strata underlying the hydraulic fill, consisting of the salt pan remnants (SIHP # -7655) and disturbed sand, could be considered older than the early twentieth century land reclamation deposit.

The modern land surface within the project area was comprised of asphalt within the parking lot and concrete within the interior of the Ward Warehouse structures and adjacent walkways. The modern land surface was universally designated Stratum Ia. Based on a review of aerial imagery, the white dredge fill material is visible as the Block B East and Block C West project area land surface within the 1927 and the 1939–1941 aerial photos (see Figure 307, Figure 308). By 1952, development within the two project areas appears significantly heavier, which would have included the addition of fill to the land reclamation materials (Figure 309). The project areas were further altered by the time of the 1970 aerial photo (Figure 310), these structures likely representing the final fill layers placed prior to the 1976 construction of the current Ward Warehouse structures.

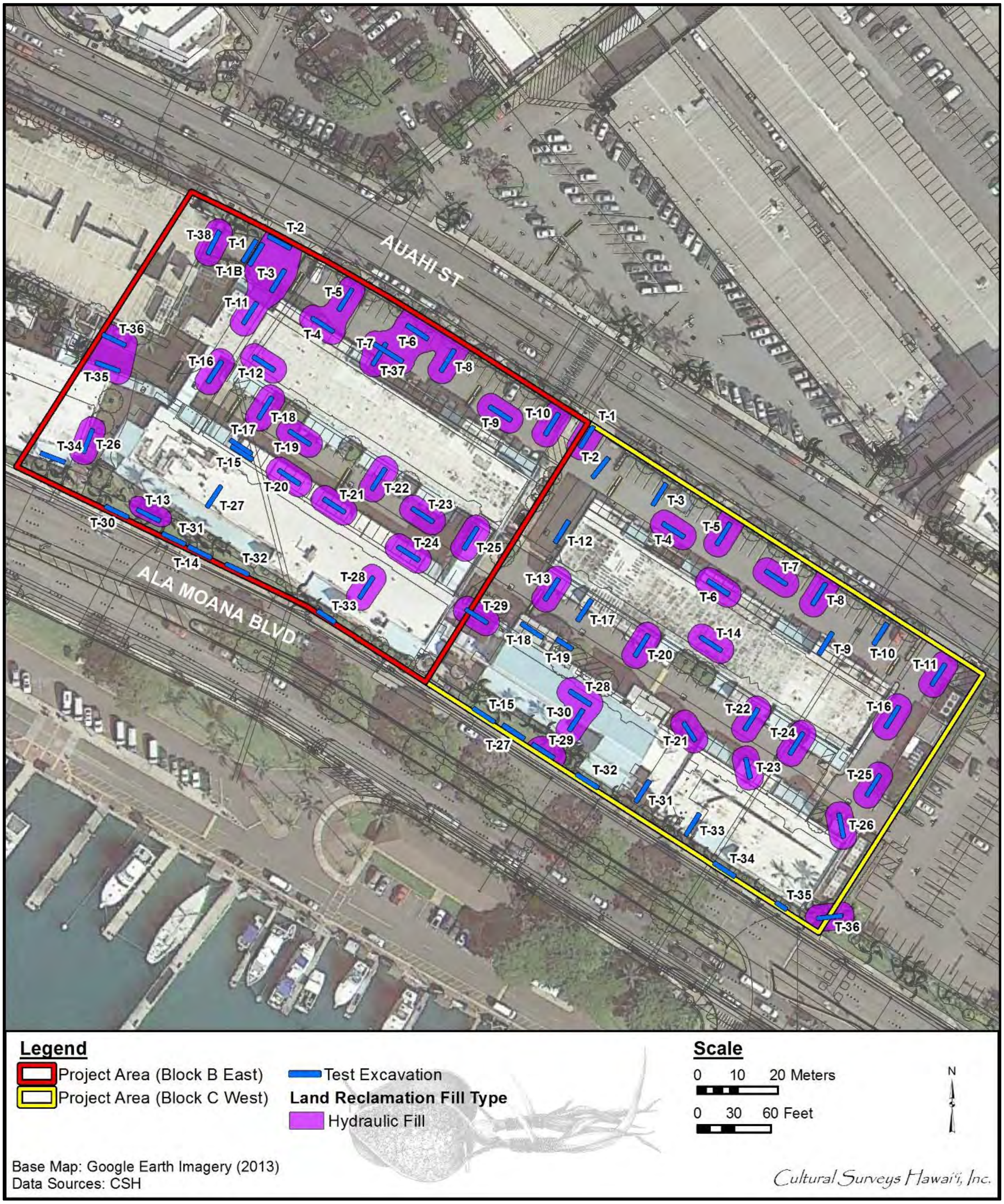

Figure 304. Aerial photograph showing the extent of the hydraulic fill documented within the Block B East and Block C West project areas (source: Google Earth Imagery 2013)

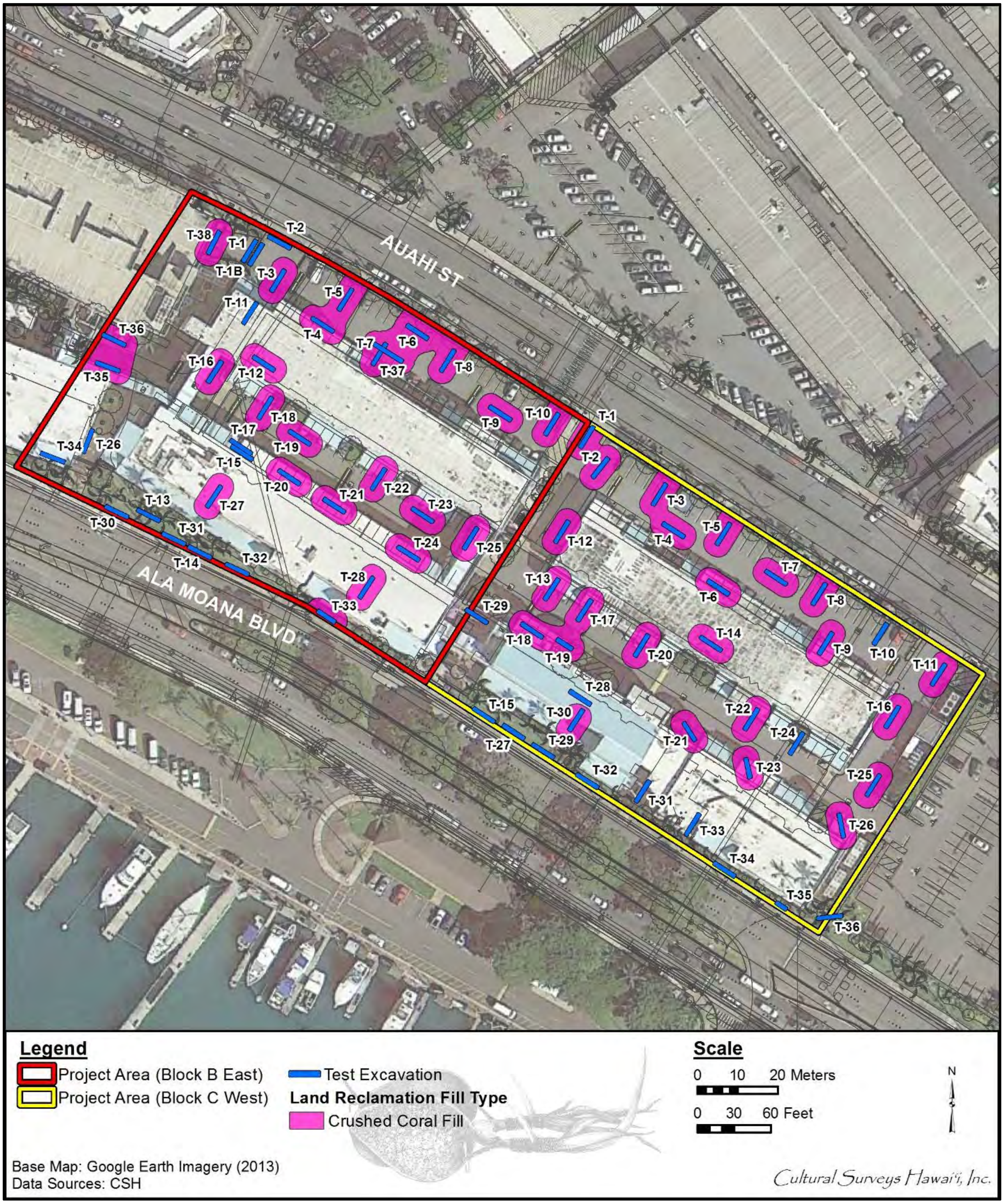

Figure 305. Aerial photograph showing the extent of the crushed coral fill documented within the Block B East and Block C West project areas (source: Google Earth Imagery 2013)

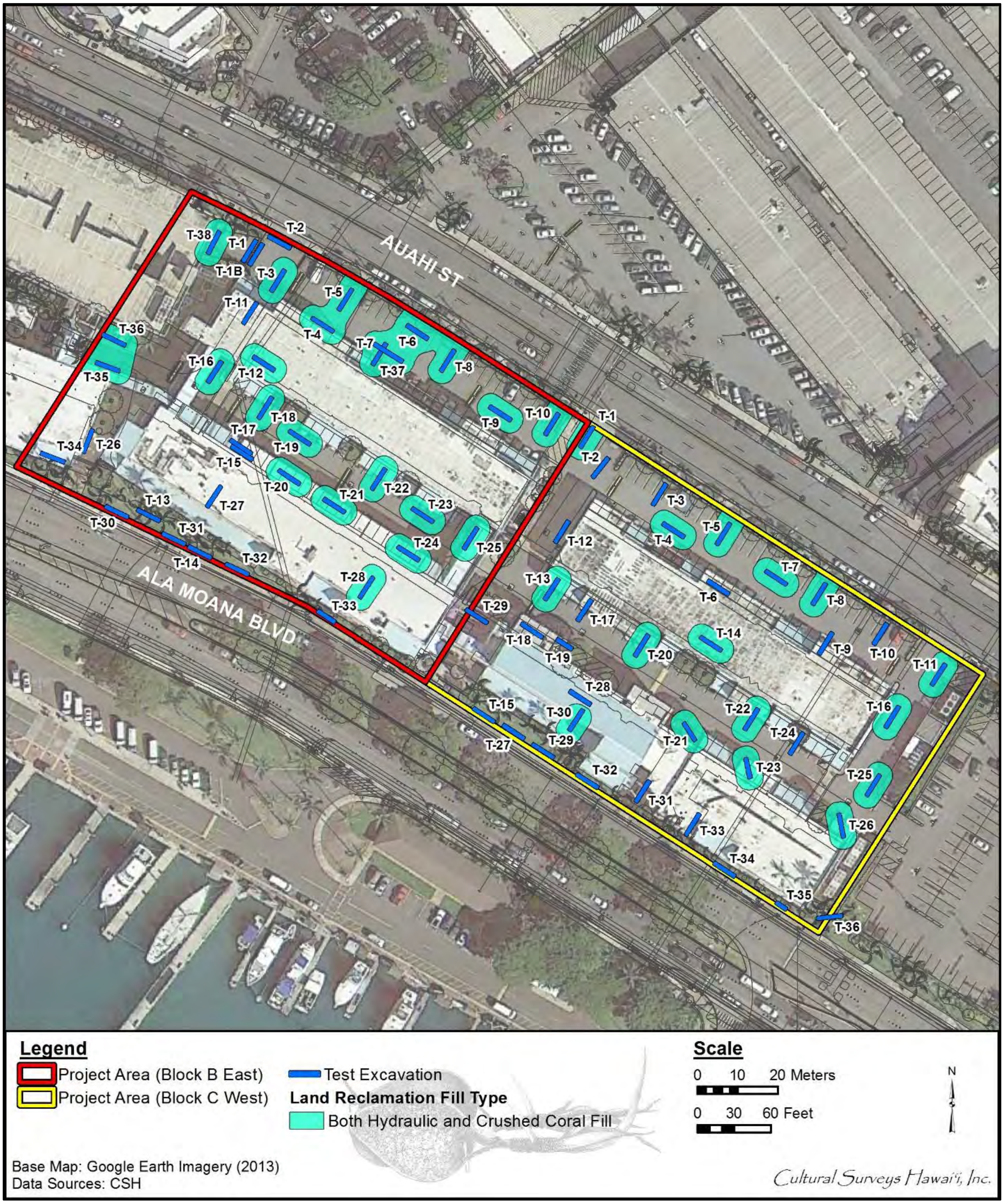

Figure 306. Aerial photograph showing only the trenches that contained both hydraulic fill and crushed coral fill, documented within the Block B East and Block C West project areas (source: Google Earth Imagery 2013)

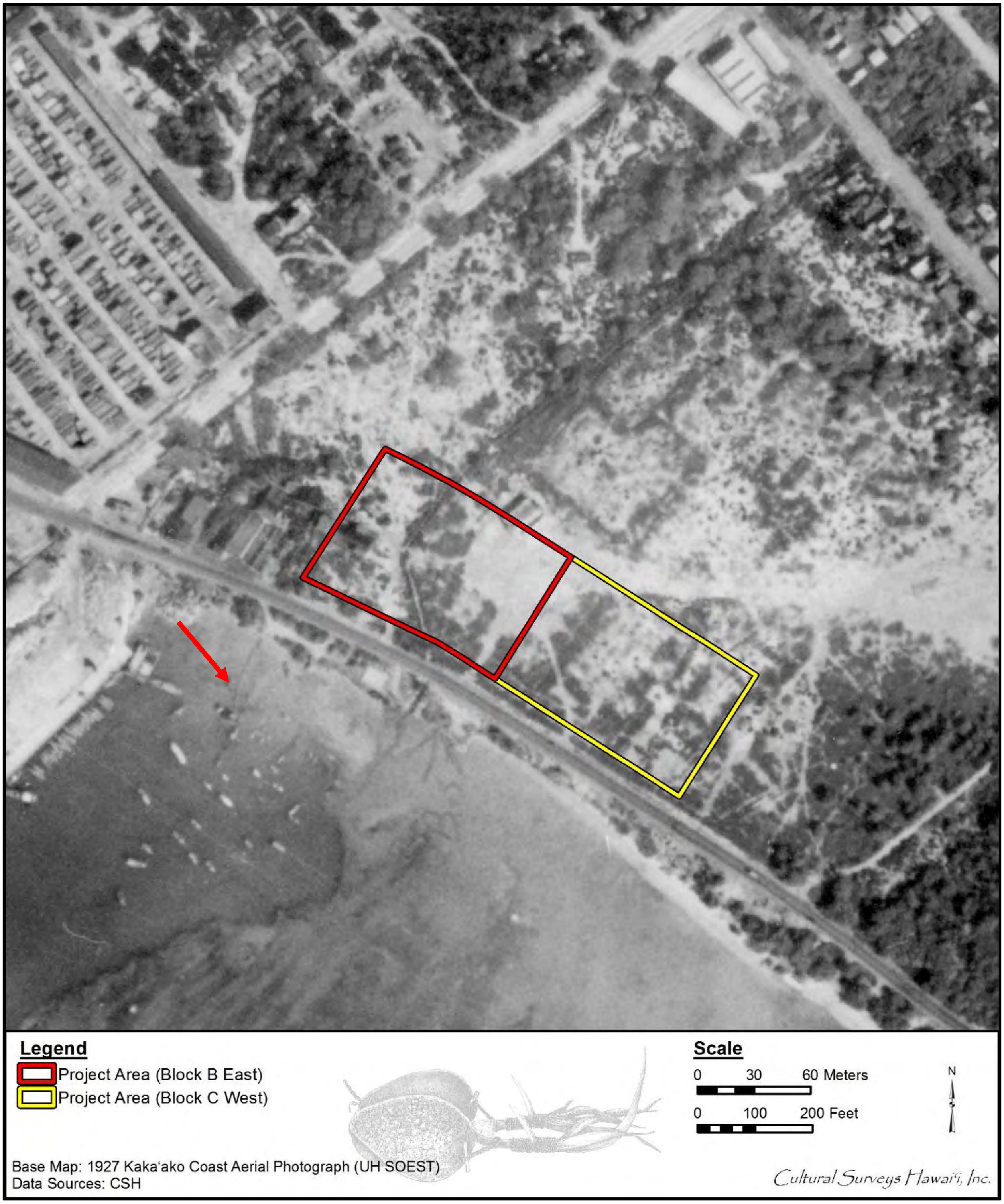

Figure 307. 1927 USGS aerial photograph showing dredge activity within and adjacent to the project area (U.S. Geographic Service; mosaic of photograph sheets from Hawai‘i Coastal Geology Group)

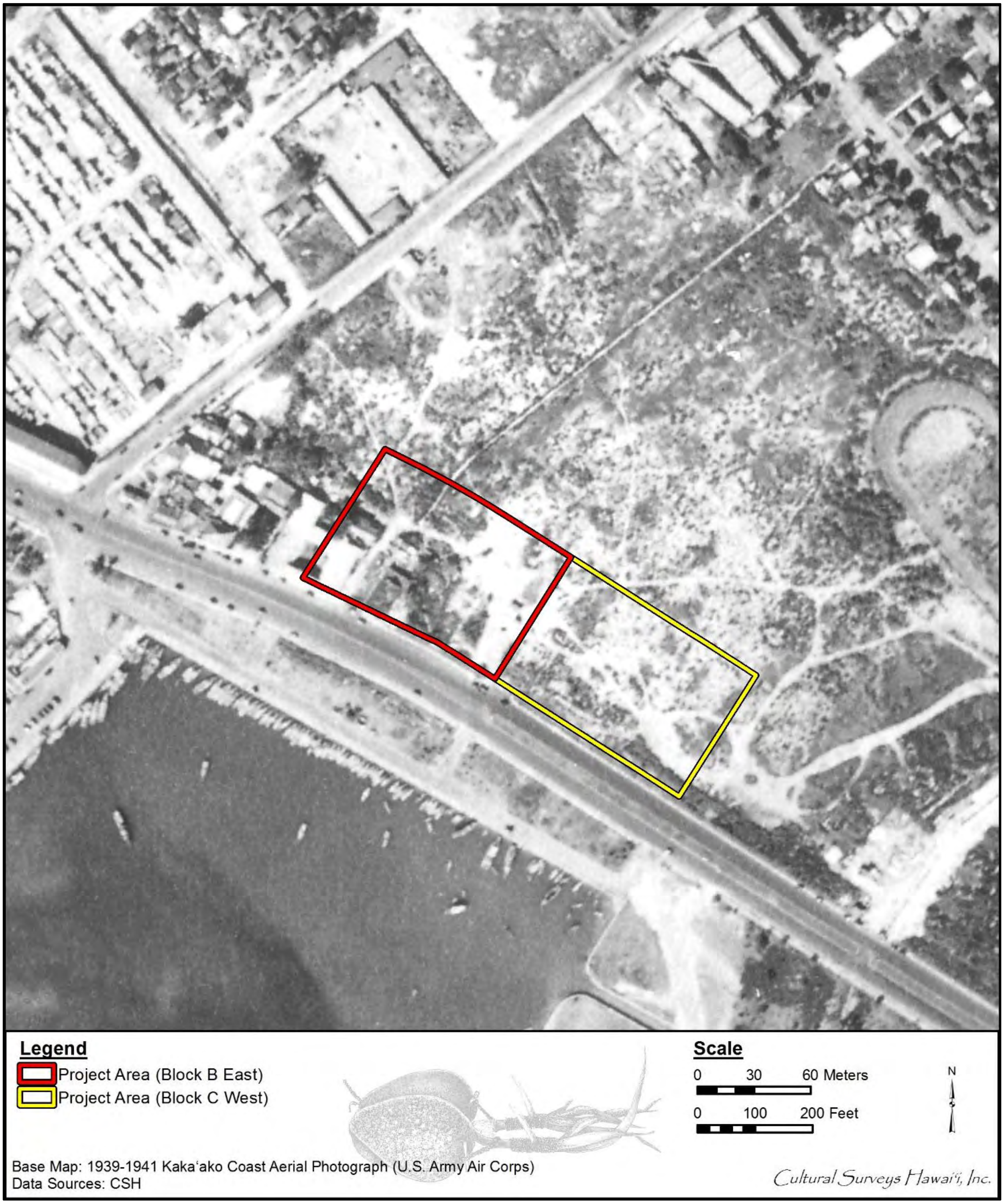

Figure 308. 1939–1941 aerial photograph (U.S. Army Air Corps) of Kakaʻako with an overlay of the Block B East and Block C West project areas showing white dredge fill material still visible as the land surface

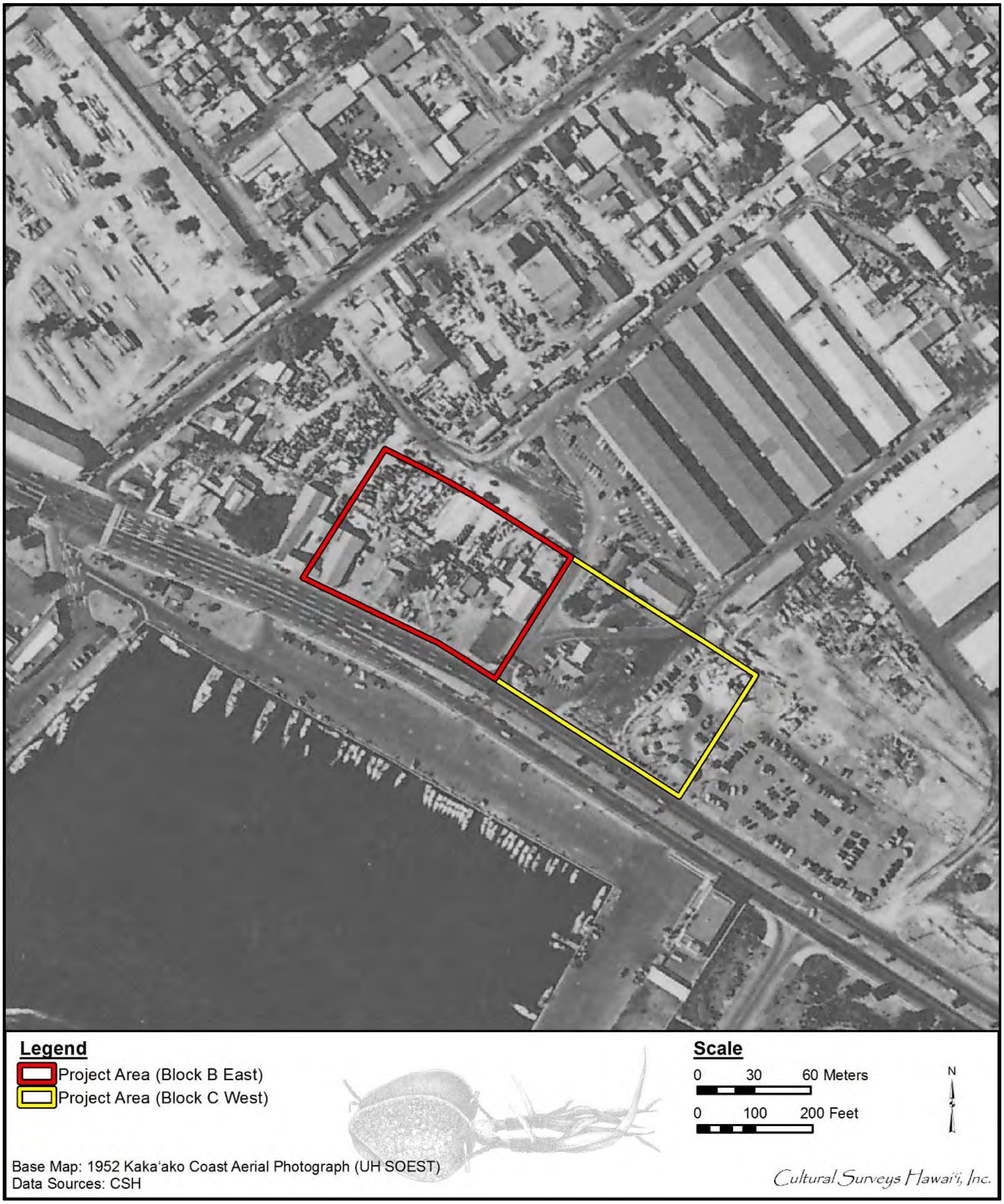

Figure 309. 1952 aerial photograph with an overlay of the Block B East and Block C West project areas showing development within the two project areas (U.S. Army Air Corps, mosaic of sheets from Hawaiʻi Coastal Geology Group)

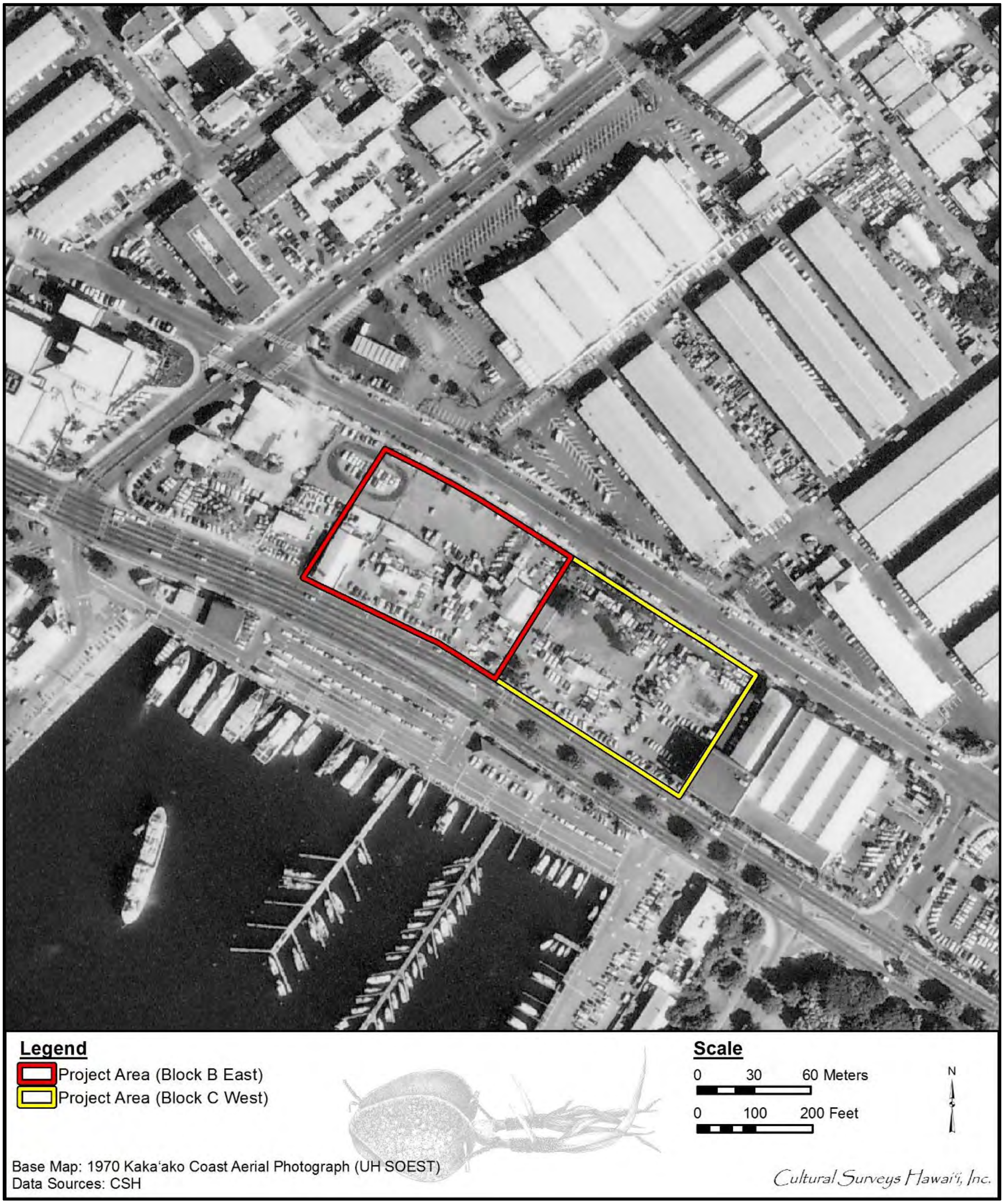

Figure 310. 1970 aerial photograph (R.M. Towill), with an overlay of the Block B East and Block C West project areas further development within the project areas

Section 8 Summary and Interpretation

The fieldwork component of this archaeological inventory survey was conducted between 21 April 2014 and 9 June 2014. CSH archaeological field personnel consisted of Ena Sroat, B.A. (project director), Megan Hawkins, M.A, Michelle Pammer, B.A., Andrew Soltz, B.A., Abby Mierzejewski, B.S., Amanda Eggers, B.A., Tim Zapor, B.A., Jessica Leger, M.Sc., Scott Belluomini, B.A., Tara del Fierro, B.A., Tara Seaver, B.A., James Thain, B.A., Laura Vollert, B.A., Pua Guanzon, B.A., Jonas Madeus, B.A., Nifae Hunkin, B.A., and Melina Reveal, M.Sc. All fieldwork was conducted under the direction of the principal investigator, Matt McDermott, M.A.

Fieldwork consisted of an initial 100% coverage pedestrian survey followed by a subsurface testing program. The pedestrian survey concluded that the entire surface of the project area has been modified as a result of development of the Ward Warehouse commercial complex, including significant elevation of the ground surface above the surrounding environment. As there were no surface historic properties, the archaeological inventory survey focused on the program of subsurface testing to locate any buried cultural deposits and to facilitate a thorough examination of stratigraphy within the project area. A total of 38 backhoe-assisted test excavations were completed, including both exterior (parking lot/courtyard) and interior (Ward Warehouse commercial space) locations.

Significant findings of the inventory survey included identification of five historic properties: 1) historic salt pan remnants consisting of low-lying wetlands converted to salt pan basins enclosed by man-made berm structures, located beneath land reclamation fill within the central and *mauka* portions of the Block B East and Block C West project areas (SIHP # -7655); 2) disturbed and reworked Jaucas sand along the *makai* boundary of the Block B East project area containing a single human skeletal fragment (SIHP # -7656); 3) buried mid-twentieth century development land surfaces, consisting of asphalt, concrete, coral and tar pavement, and oil-rolled surfaces (SIHP # -7658) observed throughout the Block B East and Block C West project areas; 4) the buried, concretized Ward Estate *‘auwai* (SIHP # -7659) within the center of Block B East; and 5) a historic trash fill layer (SIHP # -7660) encountered with an abandoned concrete drain box located along the *makai* boundary of the Block B East project area.

In general, the stratigraphic sequence within Block B East from the present land surface to the coral shelf included the modern developed land surface and variable layers of imported fill, overlying buried historic surfaces (SIHP # -7658) and associated grading fill, overlying crushed coral and hydraulic (dredge) reclamation fill, overlying historic salt pan remnants (SIHP # -7655) and/or natural wetland and marine sediments.

Background research indicates the Block B East project area was filled during dredging of the Kewalo Basin, which took place from 1919–1926. As the project area is located directly *mauka* of the Kewalo Basin, it was likely among the first pieces of land to be filled with the dredged material. Historical records indicate dredging within the project area was on-going by the middle of 1920, and was likely completed by the end of that same year. The reclamation deposits observed within the project area consisted of crushed coral fill over hydraulic dredge marine clay. The hydraulic dredge, derived from a combination of hydraulic pumping and truck dumping of sediment from the ocean floor, is comprised of platy lenses of sandy or silty clay, ranging from gleyed to pale yellow in color. The clearest observable characteristic of the hydraulic fill was the presence of microstratigraphic banding. The topmost layer of land reclamation fill typically consisted of a gravelly crushed coral fill material, differing from the hydraulic clays by providing a dry, permeable, and stable land surface. A clear geographic distribution was observed in the central and *mauka* portions of the project area, and was notably absent within the *makai* portion.

The area of reclamation fill within Block B East aligned almost exactly with the area of underlying historic salt pan remnants (SIHP # -7655), represented by a series of man-made berms and salt pan beds containing laminated organic material. The berm structures were comprised of archaeosediments, likely marine sandy clay deposits previously located within or in the immediate vicinity of the project area. The interlacing complex of berm structures was observed extensively throughout the contiguous Block B East and Block C West (Sroat et al. 2014) project areas. Within the Block B East project area, 26 of the 38 test excavations contained berms, which varied widely in height and width.

The salt pan beds consisted of the natural underlying wetland sediments covered with very thin organic laminations, likely associated with a salt production method. The organic laminations consisted of distinct micro-layers, observable as variations of color and texture. Some of the layers contained flat leaf-like organic material. In general, these laminated organic deposits ranged from 1 to 4 cm in thickness.

Background research indicates salt production took place throughout Kaka'ako in both pre-Contact and historic times. The salt making process has been described by multiple sources, including William Ellis:

> 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]

The method described by Ellis (1827) mentions the use of evergreen leaves to line the salt pan beds, which is consistent with the laminated organic material observed lining the lower-lying salt pan beds within the Block B East and the adjacent Block C West project areas. Pollen analysis performed on samples collected from the organic laminations and the underlying wetland sediments were dominated by the *kolea* (*Myrsine*), a small to medium-sized native evergreen tree (Little and Skolmen 1989:268). The *kolea* is likely an insect pollinated plant, as are most plants in the Myrsinaceae family which, opposed to the wind pollinated plants, are typically not observed within the archaeological record. The high percentage of *kolea* pollen in all of the samples from Blocks B East and C West is unusual and may indicate *kolea* leaves, a native evergreen, were utilized to line and waterproof the salt beds.

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, within the west-central portion of the project area. Feature 1 consisted of a layer of level, tabular limestone boulders forming a cohesive surface, located at the interface between natural in situ wetland sediment and the overlying man-made berm. 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. Similar to Feature 1, the structure appeared man-made, with tabular boulders forming a level top surface, 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.

According to historic maps, a corner of LCA 1903:2, consisting of two salt beds, two ditches, two salt depressions, and one salt *kula*, extends slightly into a portion of the Block B East project area. Test Excavations 1B, 2, 3, and 38, placed in an effort to locate evidence of LCA 1903:2, were consistent with the majority of the project area, containing locally procured natural sediment modified into a structural feature (man-made berm) associated with the SIHP # -7655 salt pan remnants. It is unclear whether this berm was associated with the recorded LCA 14903 salt pans; however, it seems unlikely based on its similarities to the remainder of the project area. Test Excavation 38 was unique among the four test excavations, containing stratigraphy that differed significantly from the remainder of the project area. Although evidence of a man-made berm associated with the salt pan remnants was observed within TE 38, a limestone boulder feature was present along the edge of the man-made berm (SIHP # -7655 Feature 2). These limestone boulders were observed near the transition to peaty pond-like material; however, the transition was not visible due to a previous disturbance. The pond-like sediment was only observed within the far southern edge of the test excavation, providing a minimal amount of information.

SIHP # -7658 consisted of buried historic surfaces observed in 18 test excavations within the Block B East project area. The buried surfaces included asphalt, concrete, coral and tar pavement, oil-rolled surfaces, and wooden posts, all of which were associated with multiple historic land use periods. With the exception of the wooden posts, the buried structures were all observed overlying the hydraulic dredge and crushed coral fill associated with the 1919–1926 Kewalo reclamation. The fill overlying SIHP # -7658 is associated with grading and construction of the current Ward Warehouse structures. Aerial photographs suggest urban development within the Block B East project area changed drastically between the filling of the project area and the 1976 construction of the current Ward Warehouse structure. Based on aerial photos, the buried surfaces are likely related to development between 1927 and 1976.

Stratigraphy within the Block B East project area differed along the *makai* edge of the project area, consisting of a disturbed and reworked Jaucas sand and coastal marine sandy clay sediments. The overlying fill deposits consisted of modern fill associated with the existing structure and landscaping and, in the case of three test excavations (TE 30, 31, and 32), a buried historic land surface (SIHP # -7658). Much of the disturbance to the natural sediments in this area appeared to be due to the surrounding urban development including landscaping, road way 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 may represent the source of these archaeosediments. A single human cranial fragment (SIHP # -7656) was encountered within the disturbed sand along the *makai* edge of the project area (TE 31). The cranial fragment was located at approximately 72 cmbs, well within the reworked sand, suggesting the original burial location was within the associated sand prior to its disturbance. No additional fragments of human skeletal material were encountered within the surrounding excavations, suggesting the original burial location may not have been in the immediate vicinity, or that disturbance to the in situ burial was minimal.

An abandoned concrete drain box was observed along the *makai* boundary of the Block B East project area (Test Excavation 32), filled with extremely gravelly silty loam containing a large quantity of historic trash (SIHP # -7660). The observed historic trash included glass, ceramic, and what appears to be debris related to a boat. The presence of the boat-related debris and trash that may be related to the nearby Japanese lease lands suggests the fill material associated with SIHP # -7660 may be associated with the fishing industry and tuna cannery formerly within the Kewalo Basin. This fill material was only observed within the drain box.

A concrete structure, determined to be associated with the concretized Ward Estate *ʻauwai* (SIHP # -7659), was encountered in two test excavations within the Block B East project area (Test Excavations 15 and 17). The concretized Ward Estate *ʻauwai* was constructed in the early twentieth century to replace the existing Old Plantation *ʻauwai,* prior to or in conjunction with land reclamation activity. The Ward Estate concretized *ʻauwai* is a continuous feature running from Kapiolani Boulevard into Kewalo Basin, extending into the western portion of the project area in a northeast to southwest direction. The *ʻauwai* presented as a large concrete structure encountered at 38–45 cm below the current land surface, and extending to, or below, the coral shelf.

In summary, the Block B East AIS further defined the SIHP # -7655 historic salt pan remnants associated with salt production with the Kakaʻako area, including identification of its *makai* boundary. Traditional Hawaiian activities were not observed within the Block B East project area; however, a human cranial fragment (SIHP # -7656) was observed within the disturbed and reworked sand along the *makai* boundary of the project area. Land reclamation activity was present within the current project area, with a clear geographic distribution of the central and *mauka* portions of the project area overlying the lower lying salt pan remnants. Additional evidence of historic activity within the project area was observed in the form of buried historic land surfaces (SIHP # -7658), the concretized Ward Estate *ʻauwai* (SIHP # -7659), and a historic trash fill layer (SIHP # -7660).

Section 9 Significance Assessments

The five historic properties observed within the current study area were evaluated for significance according to the broad criteria established for the Hawaiʻi Administrative Rules (HAR) § 13-284-6. The five criteria are:

a. Associated with events that have made an important contribution to the broad patterns of our history;
b. Associated with the lives of persons important in our past;
c. Embodies the distinctive characteristics of a type, period, or method of construction, represents the work of a master, or possesses high artistic value;
d. Have yielded, or is likely to yield information important for research on prehistory or history;
e. Historic property has cultural significance to an ethic group, including, but not limited to, religious structures, burials, and traditional cultural properties.

Table 42 lists the historic properties along with their significance assessments and mitigation recommendations. These significance assessments are included in this AISR for the review and concurrence of the SHPD.

SIHP # 50-80-14-7655 consists of subsurface historic salt pan remnants, documented as laminated organic material and associated man-made berms. SIHP # -7655 is assessed as significant under Hawaiʻi 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. The historic property reflects land-use activities related to historic salt pan operations, and has the potential to offer insight into these practice

SIHP # 50-80-14-7656 consists of a previously identified, isolated human cranial fragment. SIHP # -7656 is assessed as significant under Hawaiʻi state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) and criterion “e” (historic property has cultural significance to an ethic group, including, but not limited to, religious structures, burials, and traditional cultural properties) pursuant to HAR § 13-284-6. This assessment was based exclusively on the information it has provided and its cultural significance.

SIHP # 50-80-14-7658 consists of buried historic surfaces, including asphalt, concrete, coral and tar pavement, oil-rolled surfaces, and fence-lines. SIHP # -7658 is assessed as significant under Hawaiʻi state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR § 13-284-6. SIHP #-7658 has provided, and can potentially provide, additional information on twentieth century commercial infrastructure within Kakaʻako.

SIHP # 50-80-14-7659 consists of the concretized Ward Estate *ʻauwai*. SIHP # -7659 is assessed as significant under Hawaiʻi state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR § 13-284-6. This assessment was based on the historic property’s potential to provide information

Table 42. Archaeological Historic Property Significance and Mitigation Recommendations

SIHP #	Test Excavation (Block B East)	Formal Type/ Description	Significance Per HAR 13-284-6	Mitigation Recommendation
-7655	1–12, 15–29, and 34–38	Subsurface Salt Pan Remnants	“c” and “d”	Archaeological Data Recovery and Archaeological Monitoring
-7656	31	Human Skeletal Remains	“d” and “e”	Burial Treatment Plan and Archaeological Monitoring
-7658	4, 5, 7–10, 14, 18, 19, 20, 28, 30, 31, 32, and 37	Subsurface Historic Paving and Building Remnants	“d”	Archaeological Monitoring
-7659	15 and 17	Historic Drainage Channel	“d”	Archaeological Data Recovery and Archaeological Monitoring
-7660	32	Historic Trash Fill Layer	“d”	Archaeological Monitoring

on land modification associated with the Kewalo reclamation project and subsequent urban development.

SIHP # 50-80-14-7660 is a historic trash fill deposit, utilized to fill in an abandoned drain line box. SIHP # -7660 is assessed as significant under Hawai‘i state historic property significance criterion “d” (have yielded, or may be likely to yield information important in prehistory or history) pursuant to HAR § 13-284-6. This assessment was based on the historic property’s potential to provide information on the urban expansion of Honolulu into Kaka‘ako.

Section 10 Project Effect and Mitigation Recommendations

The following project effect discussion and cultural resource management recommendations are intended to facilitate project planning and support the proposed project's required historic preservation consultation.

10.1 Project Effect

The proposed project will potentially affect five historic properties (SIHP #s -7655, -7656, -7658, -7659, and -7660) identified within the project area. CSH's project specific effect recommendation is "effect, with agreed upon mitigation commitments." The recommended mitigation measures will reduce the project's potential adverse effect on significant historic properties.

10.2 Mitigation Recommendations

This AIS indicates that the Block B East project area contains: 1) historic salt pan remnants consisting of low-lying wetlands converted to salt pan basins enclosed by man-made berm structures, located beneath land reclamation fill within the central and *mauka* portions of the Block B East and Block C West project areas (SIHP # -7655); 2) disturbed and reworked Jaucas sand along the *makai* boundary of the Block B East project area containing a single human skeletal fragment (SIHP # -7656); 3) buried mid-twentieth century development land surfaces, consisting of asphalt, concrete, coral and tar pavement, and oil-rolled surfaces (SIHP # -7658), observed throughout the Block B East and Block C West project areas; 4) the buried, concretized Ward Estate *‘auwai* (SIHP # -7659) within the center of Block B East; and; 5) a historic trash fill layer (SIHP # -7660) encountered with an abandoned concrete drain box located along the *makai* boundary of the Block B East project area. Due to the inherent limitations of any sampling strategy, however, it is possible that additional historic properties or features, potentially including human burials and non-burial archaeological deposits, may be uncovered during construction activities.

The recommended mitigation measures for the five historic properties encountered within the Block B East project area (SIHP #s -7655, -7656, -7658, -7659, and -7660) include burial treatment, data recovery, and archaeological monitoring (see Table 42).

10.2.1 Burial Treatment

It is a requirement of Hawai‘i state burial law that the treatment of the previously identified burial sites within the project area (SIHP # -7656) be addressed in a project-specific burial treatment plan prepared for the consideration of the O‘ahu Island Burial Council (OIBC) (HAR §13-300-33). The burial treatment plan will incorporate appropriate input from SHPD, the recognized lineal/cultural descendants, and the OIBC.

10.2.2 Data Recovery

In consultation with the SHPD, it has been determined that an archaeological data recovery program is an appropriate mitigation for the historic salt pan remnants SIHP # 50-80-14-7655, located within the central and *mauka* portions of the project area and the concretized Ward Estate *‘auwai* (SIHP # -7659), which extends through the western and central portions of the project area. This archaeological data recovery program would begin with an archaeological data recovery plan for the review and approval of the SHPD. An End of Data Recovery Fieldwork Letter Report would need to be accepted by the SHPD prior to the construction project breaking ground.

10.2.3 Archaeological Monitoring

This AIS represents a good faith effort to identify and document the historic properties located within the project area. Due to the inherent limitations of any sampling strategy, however, it is possible additional historic properties or features, potentially including human burials and non-burial archaeological deposits, may be uncovered during construction activities. In order to mitigate the potential impact to SIHP #s -7655, -7656, -7658, -7659, and -7660, or any as yet unidentified cultural resources within the project area, it is recommended that project construction proceed under an archaeological monitoring program. A program of on-site archaeological monitoring is recommended for all subsurface project construction activities within the Block B East project area.

This monitoring program will facilitate the identification and proper treatment of any archaeological deposits disturbed by project construction, and will enable collection of additional samples and information related to the five identified historic properties. The archaeological monitoring program will include additional documentation, sampling, and analysis of SIHP #s -7655, -7656, -7658, -7659, and -7660. Jaucas sand deposits present in the *makai* portion of the project area will be fully recorded and closely examined for potential historic properties. The details of the monitoring program will be included in the project’s archaeological monitoring plan to be reviewed and approved by the SHPD.

10.2.4 Disposition of Materials

The artifacts associated with this archaeological inventory survey were collected from private lands; accordingly, this material belongs to the landowner, Howard Hughes Corporation (HHC). This collection is comprised of historic artifacts collected from fill materials and sediment samples collected from the salt pan remnants (SIHP # -7655). The artifacts associated with this archaeological inventory survey will be temporarily curated at the CSH storage facility. CSH will make arrangements with the landowner regarding the disposition of the project’s collection. Should the landowner request different archiving of material, then the archive location will be determined in consultation with the SHPD

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Appendix A SHPD AISP Acceptance

NEIL ABERCROMBIE
GOVERNOR OF HAWAII

WILLIAM J. AILA, JR.
CHAIRPERSON
BOARD OF LAND AND NATURAL RESOURCES
COMMISSION ON WATER RESOURCE MANAGEMENT

ESTHER KIA‘AINA
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WILLIAM M. TAM
DEPUTY DIRECTOR - WATER

AQUATIC RESOURCES
BOATING AND OCEAN RECREATION
BUREAU OF CONVEYANCES
COMMISSION ON WATER RESOURCE MANAGEMENT
CONSERVATION AND COASTAL LANDS
CONSERVATION AND RESOURCES ENFORCEMENT
ENGINEERING
FORESTRY AND WILDLIFE
HISTORIC PRESERVATION
KAHOOLAWE ISLAND RESERVE COMMISSION
LAND
STATE PARKS

HISTORIC PRESERVATION DIVISION
DEPARTMENT OF LAND AND NATURAL RESOURCES
601 Kamokila Boulevard, Suite 555
Kapolei, HI 96806

January 24, 2014

Ms. Ena Sroat, MA
Cultural Surveys Hawai‘i, Inc.
P.O. Box 1114
Kailua, Hawaii 96734

LOG NO: 2013.6925
DOC NO: 1401SL19
Archaeology

Dear Ms. Sroat:

SUBJECT: Chapter 6E-42 Historic Preservation Review –
Archaeological Inventory Survey Plan for the Block B East Project
Kaka‘ako Ahupua‘a, Honolulu (Kona) District, O‘ahu
TMK (1) 2-3-001:005 por.

Thank you for the opportunity to review this draft report titled *Draft Archaeological Inventory Survey Plan for the Block B East Project, Kaka‘ako Ahupua‘a, Honolulu (Kona) District, O‘ahu TMK (1) 2-3-001:005 (portion)* (Sroat et al., December 2013). We received this submittal on December 10, 2013. The 1.9-acre Block B East project area is owned by Victoria Ward, Limited (VWL) and is part of the VWL's 60.5-acre Ward Neighborhood Master Plan.

The archaeological inventory survey plan (AISP) contains an adequate discussion of the environmental setting and an extensive discussion of the traditional and historical background. The previous investigations and specific research questions concerning temporal and spatial land use changes provide a framework for the AIS of Block B East. The field methods involve excavation of about 33 backhoe trenches, the final number and placement of which will be determined in consultation with SHPD based on spatial identification and documentation of possible A horizon deposits, features, and/or Jaucas sands within the project area. The trench excavation methods will involve, where possible, identification and mapping in plan view and hand excavation of cultural layers, midden remains, artifacts, and pit features; and hand excavation of the Jaucas sands. Artifact assemblages present in fill deposits and large historic trash-filled pits will be subjected to field documentation (photographs of representative samples and qualitative and quantitative analysis) with collection of only a representative sample of artifacts for more detailed analysis in the laboratory. Traditional Hawaiian artifacts and faunal shell and bone, and charcoal and other botanics will be collected (or sampled, as appropriate) for analysis in the laboratory. Fire-affected rocks will be documented in the field.

Please revise the following:

(1) Remove any mention of a supplemental AIS and to insert agreed-upon language from Block M AISP.
(2) Update LaChance et al. 2013 and Yucha et al. 2013 to show current status of these project references.

This plan is accepted pursuant to Hawaii Administrative Rules (HAR) §13-284-5 with the understanding that the above **minor revisions are made** in the final document. Please make these revisions and send one hardcopy of the document, clearly marked **FINAL**, along with a copy of this review letter and a text-searchable PDF version on CD to the Kapolei SHPD office, attention SHPD Library.

Aloha,

Susan A. Lebo

Susan A. Lebo, PhD
Oahu Lead Archaeologist

Appendix B LCA 387 to the A.B.C.F.M.

F.R. = Foreign Register
F.T. = Foreign Testimony
N.R.= Native Register
N.T.= Native Testimony

LCA 387 Claim to the A.B.C.F.M.*

*A.B.C.F. M.=American Board of Commissioners for Foreign Missions

LCA No. 387*Oʻahu, General Claim, Mission Claims

To the Board of Commissioners for quieting Land titles, Gentlemen:

The undersigned as agents of the Mission of the American Board of Commissioners for foreign missions a the Sandwich Islands beg leave to present for your examination, the accompanying documents; being statements of grants made to various individuals of the mission at sundry times & places, for the purpose of affording facilities for the prosecution of the Missionary work in these Islands by the Missionaries of the said A.B.C.F.M. to the end, that if upon examination, they shall be found valid, the said grants may be confirmed in such manner as the laws of the Sandwich Islands may require. The following is a list of claims to be considered, viz.

Kauai - Premises & lands at Waiole, Koloa & Waimea
Oahu - Premises & lands at Honolulu, Ewa, Waialua, Kaneohe, Hauula & Punahou
Molakai - Premises & lands at Kaaluaha & out stations - if any
Maui - Premises & lands at Lahaina, Lahainaluna, Kanipali, Wailuku & Hana
Hawaii - Premises & lands at Kailua, Kealakekua, Kau, Hilo, Kohala & Waimea.

The lands & premises at the above-mentioned stations are in care of the resident missionaries of the A.B.C.F.M. at said stations. We have thought it best to enumerate all the stations though some of the claims have not been received, & some have been already presented to the Board.
Signed, Samuel N. Castle, Edwin O. Hall, agents
Honolulu, March 125h, 1847

The claims herewith sent are for Waialua, Honolulu, Punahou, Kaneohe, Waiole, Koloa, Waimea, Kaui, Hilo, Kealakekua, Kailua, Waimea, Hawaii, Kohala.

I believe Kau, Lahainaluna, Lahaina, Wailuku, Hana & Molakai are already sent in.
S.N.C.

F.R. 31-33v2
[No. 387], Honolulu, Statement of Mission Lands Claims at Honolulu.

Premises occupied by Mr. Dimond, given by Kalaimoku to Reverend William Ellis of F. M. [Foreign Missions] Society, & by him to the Mission of A.B.C.F.M, at these islands. The original grant was much larger then the spot at present enclosed by Mr. Dimond.

2d. All the parcels of land enclosed by the mission in the district known as Kawaihao, which whole distinct was given by Kaahumanu, 1st to Mr. Bingham for the use of the mission & also any enclosed portions of said district, if there be any such, not in actual possession of the natives. The mission buildings & land upon said lands. Also a portion of ground enclosed & upon which stands an adobie school house, at present occupied by Mr. Wilcox.

In addition there is a land in Koolau called Kaluanui, given by Kaahumanu to Mr. Bingham.
S.N. Castle, Edwin O. Hall, agents.

To the Board of Commissioners &c, Gentlemen:

In compliance with your public notice relative to claims of land &c I beg leave to state that I have no lease or written document of the Mission premises now occupied by myself in the Northwest part of Honolulu called Kaumakapili.

This station was commenced by myself soon after the general meeting of the American missionaries held in May 1837.

The land upon which the dwelling house, the station school house & meeting house are erected, was said to belong at that time to Konia, wife of Paki. Several of the chiefs then in authority, viz. Kinau, Kekuanaoa, Kona & Paki, after mature deliberation, informed me that they had set apart the yard in which the dwelling house is built, & the one where the station schoolhouse is erected, for a new missionary station & told me that I might commence operations at pleasure.

In the fall of 1838, the same persons set apart our meeting house yard as a place upon which to erect a house of worship to Almighty God. These 3 several yards are each enclosed with adobie walls, & their boundaries & dimensions are nearly as follows:

1st. Residence of the missionary measures about 46 yards & is bounded by a narrow lane. The mauka side is about 53 yards long, the northwest end is about 46 yards wide & the makai side is 60 yards long.

2d. The schoolhouse yard lies contiguous to the enclosure above described on the Southwest and is an oblong square, bounded on the Southeast side by the narrow lane & is 46 yard long and about 24 yards wide.

3d. The meeting house yard lies a few rods mauka of the mission dwelling house. The makai end is bounded by the public road & measures 48 yards, the northwest side is about 70 yards long &

the mauka end is 40 yards wide, the southeast side is 61 yards long
Signed, Lowell Smith
Honolulu, July 14, 1846

F.R. 33-34v2
[No. 387], Punahou [margin note illegible]

The undersigned claim in behalf of the mission of A.B.C.F.M. at the Sandwich Islands all that tract of land known as Punahou lot mauka & makai; to be used for the purposes for which it was granted.

That portion of said land which lies mauka of the Wai'un [?] road is said to be bounded nearly as follows: commencing by Allen's bridge which crosses the street near Allen's house & running inland to near the top of Ualakaa. Thence east into the valley near a certain rocky knowl [sic. knoll] pointed out by natives as the corner, thence toward the sea along a line running a short distance [illegible] east of that part of said land which is enclosed & extending to the road which runs from Honolulu to Waikiki just mauka of Allen's house, thence along said road to place of beginning.

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.

The above land was given by Boki to Mr. Bingham; then a number of the above named mission & the grant was afterwards confirmed by Kaahumanu. We have heard several persons mentioned as being acquainted with the facts & circumstances respecting this grant of land among whom are Reverend H. Bingham, Asa Thurston, William Richards, Levi Chamberlain, Governor Kekuanaoa, Laanui, John Ii, &c&c.
Signed, Daniel Dole, W.H. Rice.

I was told that Punahou extended from the road near to Allens, back to the top of Ualakaa, then the northern boundary was said to run from the top of Ualakaa eastward into the valley so far that the eastern line would include much of the rocky hill near the spring in passing down the road near Allens. There, there was a large flat on the sea shore embracing fishponds & salt beds & coral flats.
The above was written by Mr. Bingham from United States
W. Richards

F.R. 34-35v2
[No. 387], Kaneohe, Land connected with the mission station at Kaneohe

About 4 acres are held by the mission enclosed by a fence; it has been occupied about 12 years. The station was taken by permission of the King & the land given by an agent of Liliha, widow of Boki, since deceased.

In addition to the above there is a taro land, known among the natives as an ili aina; not designated by any particular boundaries. This was given for the use of the mission by Liliha - widow of Boki.
(No signature)
Kaneohe, December 8,1846

F.R. 35-36v2
[No. 387], Ewa, April 20, 1847

To the Commissioner, &c, Gentlemen:
I hereby make application for confirmation of title to a piece of land called Kionaole, a small ili in the ahupuaa of Waiawa, Ewa. I hereby enclosed a draft of said land, the measurement of which is as follows: Beginning at Northwest course & running south 74 fathoms, thence east 70 fathoms, thence north 20 fathoms, thence west 26 fathoms, thence north 44 fathoms & thence west 40 fathoms to the place of beginning. Said land comprises about 3 acres more or less.

Also a fish pond situated near the river joining southeast corner on a piece of waste land reckoned as belonging to Manana, an ahupuaa on the opposite side of the river. Said fish pond was dug out for me by my church members in 1838 & measures 27 fathoms by 14 (see draft).

I would also ask for a grant to the Protestant Church at Ewa for the use of their pastor, one of the moo paahao, of which there are two in Waiawa. As they have not been cultivated for more than 3 years & are now overgrown with bulrushes, there is no probability that both will be wanted again for the aupuni. Each moo contains 3 or 4 acres each. The members of the church wish one of them to cultivate, the avails of which are to be devoted to religious purposes.

Also, my house lot within the ili aina of Waiawa called Panaio, & three or four acres of land adjoining the Protestant Chapel for a church yard and burying ground, to be confirmed by title in the same manner as similar grants are confirmed.

For authority respecting the grant of my land marked out i the enclosed draft. I beg to refer you to Governor Kekuanaoa executor of Kinau, who gave me the said land in 1836 or early in 1837.
Signed, A. Bishop

[DIAGRAM]

F.R. 28v2
No. 387, [American Board of Commissioners for Foreign Missions], [Oahu claims, continuation of claims from other islands]

Extract from a letter addressed to Mr. Castle dated February 17th, Waialua and Signed P.J.

Gulick.

"P.S. I opened this to say a few words relative to the land connected with our premises. What it seems desirable to retain is a long narrow strip of probably 20 acres; bounded on the East by a road which crosses the river, or brook, Anahula, about 1/4 of a mile east of Mr. Emerson's residence, On the south by the brook Lanahula, On the west by the road which crosses said brook just opposite Mr. Emerson's house & On the north by a crooked stone wall built by Mr. Lock & Mr. Wilcox.

It has also been a stone wall on the east and a doby west, built by our Brethren. It is the better part of the land called Lokoea, but on the west & north it is said to fall considerably within the boundaries of Lokoea. With these data & the papers, I think you can make a more correct statement that I can; unless I get it surveyed. I don't know that I can do any better than I have now done.
Signed P.J. Gulick.

N.R. 229-231v2
No. 387, [Missionary claim]

Unirrigated farm land at Waialua, Oahu. Conveyance of a portion of land for dry farming at Waialua.

Because of my thought of the importance of knowledge and education which will benefit the Kingdom of Hawaii; and because I also think Mr. Loke /Mr. Looke/ has a good school at Waialua and the students are preparing to be educated to end the idleness and deficiencies of this land, therefore I agree and explain that a portion of land at Waialua shall be transferred to said school without payment or tax. the diagram of this land is below, however, the north side is not exactly like the diagram. The ancient boundary will prevail on that side until the time when I understand the correctness of the new move. The steam is not conveyed with the land. It is, however, the boundary on this side. If the supplies of the school are taken on the stream this is not a wrong, however, the fish are protected.

Furthermore, there are given some divisions of water for this land, three days in one week on the north side of the stream, and on the south side, two days. On those two days the water shall flow to irrigate the crops.

Furthermore, John Ii, the School Superintendent of Oahu, shall administer that land and he is also the perpetual custodian of that land.

It /the land/ is conveyed absolutely to that school; it shall not be arbitrarily taken, nor shall it be disturbed unless the school is at fault or its haole teacher or his successor, perhaps. The land shall be administered so as to benefit the school. The land may not be given over to anyone else. It is given only for the benefit and to supply the needs of the school. Here is the diagram of the land:

/see diagram/ [No diagram in this text]

This diagram is not absolutely correct, as it was not surveyed with a transit. The beginning of the measurement is at the corner marked I, at a place close to the wooden road over the water /bridge or causeway?/

This word is recorded at Honolulu on the 14th day of September, 1841.
KEKUANAOA
Witness: Paalua, Limaikaika /Armstrong/

In accordance with Kekuanaoa's thought explained in this paper, giving me the administration of that kula farm land at Waialua, I agree that this land be conveyed to said school, and Locke or his successor, perhaps, the one who teaches at that school, to stimulate intellectual growth here in Hawaii.

Recorded at Honolulu this 14th day of September, 1841.
JOHN II, School Superintendent of Oahu

We two consent to all the words in this document.
KAMEHAMEHA III, KEKAULUOHI

F.T. 260v3
No. 387, American Mission, Part 1, Section 5, Division 1, 22 February, Emerson Waialua

1. Kuakoa, sworn, I know this land at Kawaipuole in Waialua.

It is bounded:
Mauka by Kukipa's land
Waianae by an old adobe fence
Makai by my fence
Waimea by land of mine and a kalo patch of Poli and a river called Anahulu, and a kalo patch of mine.

2. This land is in Olohana, an ili, the land is called Manawai. It is an orange garden

bounded:
Mauka by a stone wall and a dry stream
Waianae by stream of Kawailoa
Makai by konohiki's land
Kolauloa by a pali.

3. This piece is an ili aina of Kawailoa at Paalaa.

It is kalo and kula bounded:

by konohiki's land, Mauka
Waianae by a pali
Makai by konohiki's land
Kolauloa by a stream of Paalaa.

Claimant got the piece No. 1 from Kinau in 1832 and has lived there constantly ever since, and no one has ever disturbed him.

He got No. 2 from Gideon Laanui in Kinau's time, 1838, and has occupied it without disturbance in peace ever since.

He got the piece No. 3 from Kinau in 1835 and has held it ever since in peace.

Olopana, sworn, the preceding testimony is correct and true, which I now of my own knowledge, and that Mr. Emerson has lived there to the present time in peace.

Continued page 302.

No. 2. Mr. Emerson did not think required a survey and states it at less than acre.

F.T. 302v3
No. 387, Sandwich Islands Mission Claim, Part 1. Section 5, Division 1, J.S. Emerson, from P. 260 [p. 260 claim for Waialua Oahu]

Kilioe, sworn (from Kauikawaha's written Report to Claimant and translated by him for the Commissioner), I heard D. Oleloa & Kaukualii ,his wife, say the Kinau wrote to them at Kauai thus "Laanui sought for land for the Missionary located at Waialua & he has found it within your land viz. Hawailoa - Give Your assent that it be given him" To which we Daniela ma gave our assent in writing.

Kamalie, sworn, I heard the same things as Kilioe says - and I heard before, at a time when Hawailoa was our land as hoaainas - my mother's brother named Wana, one of Laanui's family, came to us and said "Your land is given by the foreigner, Mr. Emerson by Kinau - so says Laanui.
Continued 306 page, Division 2

F.T. 306-307v3
No. 387, Sandwich Islands Mission, Part 1, Section 5, Division 2, P.I. Gulick, from p. 302

Reverend I.S. Emerson, sworn, In about 1837 Kinau granted to me a certain part of the land now coccupied by Mr. Gulick to aid the Church. This grant included the Western end, containing probably 3 to 5 acres. It did not I think to include the spot of Mr. Gulick's house lot. that spot, as I understood Mr. Locke came into an unwritten contract between him & Laanui, by which Mr. L.

[Locke] was to pay Laanui a certain sum per annum for the remainder of the land which Mr. Gulick now claims. This land has been in the possession & use of the Mission from about 1838 to this time.

Witness admitted Mr. Metcalf's survey [as] correct.

"E ike auanei na kanaka a pau ma keia palapala ke nana mai lakou.

Owau o M. Kekuanaoa ka makua Kane a kahu waiwai o Victoria Kamamalu. Ua Kuai lilo loa aku au no`u iho a no kuu poe hooilina a hope paha i kekahi mau Eka Umikumamaono a me ka hapa Eka aina e waiho la ma Kawailoa & Waialua Mokupuni Oahu. Aia keia aina maka aoao mauka iho o ka pa ona Gulicka la. Ua komo pu keia me kahi i Ku mua ai kona hale.

Eia ke kumu o ka lilo ana o keia aina no ka loaa ana mai ma kuu lima na Dala maikai $82.50. No laila aole o`u kuleana i koe. ua lilo loa ia Gulika a me kona mau hooilina a hopepaha.

No ka oiaio Kekakau nei au i kou inoa i keia la 23 October, 1850, M. Kekuanaoa
Ike maka, Kahiwalani

F.T. 341-343v3 [Claim 5877 of Keakaku]

F.T. 368v3
Cl. 387, American Mission, Part 1, Section 6, Ewa, May 14, 1856

Artemis Bishop testified that in 1836 this land called "Kianaole" in the district of Ewa was given to witness for the American Board of Missions and that the 2 surveys of T. Metcalf of the same, dated March 2, 1849, correctly desribe the lot which has been occupied & used for the Mission without interruption to the present time.

Note. Governor Kekuanaoa has seen these surveys & approved of them before the Commission.

See page 343

N.T. 592-593v3
No. 387, Honolulu Mission, Part 1, Section 5, Waialua, Emerson

Kuakoa, sworn, I have seen his land at Kawaipuolo in Waialua.

The boundaries are:
Mauka, Huki's lot
Waianae, the old mud wall
Makai, my fence

Waimea, Kuokoa's land, Poli's patch, Anahulu River and one patch for me.

2. Olohana ili land in Kawailoa named Manawai and is an orange grove.

Mauka, a stone wall and dry stream
Waianae, Kawailoa stream
Makai, the konohiki's land
Koolauloa, a precipice.

3. Hawaiiloa's ili land at Paalaa, a taro land and the pasture.
Mauka, the konohiki's land
Waianae, a precipice
Makai, the konohiki's land
Koolauloa, Paalaa's stream.

Section 1 from Kinau in the year 1833 and he has always lived there to the present. No one has objected.

Section 2 is from G. Laanui during Kinau's time in 1838 and life has been comfortable; No one has objected. Section 3 is from Kinau in 1835. No one has objected.

Olopana, sworn, The statements just made by Kuokoa are true, accurate and right and I have known the same way. Emerson has always lived there to the present. No one has objected.

N.T. 677v3
No. 387, Emerson, Part 1, Section 5, October 8, 1850

Kuokua, sworn, I have seen Emerson's land at Kawailoa Paalaa in Waialua. I have known the boundaries, but I have not known who had given him his land except that I had heard only it was given by Kinau and Kamekualii; however, I am not very sure.

F.T. 115-116v3
Cl. 387, part 1, americal Sandwich Island Mission, Oahu, 23 March [1849], section 2 Punahou, Oahu, [illegible], William H. Rice, agent, present

[Margin note: Mr. Lee's notes]

John Ii, sworn for claimant, I am well acquainted with Punahou and its boundaries. It consists of two parts, one inland and the other a sea land.

It is bounded:
Mauka by the large land called Manoa
Waialae by Mauna Pohaku
Makai by kula land of Allen, Kapeau, myself & others.

I think it extends nearly down to the road leading from Honolulu past Allen's place, Honolulu side by the road leading from the old Allen place to Manoa and by my land.

The makai part of Punahou is bounded:
Mauka by Kewalo and Koula
Waititi side by Kalia
Seaward it extends out to where the surf breaks
Honolulu side by Honoliilii.

This land was given to Mr. Bingham for the Sandwich Island Mission by Governor Boki in 1829. It was given upon the same terms as all their other lands were given to them; and the Grant was confirmed, so far as silence proved it, for in truth she [he?] had no right to set aside this grant.

From that time to this, the Sandwich Island Mission have been the only possessors and konohikis of the land. I was a witness to the gift. The title of the Mission is perfectly clear.

The name of the makai part is Kukulaaeo. There are several tenants on the land of Punahou whose rights should be respected.

Z. Kaauwai, sworn, I know this land. I heard Boki say to Hoapili Kane concerning the gift of this land to Sandwich Island Mission that the had given it to Mr. Bingham.

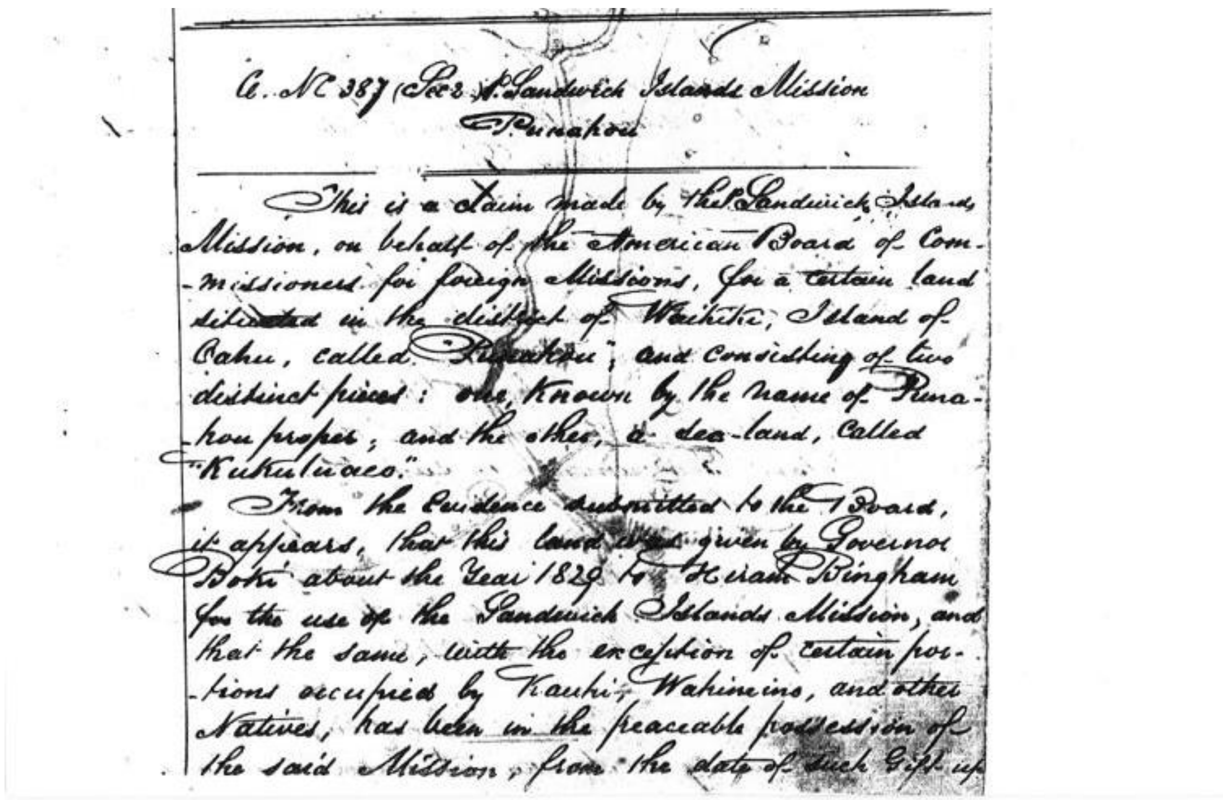
Boki's wife made some objections to giving it to Mr. Bingham, claiming it has hers as received from her father, Hoapili Kane but Hoapili Kane confirmed the gift and it was adjudged to be right & propert.

From what I heard at the time of the boundaries, I should think Mr. Metcalf's survey correct.

[Award 387; (Oahu) R.P. 1600; Beretania St. Honolulu Kona; 2 ap.; 5.36 Acs; R.P. 1600; King St. Honolulu Kona; 1 ap.; .41 Ac.; King St. Honolulu Kona; 3 ap.; 6.66 Acs; no R.P.; R.P. 5698; Printers Lane Honolulu Kona; 1 ap.; .36 Ac.; R.P. 1947; Panaio; 3 ap.; 4.13 Acs. (A. Bishop); R.P. 1931, Punahou Manoa Kona; 1 ap.; 224.68 Acs; R.P. 1945; Punahou Manoa Kona; 1 ap.; 77 Acs; R.P. 1941, 1945, 1958 R.P. 1931; Punahou Honolulu; 1 ap.; 36.90 Acs (S.N. Castle and Amos S. Cooke); R.P. 1932; Kawaiahao Honolulu; 1 ap.; 1.23 Ac. (S.N. Castle); R.P. 1941; Kawaiahao Honolulu; 1 ap.; 1.30 Ac.(Maria P. Chamberlain); R.P. 1941 Punahou Honolulu; 1 ap.; 26.66 Acs (Maria P. Chamberlain); R.P. 1944; Kukuluaeo; 3 ap.; 77 Acs (Ephraim W. Clarke; R.P. 1944; Kawaiahao Honolulu; 2 ap.; 1.64 Ac. (Ephraim W. Clarke); R.P. 1934; Kawaiahao Honolulu; 1 ap.; 1.5 Ac. (Amos S. Cooke); R.P. 1945; Kawaiahao & Punahou Honolulu; 3 ap.; 27.97 Acs (E.M. Rogers); R.P. 1933; Kaumakapili Honolulu; 1 ap.; .53 Ac. ; R.P. 1600; Kaumakapili Honolulu Kona; 1 ap.; .6 Ac.; R.P. 1600; Kaumakapili Honolulu Kona; 1 ap.; .19 Ac.; (Lowell Smith); R.P. 1938; Pukauki Kaneohe Koolaupoko; 1 ap.; 16.1 Acs; R.P. 1958; Waikapoki Kaneohe Koolaupoko; 1 ap.; 5.13 Acs (ABCFM); R.P. 1951; Kawailoa Waialua; 2 ap.; 10.81 acs (John S. Emerson); R.P. 1940; Kawailoa Waialua; 1 ap.; 24.56 acs. (Peter I. Gulick)]

LCA 387 Award to the A.B.C.F.M.

The boundary of the Kukulāeʻo lands given to the A.B.C.F. M. is on the last page of the award.



C. No 387 (Sec. S. Sandwich Islands Mission
Punahou

This is a claim made by the S. Sandwich Islands Mission, on behalf of the American Board of Commissioners for foreign Missions, for a certain land situated in the district of Waikiki, Island of Oahu, called "Punahou", and consisting of two distinct pieces: one, known by the name of Punahou proper, and the other, a sea-land, called "Kukuluaeo."

From the Evidence submitted to the Board, it appears, that this land was given by Governor Boki about the Year 1829 to Hiram Bingham for the use of the Sandwich Islands Mission, and that the same, with the exception of certain portions occupied by Kauhi, Wahineino, and other Natives, has been in the peaceable possession of the said Mission, from the date of such Gift up

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to the present time.

We consider the Title of the "American Board of Commissioners for Foreign Missions" to "Punahou proper", and to the Sea land "Kukuluaeo", to be the same in its nature as that set forth in the Award of February 1st 1849 of the Lot now occupied by Henry Dimond, and designated as Claim "No 387 - part I of Honolulu Claims".

We do therefore Award to the "American Board of Commissioners for Foreign Missions" the aforesaid lands of "Punahou proper" and "Kukuluaeo", with the exception of those portions occupied by Natives; - to have and to hold to them, and to their Successors, during the existence of the "Sandwich Island Mission": - that is to say - so long as the "Sandwich Islands Mission" shall continue to exist, and labor to promote the Christian faith they profess. But if they should cease to exist, or to pursue the object of their profession, these lands will then revert to the Sandwich Islands Government.

The above Award, however, is made upon the express understanding, that if the American Board of Commissioners for foreign Missions, shall desire to lease, sell, or otherwise dispose of these lands, or any portion thereof, they shall be at liberty to do so, by first obtaining the consent of the Sandwich Island Government, to such lease, sale, or other disposition.

The correct metes and bounds of the above awarded lands, are contained in the following surveys, made by T. Metcalf on the 6th and 9th days of May 1848.

"Notes of Survey of Punahou premises"

"Commencing at Mauka N. corner of enclosed

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premises by Road leading to Manoa valley - and running S. 40° W. 1 ch. 5 7/12 ft. along wall to slight angle. thence S. 35° W. 15 ch. 26 1/3 ft. along Road to W. corner of enclosed Premises. thence S. 26° W. 16 3/4 ch along road to makai W. Corner of this land. (9 3/4 ch. on to new Road) thence S. 63° 15' E. 22 ch. 29 ft. along Pauoa to Stake. at makai S. corner of this land. thence N. 58° 45' E. 7 ch. 8 1/2 ft. along Keauhou to Rock marked + angle - thence N. 64° 45' E. 26 ch. 47 ft. along Holipaka to Rock marked + on stoney rise - angle - Thence N. 55° E. 11 ch. 59 5/2 ft along Pilipili to pile of stones by path - angle. thence N. 15° 30' E. 6 1/4 ch. along Pilipili to Rock on makai side of stone wall by Path N. 1° 15' W. 7 ch. 54 1/2 ft. to E. angle of this lot - thence N. 37° 45' W. 13 ch. 13 7/12 ft. along Mauka side of this land to Waiolo Path - angle. thence N. 37° 15' W. 9 ch. 19 4/12 ft. to stake at intersection of Roads leading up Manoa valley. thence N. 27° W. 20 ch. 13 ft. to point on Puluuala - the mauka N. Corner of this land - then direct down Ualakaa to place of commencement - Including an area of Acres 224 68/100

J. Metcalf Sur.

May 6. 1848.

See diagram Page 603.

"Notes of Survey of "Kukuluaeo" the sea-land belonging to Punahou".

"Commencing at buried stone at Mauka N. corner of this land - joining "Kewalo" on mauka and Pehu on N. W. side, and running S. 16° W. 8 ch. 41 ft. along Pehu to angle - thence S. 5° 45' E. 5 ch 19 10/12 ft. along and to E. corner of large fish Pond. thence S. 12° 15' E. 6 ch. 23 1/2 ft. to E. Corner of Laeoha's house angle - thence S. 5° 45' W. 2 1/3 ch. to, and indefinitely into Sea. Then from point of Commencement and running S. 61° 45' E. 17 ch. 19 10/12 ft. along Kewalo to post in front of Onewa's house - angle. thence S. 60° E. 21 ch. 6 1/2 ft. along Kewalo to angle (about 4 ch. makai of Samuel Teddy's house) thence S. 31 E.

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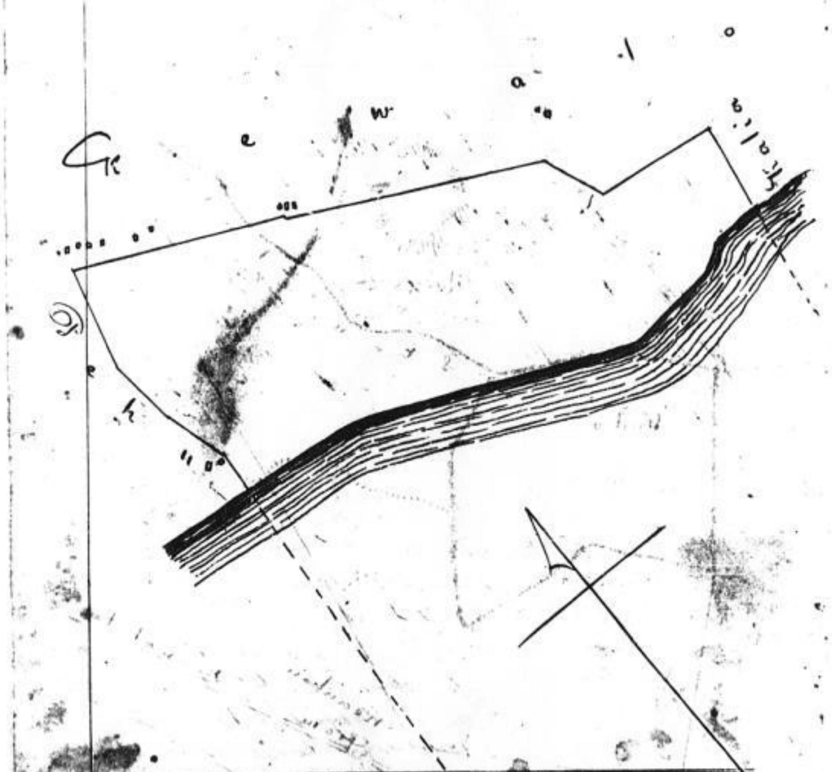
5½ Ch. along Kewalo to angle - Thence S. 81° E.
9 ch. 59 5/12 ft. along Kewalo to Mauka E. corner
of this Land - Thence S. 11° W. 7 ch. 9 3/12 ft.
along land Called Kalia, to, and Indefinitely
into Sea - Containing an Area of dry land of
Acres 77
May 9 1848. J. Metcalf Sur.



Costs. Part 2 of No 387. S. I. Mission Dr
To Bill of Survey of J. Metcalf 15
Commission Wm L Lee 5
J. H. Smith
Z. Kaauwai $ 20
M. Kamehameha
Ioane Ii

Hale Kawaiaha
7 April 1849

Appendix C LCA 1903 to Lolohi

Land Commission Claim, LCA No. 1903 to Lolohi

N.R. 293v3

To the Great President of the Land Commissioners,- William L. Lee, and his companions, Greetings to You and your commissioners: As directed by you to the claimants to state their claims I have some claims for salt works at Kukuluaeo:

2 salt beds
15 Hooliu /Literally - cause to leak, therefore, drains./
2 Poho kai /depressions where salt is gathered/
1 salt kuIa

A small farm is at lower Kaliu, close to the kawa /leaping place/ of Puehuehu.
4 lo`i
1 cultivated kula.
These are my claims.

I am, with thanks,
LOLOHI
Honolulu, 15 December, 1847

F.T. 220v3
Cl. 1903, Lolohi

Peka wahine, sworn, I know this place. It is on the salt plains, Honolulu, used for making salt.

Mauka is a stream of salt water
Waititi also several salt ponds, Napula, Kumiao and others own them.
Makai, Government road
Honolulu, Peke, Kaula, Lilea, Bolabola, Poe.

Claimant received this land from his father who died last year and held it a long time back in Kinau's time.

2. Honolulu aina, kalo.

Eseta, sworn, deferred, Witness being claimant's wife.
Paalua, sworn, confirmed the testimony in claim. 1
Resumed p. 223

F.T. 223v3
Cl. 1903, Lolohi, 26 November [1849], from page 220

Puhi, sworn, I know this place called Kaliulalo, Honolulu aina, consisting of 4 kalo patches & kula.
Mauka is Kanakaokai
Waititi, Puhana
Makai, same
Ewa, Keliula land, Kekualoa.

Claimant received this from Kuke - Tahitian in 1844 and has held it in peace ever since.

N.T. 549v3
No. 1903, Lolohi, November 23, 1849

Peke, sworn, I have seen his place at Kukuluaeo in Honolulu.

Salt land, the boundaries are:
Mauka, a salt water ditch
Waikiki, Napela
Makai, government road
Ewa, Kaula, Lilea, Polapola and my land.

Lolohi had acquired this interest from his parents when Haaliho had returned from Briton. Lolohi's parents had received it during the lifetime of Kinau and he has been living peacefully on this interest; no one has objected.

Paulua, sworn, Our testimonies are alike; no one has objected.

The hearing on Lohilohi's taro section will be heard on Monday. See page 550

N.T. 550-551v3
No. 1902!, Lolohi, From pg. 549, November 26, 1849
[should be 1903]

Puhi, sworn, I have seen his land at Kaliu in Honolulu district.

4 taro patches, 1 pasture:
Mauka, Kanakaokai
Waikiki, Paahana
Makai, Paahana also
Ewa, Kaliuluna which is Kekualoa's land.

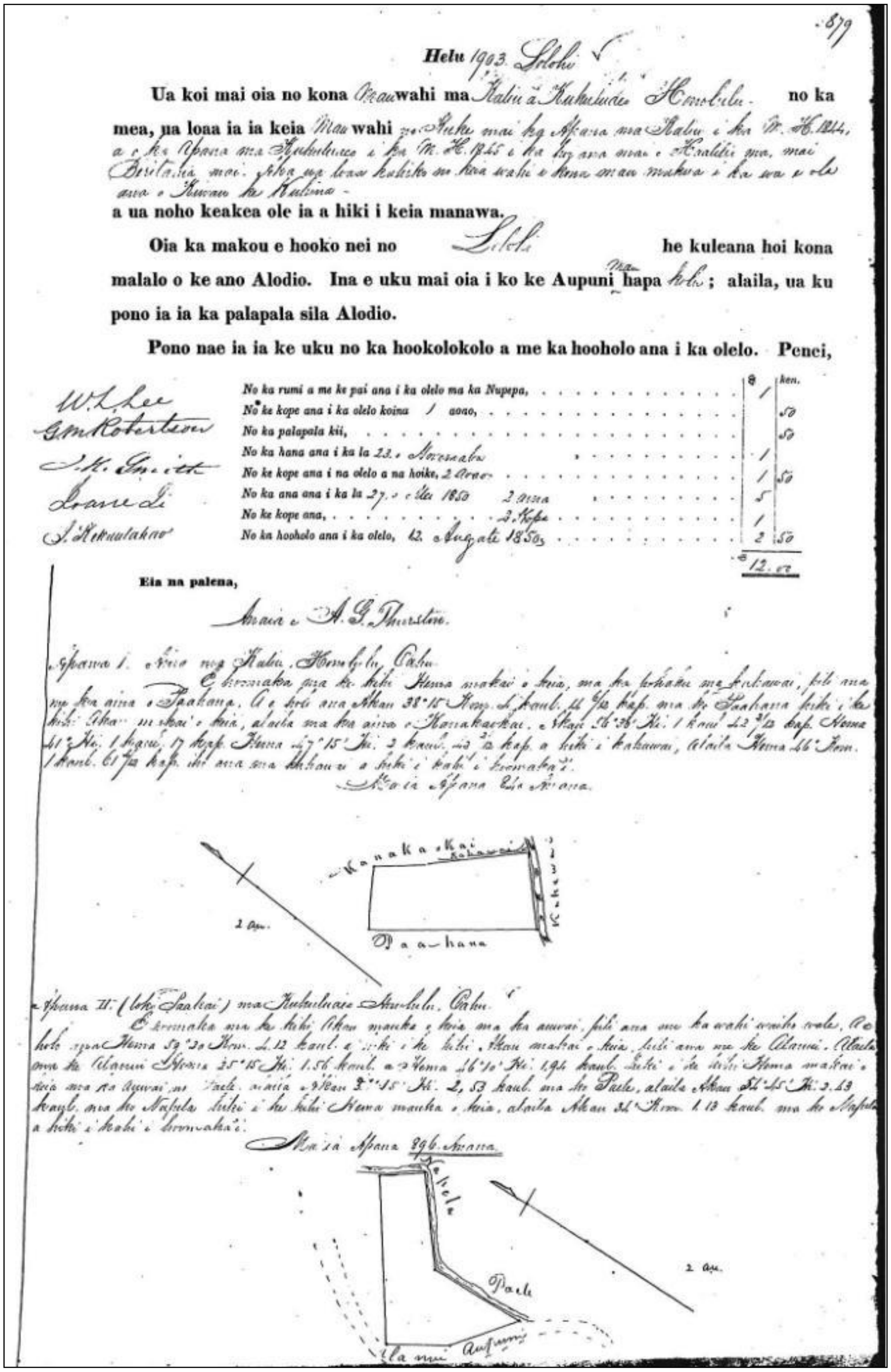
Lolohi's land is from Kuke given in the year 1844 and he has been living comfortably. No one has objected.

Kelalaina, sworn, Our testimonies are alike. No one has objected.

[Award 1903; Land Patent 8174; Kaliu Honolulu Kona; 1 ap.; .69 Ac.; Land Patent 8237; Kukuluaeo Honolulu Kona; 1 ap.; .74 Ac.]

Land Commission Award 1903 to Lolohi*

*Note map of parcel on the page bottom that is partially within Block B East



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Helu 1903 Lolohi

Ua koi mai oia no kona Mau**wahi ma** Kalia a Kukuluaeo Honolulu **no ka mea, ua loaa ia ia keia** Mau **wahi**

a ua noho keakea ole ia a hiki i keia manawa.

Oia ka makou e hooko nei no Lolohi **he kuleana hoi kona malalo o ke ano Alodio. Ina e uku mai oia i ko ke Aupuni hapa** ; **alaila, ua ku pono ia ia ka palapala sila Alodio.**

Pono nae ia ia ke uku no ka hookolokolo a me ka hooholo ana i ka olelo. Penei,

W. L. Lee
G. M. Robertson
J. H. Smith
Ioane Ii
J. Kekaulahao

	$	ken.
No ka rumi a me ke pai ana i ka olelo ma ka Nupepa,	1	
No ke kope ana i ka olelo koina 1 *aoao,*		50
No ka palapala kii,		50
No ka hana ana i ka la 23 *o Novemaba*	1	
No ke kope ana i na olelo a na hoike, 2 Aoao	1	50
No ka ana ana i ka la 27 *o Mei 1850* 2 Apana	5	
No ke kope ana, 2 Kope	1	
No ka hooholo ana i ka olelo, 12 *o Augate 1850*	2	50
	$12.00	

Eia na palena,

Ana ia e A. G. Thurston.

Apana 1.

Apana II.

Ma ia Apana 896 Anana

Appendix D Consultation Letter (OHA)

CULTURAL SURVEYS HAWAIʻI
ARCHAEOLOGICAL, CULTURAL, AND HISTORICAL DOCUMENTATION SERVICES - SINCE 1982

Oʻahu Island
P.O. Box 1114
Kailua, Hawaiʻi 96734
Ph: (808) 262-9972
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1860 Main Street
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Ph: (808) 242-9882
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Branch Offices:
Hilo, Hawaiʻi
Kona, Hawaiʻi
Lāwai, Kauaʻi

20 June 2014

Dr. Kamanaʻopono Crabbe
Administrator
Office of Hawaiian Affairs
711 Kapiʻolani Blvd.
Honolulu, Hawaiʻi 96813

Subject: Cultural Surveys Hawaiʻi, Inc.'s (CSH) request for consultation regarding archaeological inventory survey results for the Block B East and Block C West Project Areas, Kakaʻako Ahupuaʻa, Honolulu (Kona) District, Oʻahu Island (TMK: [1] 2-3-001:005 por.)

CSH Job Codes: KAKAAKO 119-120

Aloha Dr. Crabbe:

On behalf of Victoria Ward, Limited and The Howard Hughes Corporation, CSH has recently completed archaeological inventory surveys (AIS) for the Block B East and Block C West project areas within the Ward Neighborhood Master Plan area (Figure 1). For the purposes of consultation and to provide the Office of Hawaiian Affairs (OHA) with the preliminary results of these archaeological investigations, a brief summary of the AIS findings is presented below. Following your review of the information provided, CSH requests that OHA reply with any questions, comments, or concerns regarding the Block B East and Block C West project area AIS findings.

Block B East Project Area

The Block B East project area comprises the central portion of the Ward Warehouse commercial complex. A total of 38 test excavations were completed (Figure 2). The majority of the test excavations, extending from the *mauka* project area boundary along Auahi Street to the *makai* edge of the *makai* Ward Warehouse commercial building, contained buried historic salt pan remnants (Figure 3). The salt pan remnants consist of a complex of man-made berm structures arranged in a grid formation around low-lying salt pan beds (Figure 4). Only along the *makai* project area boundary, directly adjacent to Ala Moana Boulevard, were disturbed natural sand deposits encountered. Within Test Excavation 31 in this area, an isolated human cranial fragment was documented within disturbed sand (Figure 5). Careful cleaning of the surrounding area did not identify any additional human remains, nor within any of the closely adjacent test excavations. Cultural monitors from ʻOiwi Cultural Resources were on hand to assist with treatment of the *iwi kūpuna*, which has been left in place pending the results of burial treatment consultation. Also identified within the Block B East project area was the historic Ward Estate *‘auwai*, modified in the early twentieth century into a concrete-encased channel (visible as an elbow-shaped line within Figure 4, adjacent to Test Excavations 15 and 17).

Block C West Project Area

The Block C West project area comprises the southern portion of the Ward Warehouse commercial complex. A total of 36 test excavations were completed (see Figure 2). As with Block B East, the majority of the project area documented buried historic salt pan remnants, extending from the *mauka* project area boundary along Auahi Street to the *makai* edge of the *makai* Ward Warehouse commercial building (see Figure 3). Disturbed marine and sand deposits were encountered along the *makai* project area boundary fronting Ala Moana Boulevard, with no significant finds in this zone.

Consultation

Consultation with the State Historic Preservation Division (SHPD) concerning the results of the Block B East and C West AIS investigations has been ongoing throughout the AIS fieldwork. In addition, on 16 June 2014, the AIS findings were presented to the recognized cultural descendants of the project, including detailed information concerning the *iwi kūpuna* identified within Block B East. On 14 May 2014, the Block B East AIS *iwi kūpuna* findings were also presented to the O‘ahu Island Burial Council (OIBC).

Once again, CSH welcomes OHA's input in this consultation process. Please review the information and figures provided in this consultation letter and contact CSH with any questions, concerns, or comments that OHA may have regarding the AIS investigation and findings. Thank you for your consideration of this matter.

Sincerely,

Cultural Surveys Hawai‘i, Inc.

Matt McDermott
(mmcdermott@culturalsurveys.com)
Tel. (808) 262-9972

To: Office of Hawaiian Affairs **Page 3**

20 June 2014

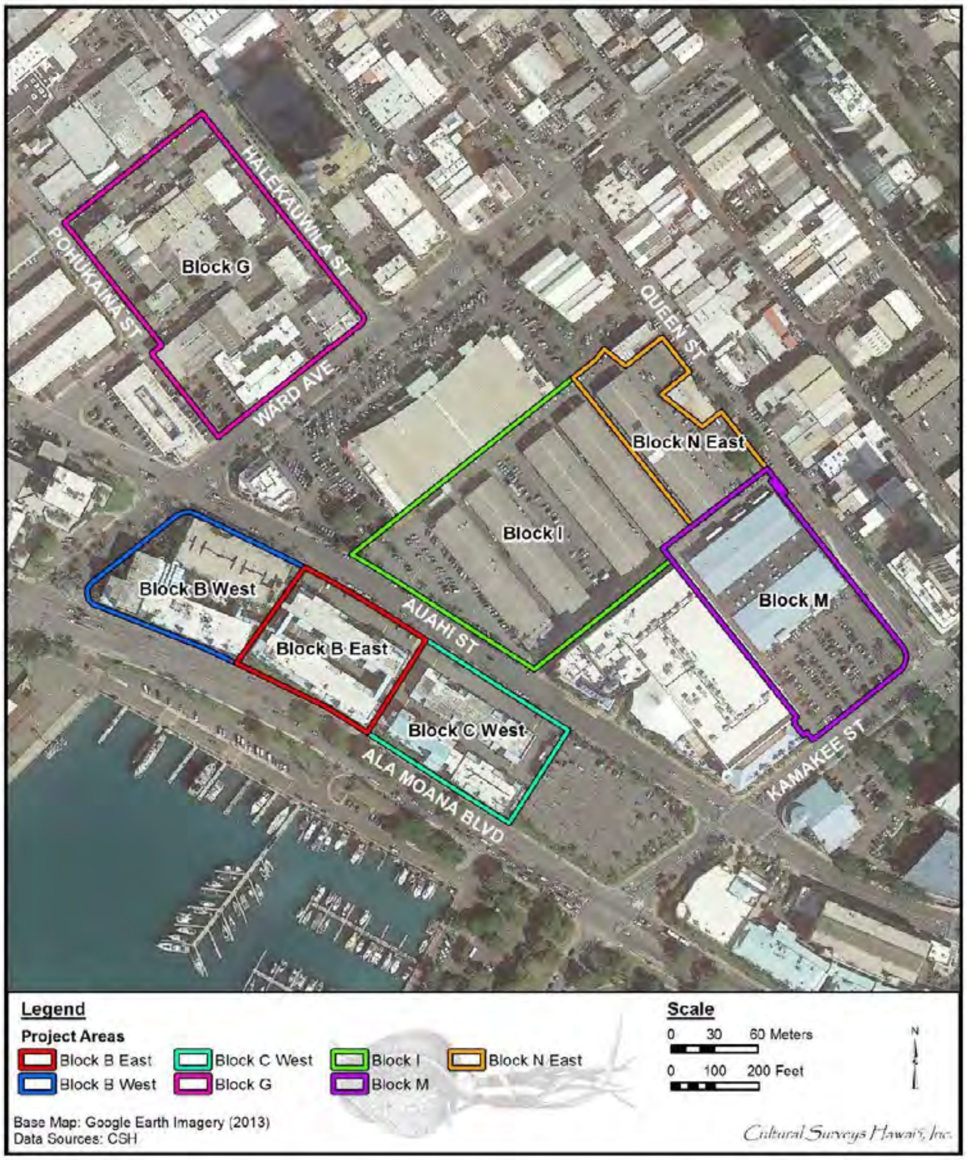

Figure 1. Aerial photograph showing the location of the Block B East and Block C West project areas within the Ward Neighborhood Master Plan Project area

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20 June 2014

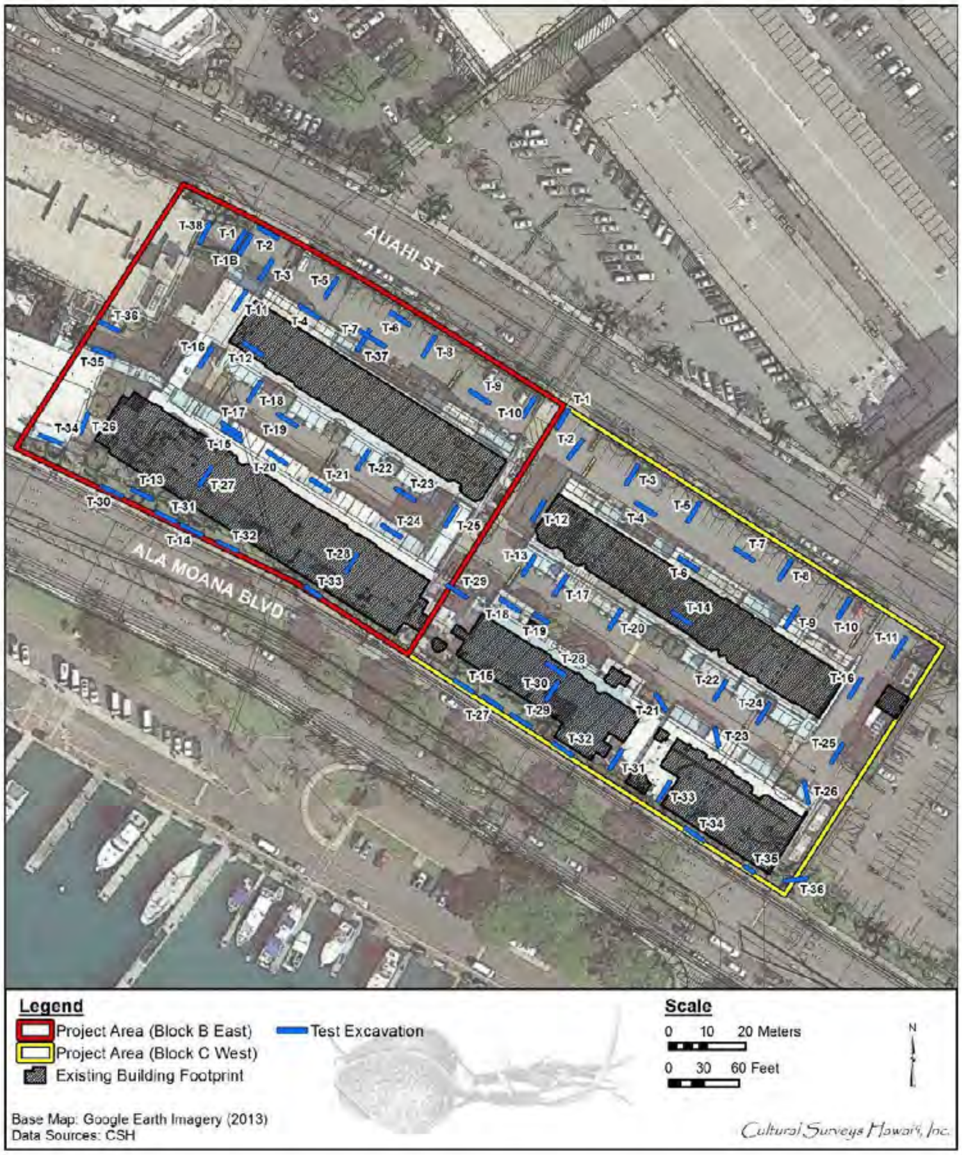

Figure 2. Aerial photograph showing the location of test excavations within the Block B East and Block C West project areas

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20 June 2014

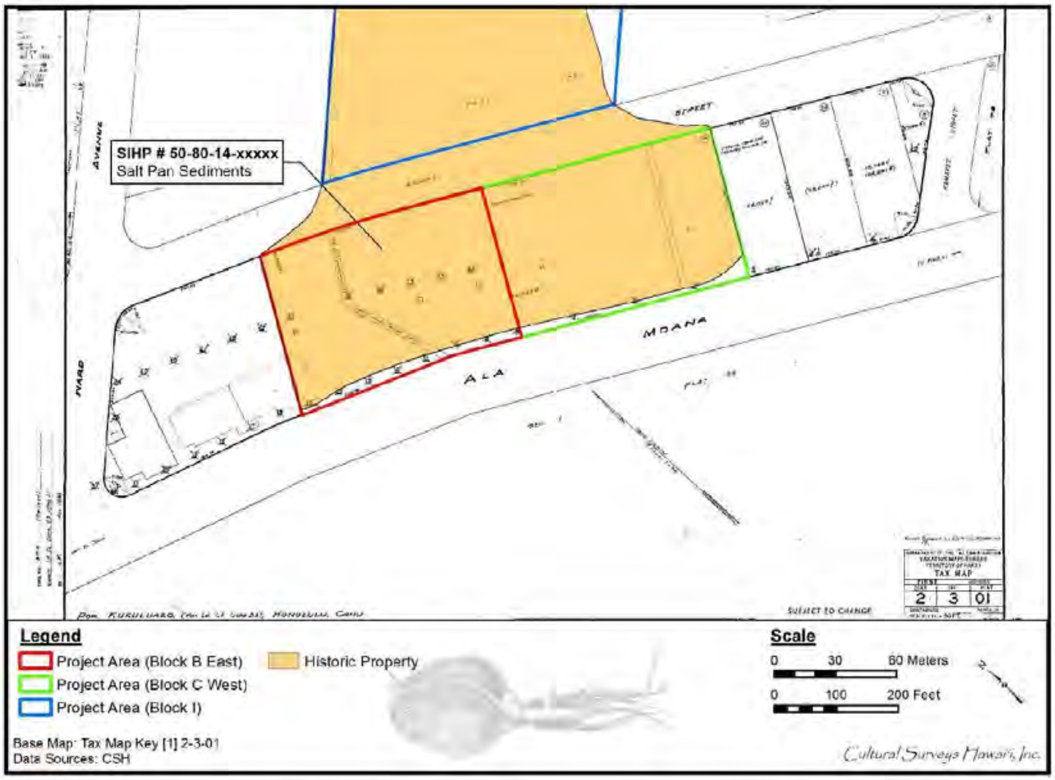

Figure 3. Figure showing the extent of documented historic salt pan remnants within Blocks B East and C West

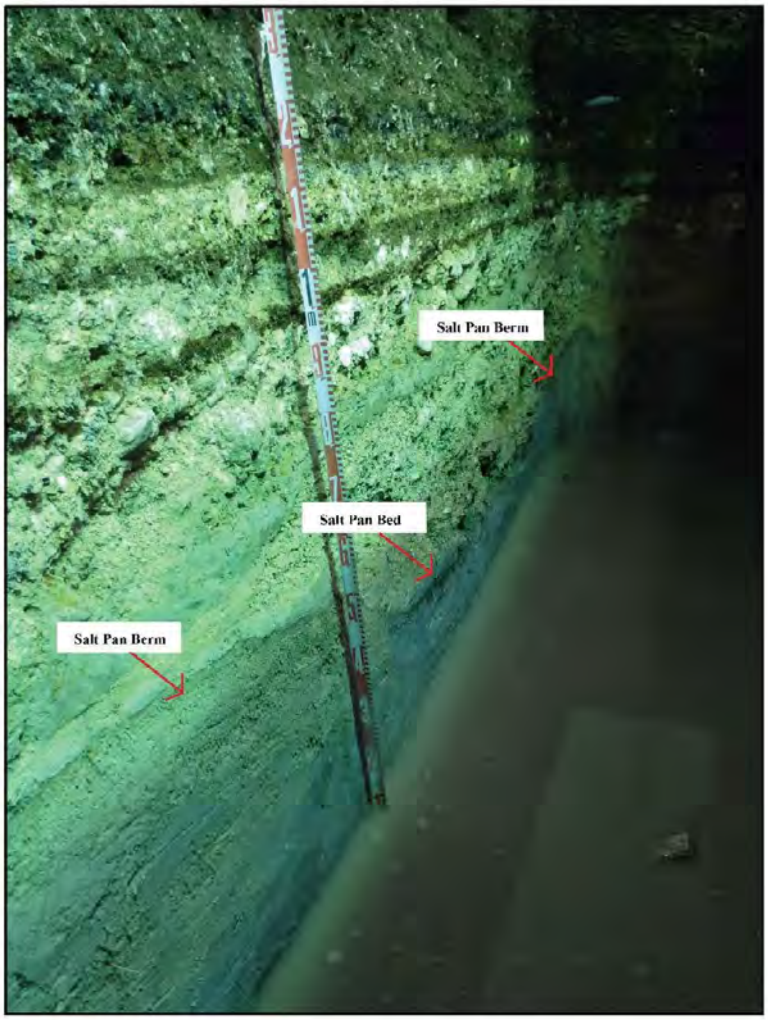

Figure 4. Photograph showing man-made historic salt pan berm structures and salt pan bed

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20 June 2014

Figure 4. Figure showing the location of identified human skeletal remains within Test Excavation 31 of Block B East

Appendix E Pollen Analysis Report

POLLEN ANALYSIS OF SAMPLES
FROM SITES KAKAAKO 119 AND KAKAAKO 120
IN KAKA'AKO, O'AHU

By

Linda Scott Cummings

With assistance from
R. A. Varney

PaleoResearch Institute
Golden, Colorado

PaleoResearch Institute Technical Report 14-058

Prepared for

Cultural Surveys Hawaii, Inc.
Waimanalo, Hawaii

June 2014

INTRODUCTION

Sites KAKAAKO 19 and KAKAAKO 120, located between Auahi Street and Ala Moana Boulevard within Kaka'ako, in Honolulu County, O'ahu, are situated in an urban parking lot of Ward Warehouse Central. Stratigraphic sediments observed in subsurface test trenches included peat and clay deposits indicative of wetlands. These sediments, and salt pan remnants, were sampled for pollen analysis and microscopic charcoal quantification to provide information about past vegetation and environmental conditions. Two strata (II and III) were targeted for sampling.

METHODS

Pollen

Due to the highly organic nature of these samples, our normal chemical extraction technique was modified. Quantities that varied from approximately 3 to 16 cubic centimeters (cc) of organic-rich sediment were selected for most of the samples. Two samples (9 and 11) contained large quantities of carbonate sand, so larger quantities (30 and 50 cc) of these samples were started. All samples received hydrochloric acid (10%) to remove any calcium carbonates present, and all samples displayed strong reactions indicating presence of carbonate shell fragments to varying degrees. Next the samples were screened through 250-micron mesh. The samples were allowed to settle for 2 hours, after which the supernatant was poured off and the samples were transferred to 50-ml tubes. The samples then received a 30 minute treatment in hot hydrofluoric (HF) acid to remove inorganic particles. The samples were acetylated for 5 minutes to remove extraneous, non-pollen organic matter.

A light microscope was used to count pollen at a magnification of 500x. Pollen preservation in these samples varied from good to poor. Comparative reference material collected at the Intermountain Herbarium at Utah State University, the University of Colorado Herbarium, and the Bishop Museum Herbarium was used to identify the pollen to the family, genus, and species level, where possible.

Pollen aggregates were recorded during identification of the pollen. Aggregates are clumps of a single type of pollen and may be interpreted to represent either pollen dispersal over short distances or the introduction of portions of the plant represented into an archaeological setting. The aggregates were included in the pollen counts as single grains, as is customary. The presence of aggregates is noted by an "A" next to the pollen frequency on the percentage pollen diagram. The percentage pollen diagram was produced using Tilia 2.0 and TGView 2.0.2. Total pollen concentrations were calculated in Tilia using the quantity of sample processed in cubic centimeters (cc), the quantity of exotics (spores) added to the sample, the quantity of exotics counted, and the total pollen counted and expressed as pollen per cc of sediment. Microscopic charcoal fragments were tallied and are presented as a ratio to the pollen recovered. The total number of microscopic charcoal fragments for each sample was divided by the pollen sum, resulting in a charcoal frequency that reflects the quantity of microscopic charcoal fragments observed, normalized per 100 pollen grains. Total microscopic charcoal values also were calculated in a similar manner as total pollen concentration.

ETHNOBOTANIC REVIEW

Ethnographic studies and published historic documents and accounts have been valuable indicators of possible or even probable plant uses. The ethnobotanic literature provides evidence for the exploitation of numerous plants in historic times, both by broad categories and by specific example. Although ethnographic sources document historic use of some plants as a carryover from the past, loss of plant knowledge most likely occurred as cultures moved from subsistence to agricultural economies and/or agricultural practices were introduced from abroad. The ethnobotanic literature serves only as a guide for potential uses, not as conclusive evidence of those uses. Pollen, phytoliths, starch, and macrofloral remains, when compared with the material culture (artifacts and features) recovered by archaeologists, can become indicators of use. We review plants represented by pollen in the following paragraphs to provide an ethnobotanic background for discussing the remains recovered in this study.

Cultivated Plants

Ipomoea batatas (Sweet potato)

Ipomoea batatas (sweet potato) is a Polynesian introduction to Hawai'i. Approximately 230 cultivars of sweet potatoes were recognized and used by early Hawai'ians. Not only the tubers were eaten, but the stem tips and young leaves also were used as food. Tubers were fermented to make potato beer and various parts of the plant were used medicinally. Vines and leaves were used as pig food, and old leaves were used as padding under floor mats. Tubers also were used to fatten hogs and as bait for *'opelu* (mackerel scad) (Wagner et al. 1990:555). Grated sweet potato root also was apparently used as an emetic (Whistler 1992:161).

Oryza (*Laiki*, Rice)

Oryza sativa (*laiki*, rice) is one of six tropical species of rice that grows as either an annual or perennial swamp grass. Most rice fields are terraced to benefit from elaborate irrigation systems. "When the grains begin to ripen and the panicle droops with their weight, the water is drained from the field to hasten the harvest" (Neal 1965:69). Rice seed probably was introduced to Hawai'i from China in 1856. More suitable seed was brought from South Carolina in 1860, and by 1862 rice was the second most important crop in Hawai'i. This economic importance was short-lived, as it yielded to coffee in 1899, largely because of the ancient and rather impractical methods of rice culture, milling, and marketing used in Hawai'i (Neal 1965:71).

Saccharum (Sugar Cane)

Saccharum (sugar cane) is a member of the grass family (Poaceae), as is considered to yield one of the five most valuable plant products. The large canes, known as "noble canes", grow only in cultivation. Sugar cane grown in Hawai'i includes many commercial varieties that are the result of hybridization (Neal 1965:77).

The prehistoric origin of sugar cane is variously reported as near central New Guinea (Neal 1965:77) or India around 500 B.C. (Toussaint-Samat 1992). Until the 19th century, the

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principal source of sucrose was the cultivated sugar cane, *Saccharum officinarum*, which has a sucrose content of about 13% in its fluids (McGee 1984). Early Polynesian immigrants introduced sugar cane into Hawaii and planted it in their gardens. They used it as a source of sugar and also as fiber for making hats and house thatching, although it is less durable than pili grass. The first sugar firm was established in Koloa, Kauai in 1835. Today, sugar plantations occupy approximately 5.5% of the total land area of the state, yielding 9-10 tons of sugar per acre. Although cane grows best at sea level, it may be grown to an elevation of 2800 feet on the lee sides of the islands. The crop requires 22–24 months to ripen and must receive adequate rainfall or be irrigated (Neal 1965:78).

From the Middle Ages until the late 19th century, processing of sugar cane followed the same basic procedure. At maturity, the cane fields were burned to clear cane leaves and other undesirables such as insects. The unburned, water-filled stalks were then cut and transported to a processing area where they were crushed and pressed. The green juice was cleared of impurities by heating with lime and a substance such as egg white or animal blood, which would coagulate the impurities that floated to the top, and were skimmed off. The remaining liquid was boiled down using shallow pans and poured into cone-shaped clay molds, called sugarloafs, where it crystallized into raw sugar. Additional steps could then be taken to further purify the sucrose crystals (McGee 1984). Byproducts such as molasses, alcohol, fuel fertilizer, and cattle feed also were gleaned from the crop (Neal 1965:78).

DISCUSSION

Two sites (KAKAAKO 119 and KAKAAKO 120) yielded 11 soil samples collected from peat, clay, and salt pan remnants that constituted Strata II and III (Table 1). Three trenches from each site were targeted for sampling. The testing area lies in a parking lot of Ward Warehouse Central between Auahi Street and Ala Moana Boulevard. Background research indicates the potential for historic trash pits, privies, and other historic features in this area. Pollen analysis and microscopic charcoal quantification was undertaken to address the record of vegetation and assist with identification of any human activity associated with this area.

KAKAAKO 119

The pollen record from KAKAAKO 119 includes samples from Strata II and III in three trenches (6, 21, and 22). These trenches are arranged approximately north to south with Trench 6 representing the *mauka*-side of the parking lot, through the central portion of the parking lot (Trench 22), and ending with Trench 21 representing the *makai*-side of the parking lot. All samples from this site were characterized as clayey peat with a gray-green color suggesting anaerobic conditions. The pollen record is dominated by *Myrsine* pollen (Figure 1, Table 2) in all samples from this site. *Myrsine* (*kōlea*) shrubs or trees are noted to grow in and around bogs and in mesic to wet forests, usually at elevations above 600 m (Wagner, et al. 1990:937-947). Recovery of this pollen as a dominant type in wetland sediments retrieved from locations near the coast suggests these shrubs/trees grew closer to the coast in the past and probably during the recent or historic past. This pollen has been a common component of samples examined from the Ward Village and Waikiki areas on the leeward side of Oahu

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(Cummings 2013; Cummings et al. 2012). Recovery of *Myrsine* pollen in these locations suggests that the wetlands along the coast supported *kōlea* into historic times.

Occasional presence of small quantities of *Cocos nucifera* pollen indicates growth of coconut palms near the coast. Evidence of shrubby vegetation was minimal, as *Chenopodium* pollen was observed only in sample 5 from Trench 22. Plants in the Asteraceae (sunflower family) also were not abundant in the area, as this pollen was noted only in sample 2 from Trench 6. Poaceae pollen was noted in samples from Trenches 6 and 21, probably representing grasses growing within or proximate to the wetlands. Cyperaceae pollen was observed in most of the samples from this site, indicating sedges growing as part of the wetland vegetation community. *Typha* pollen was noted only in sample 1, documenting growth of cattails in the most recent deposits (Stratum II) sampled from this location. Spores representing ferns also were noted in each of the samples from this site, indicating that at least three different types of ferns grew in the area.

Pollen representing alien plants included *Casuarina* (Australian pine), *Leucaena* (*koa haole*), and *Prosopis* (*kiawe*). Small quantities of these pollen were distributed throughout the sediments examined from this site. *Casuarina* would have been part of the littoral vegetation community, while *koa haole* and *kiawe* would have grown nearby on drier sediments. Pollen from all of these trees is expected to be transported at least short distances on the wind. Further, recovery of relatively stable quantities of pollen representing these alien plants establishes these deposits as historic.

Pollen that might represent either land use or perhaps accumulation of trash include *Saccharum*, representing sugar cane that was observed in Trench 22. Only small quantities of large Poaceae pollen that exhibited a distinct surface texture typical of *Saccharum* were observed in samples 5 and 6. Although large, *Saccharum* pollen may be transported at least 100 meters, indicating that an area near this wetland could have been farmed for sugar cane. Alternatively, remnants of sugar cane might have been discarded in this area. The hirsute leaves should retain at least small quantities of pollen long after the plants have ceased pollinating, making pollen transport through discard a possibility over a longer period of time than merely the few weeks that the plants pollinate.

Foraminifera were observed in each of the samples from Site KAKAAKO 119, documenting exchange of water with the sea or the presence of brackish water in this location.

Stratum III sediments exhibited elevated microscopic charcoal frequencies that were many times more abundant than the pollen, which are calculated to be about 2 million and approximately 1.5 million pieces of charcoal per cc of sediment (Table 3). This suggests the possibility that fields in the area were burned or that ash was discarded in this area. This practice does not appear to have been carried forward into Stratum II at this location. Sample 1, the uppermost sample from Stratum II in Trench 6, also yielded nearly 1 million pieces of microscopic charcoal per cc of sediment, but due to the large total pollen concentration, the ratio between pollen and microscopic charcoal is low.

Total pollen concentration was high in all samples examined from this site. The lowest total pollen concentration was observed in sample 2 from Trench 6, suggesting more rapid accumulation of sediments at this time and place. This is followed by the largest total pollen concentration in the overlying sample 1, suggesting a very stable surface landscape. Trench 2 exhibited moderate total pollen concentrations, suggesting slightly more rapid sediment accumulation in this location. Finally samples from Trench 21 exhibit large total pollen concentrations, which is a trait of pollen records from bogs or shallow open water settings.

Site KAKAAKO 120

Site KAKAAKO 120 is represented by five pollen samples collected from three trenches (1, 6, and 23). From north to south, Trench 1 is *mauka*-side, Trench 6 is slightly less *mauka*-side, and Trench 23 is *makai*-side of the parking lot.

Like the samples from site KAKAAKO 119, the pollen samples from KAKAAKO 120 were dominated by *Myrsine* pollen, indicating growth of *kōlea* associated with the bog. Pollen evidence for vegetation is more diverse in this area than it was at the other site. This suggests drier habitats in the vicinity of this location.

Sample 7, representing the uppermost portion of Stratum IIb in Trench 1, yielded a large quantity of microscopic charcoal, suggesting local fires, perhaps for land clearing. Pollen also observed in this sample includes *Cocos nucifera*, Poaceae, and Cyperaceae representing coconut palms, grasses, and sedges growing in the general vicinity. *Casuarina* and *Prosopis* pollen indicate that Australian pine and *kiawe* also grew along the coast. Recovery of a small quantity of *Saccharum* pollen indicates sugar cane cultivation in the area or discard of sugar cane remains in a trash midden. Total pollen concentration for this sample was moderately large and similar to that noted in the Trench 21 samples.

Trench 6 is represented by two samples, both collected from Stratum II. Sample 9, the lowest, yielded the smallest quantity of *Myrsine* pollen observed in samples from these two locations. Moderate quantities of *Chenopodium* and Cyperaceae pollen reflect shrubby *ʻaheahea* growing in drier habitats outside the bog and sedge growing in mesic or wet sediments near or in the bog. Small quantities of *Mangifera*-type Anacardiaceae and *Cocos nucifera* pollen represent mango and coconut palm trees growing in the area. Recovery of small quantities of *Casuarina*, *Leucaena*, and *Prosopis* pollen indicate that alien Australian pine, *koa haole*, and *kiawe* trees also grew in the area, labeling these deposits as historic. Small to moderate quantities of fern spores indicate that ferns also grew, probably in the shade of the *kōlea* at the edge of the bog. Ferns are well documented in this sample, which is the only one to yield Dicksoniaceae spores, representing tree ferns. Small quantities of *Oryza*-type and *Saccharum* pollen were noted in this sample suggesting local cultivation of rice and sugar cane. Total pollen concentration in this sample is very low, suggesting rapid sediment accumulation and possibly drying of the bog as a result. The lower sample exhibited a larger quantity of microscopic charcoal in comparison with the quantity of pollen, than did the upper sample from this location. This is consistent with the pattern observed in samples from Trenches 21 and 22.

Sample 8 yielded small quantities of *Mangifera*-type Anacardiaceae and Myrtaceae pollen indicating that mango and guava, or another member of the myrtle family, trees also grew in the vicinity of this bog. Recovery of small quantities of Low-spine Asteraceae, High-spine Asteraceae, and Liguliflorae pollen probably represent weedy plants in the sunflower family growing locally. *Boerhavia*-type pollen represents weedy *alena* probably growing mixed with the plants in the sunflower family in disturbed areas. These pollen types combine to indicate both sediment disturbance and a drier habitat. Small quantities of Poaceae and Cyperaceae pollen probably reflects grasses and sedges growing near the margins of the bog. Slightly larger quantities of pollen representing alien *Casuarina*, *Leucaena*, and *Prosopis* were observed in this sample, suggesting a slight increase in the local population of Australian pine, *koa haole*, and *kiawe*. This upper sample yielded small quantities of *Ipomoea batatas*-type, *Oryza*-type, and *Saccharum* pollen indicating cultivation of sweet potato, rice, and sugar cane. Alternatively, it is possible that this area functioned as a midden during the accumulation of these sediments, in which case these pollen might be associated with discard of agricultural products. Although the ratio between pollen and microscopic charcoal suggests a smaller quantity of microscopic charcoal in sample 8, when the values are calculated the underlying sample 9 yielded approximately 43,000 pieces of microscopic charcoal per cc of sediment, while sample 8 yielded more than 124,000 pieces of microscopic charcoal per cc of sediment. Total pollen concentration in sample 8 was only moderate at slightly more than 31,000 pollen per cubic centimeter (cc) of sediment examined. Foraminifera were not observed in either of these samples.

Samples examined from Trench 23, located closer to the coast, exhibit a more simple signature, reminiscent of that observed in samples from Trench 6. Other than *Myrsine*, which dominated the record, these 2 samples exhibited only small quantities of *Chenopodium*, *Artemisia*, *Cressa*, Poaceae, Cyperaceae, and the alien *Leucaena*, and *Prosopis* pollen in one or both of the samples, representing *'aheahea*, *'āhinahina*, cressa, grasses, sedges, *koa haole*, and *kiawe*. Very little microscopic charcoal was noted in either of these samples. The lower sample exhibited a much smaller total pollen concentration, at approximately 18,600 pollen per cc of sediment, suggesting more rapid sediment accumulation and disturbance. The upper sample represents sediment that appears to be relatively stable, since the total pollen concentration was more than 300,000 pollen per cc of sediment. Sample 10, the uppermost examined from this trench, yielded a small quantity of Foraminifera, suggesting the presence of open water. The sediment sample were consistent with the presence of open water in this area, as these sediment submitted was sandy rather than being a clay peat.

SUMMARY AND CONCLUSIONS

Pollen and microscopic charcoal analysis of samples collected and examined from KAKAAKO 119 and KAKAAKO 120 indicate these two areas were boggy and perhaps supported open water. Recovery of Foraminifera consistently in the samples from KAKAAKO 119 and in only one of the samples from KAKAAKO 120, suggests more open water in the vicinity of KAKAAKO 119. Certainly the more complex pollen signatures derived from samples collected from KAKAAKO 120, which, when combined with the lower total pollen concentrations from the lower samples in each of Trenches 6 and 23, suggests more rapid sedimentation in this area. The boggy area or areas represented in this study supported large stands of *kōlea*.

Local vegetation in the vicinity of the bogs included grasses and sedges, documented by recovery of Poaceae and Cyperaceae pollen in nearly all of the samples. Cyperaceae pollen, representing sedges, was particularly abundant in sample 9, representing the lower portion of Stratum II in Trench 6 and slightly abundant in sample 6, representing Stratum III in Trench 22. Sedges would have grown either at the edges of the bog or perhaps forming mats throughout the bog. Cyperaceae pollen was not sufficiently abundant to suggest that these peat bogs were sedge bogs. Fern spores were recovered in most of the samples examined, and were particularly abundant in sample 9, representing the lower portion of Stratum II in Trench 6. Dicksoniaceae spores were recovered only in this sample, suggesting local growth of at least a few tree ferns.

Evidence for pollen representing alien plants that included Australian pine, *koa haole*, and *kiawe* was well distributed throughout the samples examined from both sites, indicating that the sediments sampled are historic.

It is likely that the area supported sugar cane fields, as *Saccharum* pollen was noted in samples from Trench 22 (KAKAAKO 119) and in samples from Trenches 1 and 6 (KAKAAKO 120). A rice paddy might have been located in the vicinity of Trench 6, documented by recovery of *Oryza*-type pollen in both samples from this trench. Sweet potatoes also might have been cultivated near Trench 6, since *Ipomoea batatas*-type pollen was recovered from sample 8 in the upper portion of Stratum II. Alternately, the area sampled by Trench 6 might have been used as a trash dump or midden.

Comparing ratios of microscopic charcoal to pollen suggests that microscopic charcoal is more abundant in samples examined from Stratum III at KAKAAKO 119. The calculated absolute quantity of microscopic charcoal observed in these samples substantiates this observation, but indicates a surprisingly large quantity of microscopic charcoal in sample 1. At KAKAAKO 120 the largest quantity of microscopic charcoal observed was in samples 7, collected from Stratum IIb in Trench 1. This is, in fact, the largest quantity of microscopic charcoal noted in any of the samples examined from these two sites. A large quantity of microscopic charcoal also was noted in sample 10, collected in the upper portion of Stratum II in Trench 23. It is possible that these large concentrations of microscopic charcoal represent burning weeds to clear land between crop plantings. Charred Asteraceae tissue fragments were noted in samples 4 and 9, suggesting burning weedy plants, but large quantities of microscopic charcoal do not coincide with pollen evidence for weedy plants that are expected to accompany agricultural plots. Sugar cane also was burned as part of the harvesting process, but there is little evidence for the presence of burned grass stem other than three charred bilobate phytoliths recovered in sample 6, suggesting burning sugar cane debris. Microscopic charcoal also might represent ash discard or dumping in midden sediments. At least some of the microscopic charcoal in many of the samples were very tiny. It was not possible to discriminate between tiny microscopic charcoal fragments and possible petroleum contamination that accumulates in coastal sediments, therefore, for at least the upper samples it is possible that the microscopic charcoal count has been influenced by the presence of petroleum.

TABLE 1
PROVENIENCE FOR SAMPLES FROM SITES KAKAAKO 119 AND KAKAAKO 120, O'AHU

Sample No.	Trench	Stratum	Depth (cmbs)	Provenience/ Description	Analysis
KAKAAKO 119					
1	6	2	133-134	Clayey peat, gray-green, w/red inclusions	Pollen
2			134-135	Clayey peat, gray-green	Pollen
3	21	2	160-161	Clayey peat, gray-green, w/red inclusions	Pollen
4		3	161-164	Clayey peat, gray-green	Pollen
5	22	2	145-147	Clayey peat, gray-green	Pollen
6		3	150-152	Clayey peat, gray-green	Pollen
KAKAAKO 120:					
7	1	2b	125-127	Clayey peat, gray-green, w/red inclusions	Pollen
8	6	2	151-152	Clay, gray-green	Pollen
9			152-155	Sandy clay, gray	Pollen
10	23	2	120-121	Peat, yellow gray	Pollen
11			121-125	Sandy clay, gray	Pollen

TABLE 2
POLLEN TYPES OBSERVED IN SAMPLES FROM SITES KAKAAKO 119 AND KAKAAKO 120, O'AHU

Scientific Name	Common Name	Nat	Pol	End	Ind
TREES:					
Cocos nucifera	Coconut, *Niu, alolani*		x		
Mangifera-type Anacardiaceae	Mango in mango family	Introduced from India			
Myrsine	*Kōlea, 'Ōliko, Kōlea lau nui, Kōlea lau li'i*			x	
Myrtaceae	Myrtle family	x	x	x	x
SHRUBS:					
Chenopodium	Goosefoot, pigweed, lamb's quarters, Mexican tea, worm seed, *'aheahea, 'ahea, 'ahewahewa, alaweo, alaweo huna, 'aweoweo, kaha'iha'i*	x		x	
Artemisia	*'Āhinahina, hinahina, hina hina kuahiwi*	x		x	
HERBS:					
Low-spine Asteraceae	Sunflower family; Includes ragweed and others	x		x	x
High-Spine Asteraceae	Sunflower family; Includes *Bidens*	x		x	x
Liguliflorae	Sunflower family, chicory tribe	x			
Boerhavia-type	*Alena, anena, nena*	x			x
Cressa	Cressa				x
GRASSES, etc.:					
Cyperaceae	Sedge family	x		x	x
Poaceae	Grass family	x		x	x
Typha angustifolia-type	Cattail	x			
ALIENS:					
Casuarina	Australian pine (Ironwood, *Paina*)	x			
Leucaena	*Kao-haole ('ekoa, lilikoa)*	x			
Prosopis	*Kiawe*, mesquite	x			

TABLE 2 (Continued)

Scientific Name	Common Name	Nat	Pol	End	Ind
AGRICULTURE:					
Ipomoea batatas-type	*'Uala, 'uwala*, cultivated sweet potato		x		
Oryza-type	*Laiki*, rice	Introduced by Chinese			
Saccharum	*Kō*, sugar cane	x			
SPORES:					
Dicksoniaceae	Tree fern family			x	x
Monolete bumpy	Ferns				
Monolete smooth	Ferns				
Trilete bumpy	Ferns				
Trilete smooth	Ferns				
Trilete spiny	Ferns				
OTHER:					
Foraminifera	Forams, single-celled protists with shells				
Scolecodont	Worm jaw				
Charred Asteraceae Tissue Fragment	Charred tissue fragment from a member of the sunflower family				
Microscopic Charcoal	Microscopic charcoal fragments				
Total Pollen Concentration	Quantity of pollen per cubic centimeter (cc) of sediment				

Plant names and information derived from (Wagner, et al. 1990)
Fern (spore) names derived from (Selling 1946)

Nat = Naturalized
Pol = Polynesian introduction
End = Endemic
Ind = Indigenous

Pollen identifications to species were made based on the fact that only 1 species is reported by (Wagner, et al. 1990). Species identification was not made based on morphologic characteristics observed under the microscope.

TABLE 3
MICROSCOPIC CHARCOAL RESULTS

Sample No.	Trench	Stratum	Depth (cmbs)	Microscopic Charcoal, Ratio	Microscopic Charcoal, Absolute Quantity
KAKAAKO 119					
1	6	2	133-134	49	915,168
2			134-135	101	15,120
3	21	2	160-161	60	187,699
4		3	161-164	1607	2,010,871
5	22	2	145-147	181	119,836
6		3	150-152	3110	1,438,033
KAKAAKO 120					
7	1	2b	125-127	3564	7,396,048
8	6	2	151-152	399	124,201
9			152-155	1794	43,379
10	23	2	120-121	303	961,955
11			121-125	128	23,907

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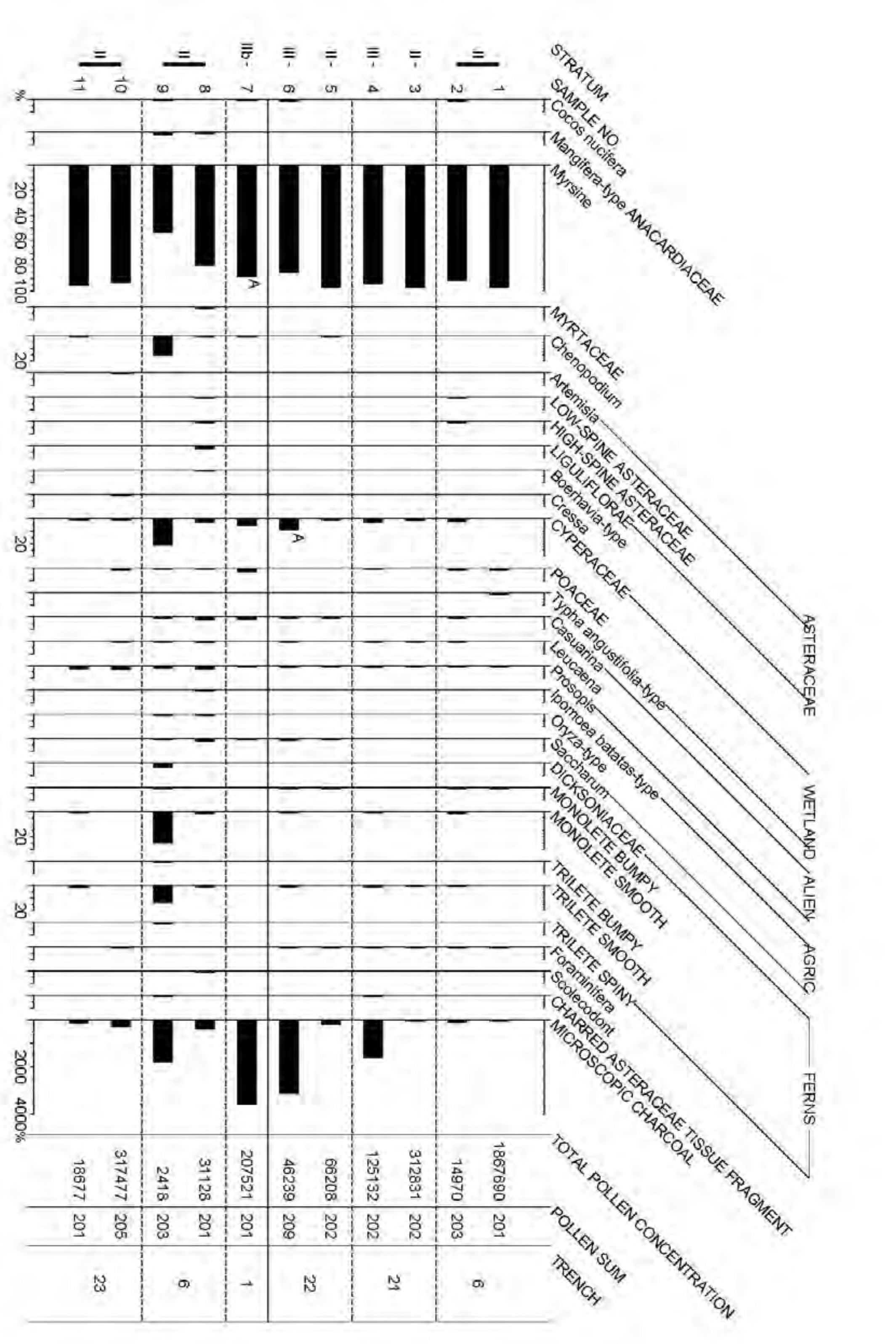

FIGURE 1. POLLEN DIAGRAM FOR KAKAAKO 119 (TOP) AND KAKAAKO 120 (BOTTOM), WARD WAREHOUSE CENTRAL, OAHU.

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